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FOREWORD

BALTIC SURVEYING (ISSN 2255 – 999X) is international scientific journal. The periodicity of the journal is 1 or 2 volume per year.

Universities from Estonia, Latvia and Lithuania joined their efforts to publish international scientific journal BALTIC SURVEYING. It is jointly issued by:

- Department of Geomatics of Estonian University of Life Sciences;
- Department of Land Management and Geodesy of Latvia University of Agriculture
- Institute of Land Use Planning and Geomatics of Aleksandras Stulginskis University (Lithuania).

In the 2nd volume of the journal are included original articles on land administration, land management, real property cadastre, land use, rural development, geodesy and cartography, remote sensing, geoinformatics, other related fields, as well as education in land management and geodesy throughout the Baltic countries, Western and Easten Europe and elsewhere. The journal is the first one in the Baltic countries dealing with the issues mentioned above.

This scientific journal contains peer reviewed papers. For academic quality each paper has been reviewed by two independent anonymous academic reviewers having Doctors of science degree. Editorial Board has made the final decision on the acceptance for publication. Each author is responsible for high quality and correct information of his/ her article.

We believe that in the future scientists from other foreign countries will become authors of research articles, and the topics of articles will range widely.

We believe that journal will disseminate the latest scientific findings, theoretical and experimental research and will be extremely useful for young scientists

Scientific journal BALTIC SURVEYING already is indexed in Agris database. Published scientific papers will be submitted to CAB Abstracts and EBSCO Academic Search Complete databases. The data bases select the articles from the proceedings for including them in their data bases after individual qualitative and thematic examination.

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Editorial board

CONTENT

CHANGES OF LAND USERS IN INTERWAR LITHUANIA

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Abstract
The article presents the analysis of the change of land users in the Republic of Lithuania during the period between 1919 and 1940. The main factor affecting the relationship of land and its use was the political changes in the country, whereas economic and social aspects had less influence. During the period between 1919 and 1939 the land reform of independent Lithuania not only strengthened the country's agriculture, but also laid the foundations for the entire nation-state, it was one of the most significant achievements of independence, a real agrarian revolution, which intensified the land use. The main goal of the land reform was to alienate and distribute the state land and the land of large estates to peasants and to complete distribution of village land into individual farmsteads. Landlords were left inalienable 80 hectares (later 150 ha) of land area. The land from the State Land Fund was distributed to volunteers and new settlers (the landless) peasants up to 8-10 ha, to estate workers and rural craftsmen – up to 1.5-2 ha, as well as to poor peasants, state enterprises, farms and forestries, etc.
 Keywords: land users, land reform, poor and landless peasants, farmers, agricultural land.

Introduction
Lithuania has always been and is an agricultural country, in which long-standing traditions of agriculture have been valued and cherished since ancient times. The agricultural sector plays a very important economic, social, environmental and ethno-cultural function and is considered to be the country's priority sector of the economy. The restoration of the independent state of Lithuania (February 16, 1918) made it possible to change the outdated procedure and create more advanced one. One of such sectors is the redevelopment of land management and land use relations. Lithuania has survived the feudal epoch formed land management and land use procedure – the three-field strip farming and street accommodation system.

In the wake of the First World War storms, Lithuanian agriculture was exhausted. The war mainly affected large farms - estates. In estates, the number of cattle and horse fell twice, many buildings were burnt down, agricultural equipment and machinery were taken away. According to the Law on Land, land owners and land users had to use the land according to the main purpose of use, the method of use, follow special land use conditions established for land parcels, keep to the requirements established in land use planning documents (Lietuvos…, 2004).

The task of the land use planning documents was to determine valuable farming lands, to provide their improvement (road network and drainage system reconstruction, soil reclamation), to choose the area for urbanization and the layout of infrastructure objects, to determine the areas, where afforestation was purposeful and possible. The implementation of the planned solutions had to be performed by municipalities and rural communities (Aleknavičius, 2007).

A. Aleknavičius and P. Aleknavičius analysed the change of the farming land area situated in agricultural land in Lithuanian cultivated areas during the period between 1990 and 2008. During the period of the land reform in Lithuania, the farmland area decreased by 732 thousand ha (21.7 per cent), of which about 450 thousand ha (15.2 per cent) belonged to arable land (Aleknavičius, 2010).

Agriculture is an industry supplying people with the main source of survival - food. Due to the specific features of production process, agriculture slower adapts to the changes in the demand and is less flexible. In this case, employed people and households involved in agriculture are at greater risk of suffering losses, therefore the government uses the money collecting taxes from the whole population of the country in order to support agriculture (Girdžiūtė, 2011).

D. Makutėnienė analysed changes in the size of farmers' farms and the impact of their land area on economic results. It was estimated how the land reform affected the establishment of farms as well as their structural changes, economic changes in the average land area in the country. Results of the study showed that small farmers' farm land is used much more intensively than that in large farms (Makutėnienė, 2004).

E. Abalikštienė and V. Stravinskienė (2011) analysed the use of the land in southeast Lithuania. During the period between 2003 and 2010 six districts, Ignalina, Molėtai, Švenčionys, Trakai, Varėna and Zarasai, having less favourable conditions for farming, were selected for the analysis. The results showed that the number of farms decreased in all districts.

P. Aleknavičius (2012) analysed agricultural land rearrangement works carried out in independent Lithuania. In order to create favourable conditions for agricultural land users he recommended to improve agricultural policies and laws, by providing support to households which purchased the prospective land within the boundaries of their land use and which started to use the abandoned land.

During the process of the land reform in independent Lithuania, only land parcels and not farms were designed since 1997, as land territorial units were required to be registered by the law. Thus, land parcels became smaller and more scattered. Since the formation of the farm land holdings were left to a chance, the rearrangement of the layout of land parcels would be solved during the repeated land management works and during the preparation of land consolidation projects.

All agricultural development forecasts (carried out at Lithuania scale) are more optimistic and are associated with purposeful regulated activities by the state: "Agricultural land use plan is appropriate to the recommended farm specialization, corresponding to soil characteristics. Agricultural land area in Lithuania, after the identification of a neglected agricultural land, can be increased to 3 million ha" (Aleknavičius, 2012).

Since Lithuania is an agricultural country, it is important to analyse the land use and the change of land users during various political and social events of the country. The aim of the paper was to describe agricultural land use peculiarities in Lithuania during the period between 1920 and 1940.

In order to achieve the goal the following tasks have been set:

1. to analyse the use of the land in Lithuania during the first period of independence (during the period between 1919 and 1940);
2. to analyze the land use structure and change;
3. after the analysis of the legal, historical documents and statistical data of the analysed period to provide basic land use characteristics of the analysed period.

Methodology of research and materials

In order to achieve the aim the following research methods were used: the study of scientific literature and legal documents, the analysis and synthesis of statistical indicators, the analysis of mathematical processing and comparative analysis. The study was carried out using the data obtained from the Department of Statistics, the National Land Service under the Ministry of Agriculture as well as from the Lithuanian Agricultural Information and Rural Business Centre for the years 1920 and 1940.

Results and discussion

Land use during the period between 1920 and 1940. In the wake of the First World War storms, Lithuanian agriculture was exhausted. The war mainly affected large farms - estates. The number of cattle and horses fell twice in estates, many buildings were burnt, agricultural equipment and machinery were taken away. Totally in Lithuania, except for the region of Vilnius, 1,200 villages with 14,270 farms, 2,000 individual farmsteads, 270 estates and 50 villages with churches were burned. 16% of the fields and as much as 35% of estate lands lay waste (Žemėtvarka ..., 2004). If part of the arable land of estates was cultivated, it was done mostly by small tenants with the help of hand tools. Therefore, in 1918, after Lithuania regained the independence, one of the main tasks of the government was to start the land reform without delay. The main reasons for the implementation of the land reform were as follows: the lack of land for farming families, big economic weakness and disorder in rural land use. Considering the cause of the land reform, the following objectives were set:

1. to provide poor and landless peasants with the land;
2. to dispose of or reduce obsolete ownership status (land holdings belonging to mansions, banks, religious organizations);
3. to unify farming conditions on the basis of the farmstead land tenure (i.e. completing the strip land use);
4. to dispose of easements in estates' pastures and forests;
5. to distribute land to be managed as joint ownership (mostly - common pastures in villages).

In 1919, Lithuanian landlords owned about 1,384 thousand hectares of land, or 26.2% of the national territory (Table 1).

Table 1

Land ownership in Lithuania in 1919 (Vaskela, 1998)

Land according to ownership forms	Landholding area, ha	Landholding structure, %
Landlords' land	1,384,000	26.2
Peasants' land	2,932,200	55.51
Patrimony	1,7015	0.32
State land and other land	949,000	17.97
State territory ha*	5,282,185	100

Lithuanian territory without Vilnius and Klaipėda regions

One estate owned on average 490 ha. There are no accurate land distribution data, but it is considered that in 1919 the peasants' farms owned 2,932 thousand ha, or 55.5% of the total land. Landless peasants accounted for about 21% of the population working in agriculture at that time. Small and very small peasants, who were landowners, accounted for about 25%. The share of landlords and their family members made up only 1.1% of the rural population (Vaskela, 1998). Consequently, imbalanced distribution of the land was evident.

According to the survey of the year 1919 conducted by the Land Reform Commission, 94.6 thousand of poor and landless peasants wanted to get about 1,550 thousand hectares of land. A number of villages still had retained the old land relations – they owned land by strip three-field system of farming. Till the First World War in Lithuania (without Vilnius and Klaipeda regions) about 910 thousand hectares of land (3,886 villages) were distributed into individual farmsteads. According to the statistics of the Department of Land Management, there were 9,604 villages (about 180 thousand farms) in Lithuania in 1919 still not distributed into individual farmsteads. The area of not distributed villages and towns covered 1.973.3 thousand ha (Žemėtvarka ..., 2004). Economic, social and political conditions were reasons, which influenced the implementation of the land reform.

612 thousand ha of the land left without owners or the land once owned by the state estates or owners from other countries, landlords or Russian colonists, were taken over by the State Land Fund. The largest areas of the land were taken from the landlords – up to 84% of the expropriated land. According to the data of L.Truska there were 1,301,544 ha of land in the State Land Fund (Table 2) (Vaskela, 1998).

Table 2

The State Land Fund in Lithuania during the period between 1919 and 1940
(according to the data of L.Truska)

State Land Fund sources	Area, ha	Structure, %
Land of private land owners:	1,247,837	95.87
of which forests and water reservoirs	592,127	45.59
State land	11,173	0.86
Land belonging to churches and monasteries	2,194	0.17
Land belonging to Land Bank	2,687	0.21
Peasant land bank	26,166	2.01
Other land	11,487	0.88
Total	1,301,544	100

Foreign citizens have been banned from owning and buying land in Lithuania. During the reform the land of the larger estates was expropriated, leaving the owners 80 ha of land rate. In 1929, the inalienable land area was increased to 150 ha. Landowners received compensations for expropriated land according to the law.

The most intense land rearrangement and distribution related to the State Land Fund took place during the period between 1923 and 1930.

The land was distributed to about 65 thousand families. Peasants had to pay redemption fees for the received land. First of all, the biggest land parcels were given to the former officers and soldiers, who were drafted in the year the state was established, as well as to honoured persons of political parties of

independent Lithuania. Landless peasants or those who owned no land at all received from 8 to 20 ha of land, labourers and craftsmen of rural estates received from 1.5 to 2 ha of land.

According to the State Land Fund, the land was distributed in the following way:

- to poor and landless peasants - 453 thousand ha;
- to state-owned enterprises and forest farms – 35 thousand ha;
- to city municipalities and individual buildings – 9 thousand ha;
- rented to representative and cultural farms – 9 thousand ha;
- for other purposes (easements' elimination, sales, etc.) – 46.5 thousand ha.

Totally, during the period between 1919 and 1940 1,443 estates were parcelled, easements were eliminated in the area of 100 thousand ha. Totally, parcelling affected 720,282.1 hectares that made up 81,837 parcels of land. The parcelling of estates in Lithuania covered about 25% of the territory of the state (Land Management ..., 2004). The progress of the land reform can be seen in Figure 1.
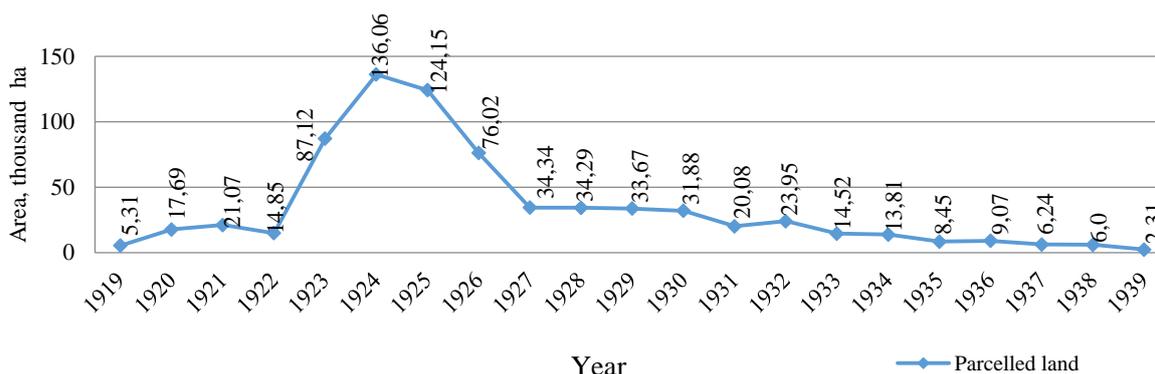
Fig.1. Areas parcelled during the land reform (Šalčius, 1998)

Estates were expropriated most intensively during the period between 1923 and 1926, and in 1924 the intensity reached the maximum level; more than 136 thousand hectares of land were parcelled. During the period between 1923 and 1926, 58.6% of the total work carried out during the land reform was executed.

New settlers, i.e. those who had no land until the land reform, were given 362,084 ha to the ownership and 90,629 ha were given to poor people (Table 3). The new settlers' group was divided into two categories: those who have received up to two hectares of the land, and those who received over 2 hectares of the land. The total number of 4,690 people received up to 2 hectares, and they received 8,007 ha of land, in average of 1.71 ha each (Vaskela, 1998).

Table 3

Distribution of the State Land Fund in Lithuania during the period between 1919 and 1940
(according to the data of L.Truska)

Land given	Parcels	Area	
		ha	**%**
To new settlers:	38,747	362,084	27.8
up to two hectares of land to rural workers and craftsmen	4,690	8,007	0.61
2 - 20 ha parcels to the landless	33,504	339,371	26.06
more than 20 hectares of land to the landless	553	14,706	1.13
To people having not much land	26,367	90,629	6.96
To rural workers' gardens	7,918	3,287	0.25
To peasants for easements	-	28,214	2.17
Left to landlords	1,734	186,621	14.33
To public institutions, municipalities, governmental organizations, etc.	5,234	50,409	3.87
State forestry and water enterprises	-	557,894	42.84
Sold and allocated to other uses	-	18,109	1.39
Left undistributed	-	5,145	0.4
Total:	-	1,302,392	100

All the independent Lithuanian land reform is divided into two stages: the period between 1919 and 1930, when parcelled estates and villages were divided into households, and the period between 1931 and 1939, when the distribution of the villages predominated. The average managed rural area was 237 ha, and the average household area - 10.4 hectares. However, the Lithuanian villages' distribution to households had not been completed.

During 20 years of the reform the rural land management work was intense and complicated. Lithuania became a country of households. Small parcels dominated in agricultural lands.

According to the data of agricultural census carried out in 1930, there were 287,380 households (4,327,500 ha) in Lithuania. The average farm owned 15 ha of land. Farms from 1 to 12 ha accounted for 90.93% of the total number of farms. There were 99,345 farms having not much land (1-8 ha) across Lithuania, which accounted for about 35% of the total number of farms. They accounted for 10.4% of the total farm area (Figure 2).

There were 159,360 medium-sized farms (8-30 ha), or 55.5% of the total number of farms. They occupied 55.8% of the total farm area. There were 1,602 estates (100 ha and more) or only 0.6% of the total number of farms. They took 6.3% of the total land area of the farm. Meanwhile, before the First World War in Kaunas province alone 46.5% of the land belonged to farms with more than 100 tens (Šalčius, 1998).
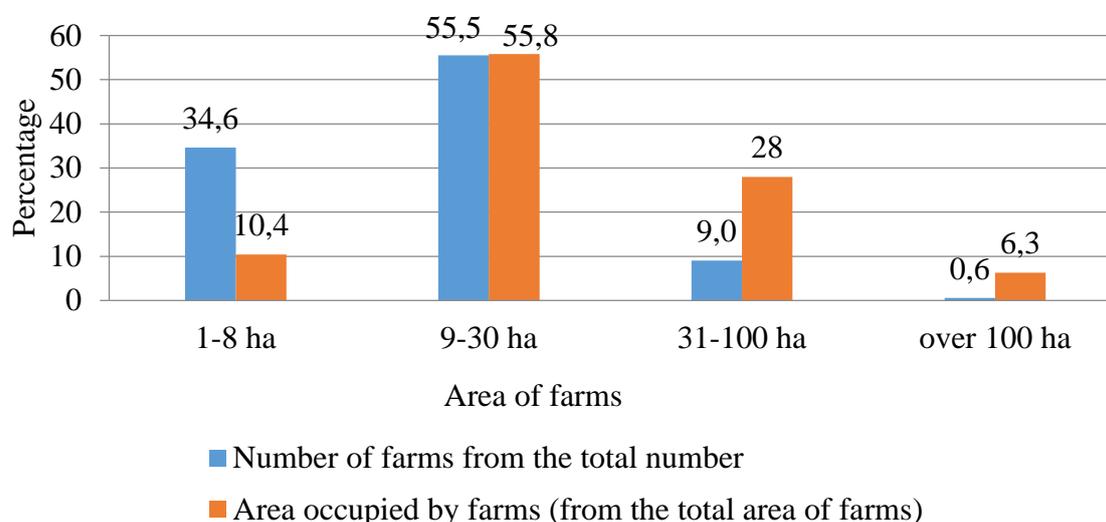
Fig. 2. Number of farms and their areas in 1930, in percentage (Žemėtvarka...,2000)

During two decades of the existence of an independent state (during the period between 1919 and 1940) public and peasant land areas increased. Actually, landlords' landholdings disappeared, although formally landowners of landlords' origin saved remnants of the former areas. Landlords' holdings in Lithuania decreased by 15 times during the period between 1919 and 1940. The share of estate land in the state area had declined from 26% to 1.5%, the state land areas had increased from 2.2 to 2.5 times (Table 4).

Table 4

Lithuanian landholding percentage change during the period between 1919 and 1940
(Vaskela, 1998)

Land owners	**1919**	**1940**	**Change**
State	9.23	18.5-20.5	+9.22 -10.99
Peasants and other farmers	55.51	70.66	+15.15
Landlords	26.2	1.53	-24.38
Church	0.32	0.35	+0.03
Other lands	8.73	6.96 – 8.72	-1.77 – 0.01
Total	100	100	

State land area has increased due to the fact that private forests and larger bodies of water were nationalized. 506,030 hectares of forests and 51,864 hectares of water bodies were expropriated from private owners until 1940 (Vaskela, 1998). The ownership of churches' land changed only slightly, such lands were extremely rare, so this fact did not have a significant impact on the structure of land tenure.

However, the drawback of the land reform was that the newly created private farms were too small for practical use. The land reform law provided the farm size from 8 to 20 ha as sufficient for one family to feed. The concern that settlers would not be able to use the obtained land did not come true. A sharp drop in the number of the poor and the landless was observed that would have positively affected the rise of agricultural production over time, if the Soviet land reform had not followed.

The land reform of the independent state of Lithuania during the period between 1919 and 1939 strengthened not only the country's agriculture, but also laid down the foundations for the national state, it was one of the most significant achievements of independence, a real agrarian revolution, which intensified land use.

After the removal of three-field agricultural system, areas of virgin soils decreased. In 1912, virgin soils covered 28.4% of cultivated land area, in 1925 - 25%, in 1939 - 15%. Abandoned areas mainly were situated in large farms: in 1919 in large farms - 31.4%, in small farms -12.6%, and in 1921 in large farms - 18.6%, in small farms - 3.0% (Vaskela, 1998). Agricultural areas increased significantly. In 1930, there were 3,800.9 thousand ha of agricultural lands, which accounted for more than 67% of the total land area, and in 1935 - about 70%, i.e. the agricultural land area has increased by 2.4% (Fig. 3).
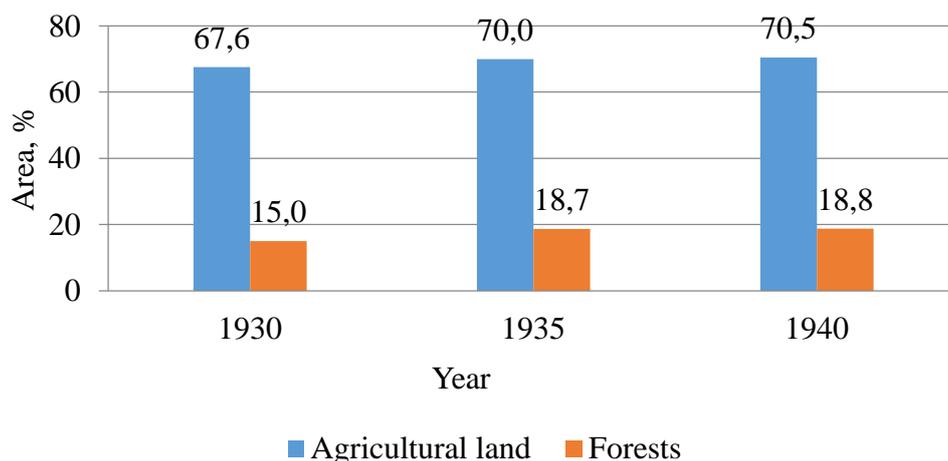
Fig. 3. Agricultural land and forests percentage change during the period between 1930 and 1945 (Povilaitis, 2000)

This resulted in important historical processes initiating the wave of the formation of individual farms. Each piece of land was important to the farmers. Even in economically poor soils crops were cultivated. Thus in 1940 agricultural land has already accounted for 4,394 thousand ha, or 70.5% of the entire territory. Along with agricultural land, forest areas practically evenly increased as well. At the beginning of the period (in 1920) Lithuanian forests covered about 15% of the country's territory, and at the end of the period (in 1940) - 18.8%, i.e. forest area has increased by 3.8%.

Arable lands dominated in the agricultural land structure, the area of which increased with increasing crop areas (Fig. 4).
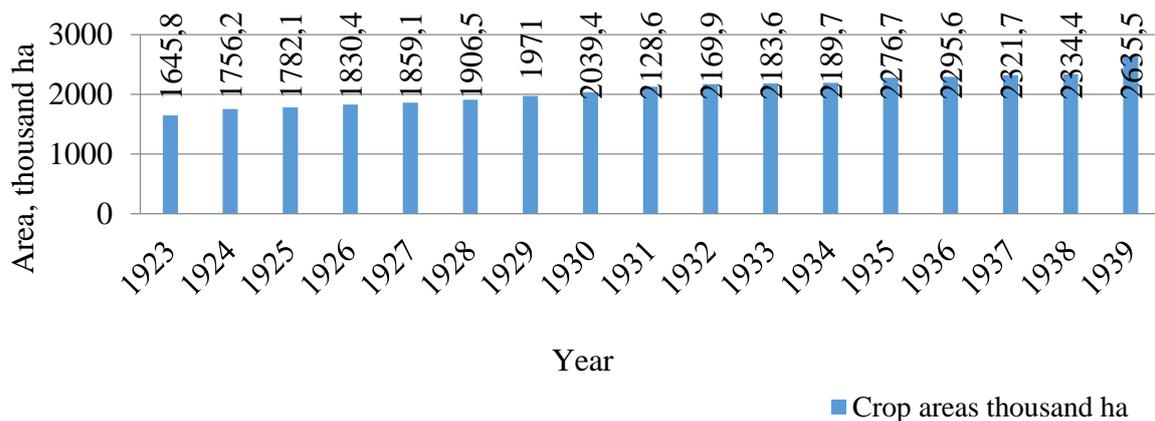
Fig. 4. General Lithuania crop areas from 1923 until 1939 (Povilaitis, 1988)

In 1930, arable land accounted for more than half (53.7%) of the total agricultural land area, and in 1940 this number increased even up to 67% (Fig. 5). Scrubs, natural grasslands and pastures were cultivated. Due to this fact areas of grasslands and pastures decreased significantly.
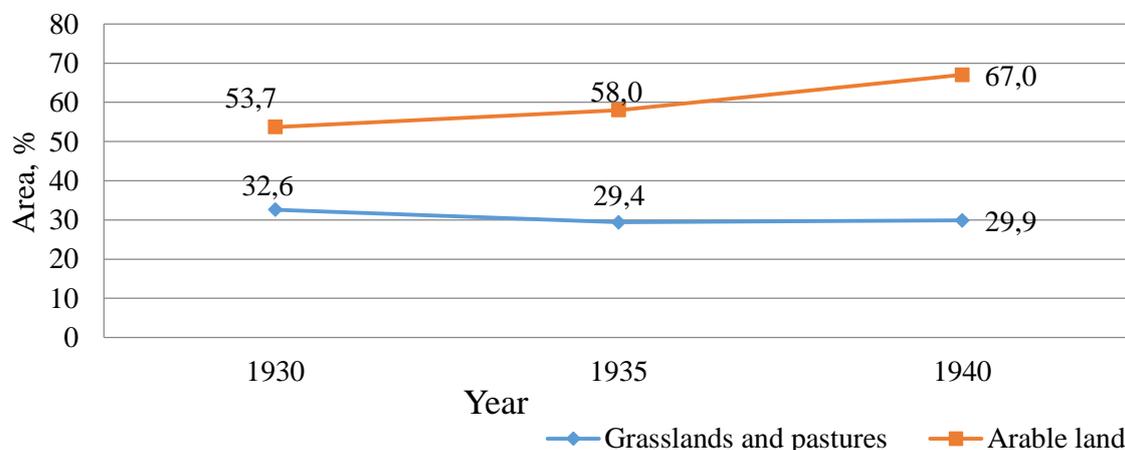
Fig. 5. Part of grasslands and pastures as well as arable land in the agricultural land during the period between 1930 and 1945

In 1930, the total area of grasslands and pastures made up 1,283.3 thousand ha or 32.6% of the total agricultural land, and in 1935 – 1,140 thousand ha respectively or 29.4%. Later, these areas stabilized and only in 1940 slightly increased to 1,189.7 thousand ha (Povilaitis, 2000). During the period between 1920 and 1940 the largest area of agricultural reclaimed lands was achieved.

Arable land areas have been verified on the spot during the Agricultural Census in 1923, 1930 and 1935, and during other in-between years the Lithuanian Statistics Office made only corrections. With the establishment of individual farmsteads, areas of gardens increased as well. A garden was an integral part of each homestead. In 1930, gardens accounted for only a small part (0.79%) of the total agricultural land. However, especially during the five years of intensive establishment of individual farmsteads (1930 - 1935) their area increased significantly, and in 1935 they already accounted for 1.13%, or 43.8 thousand ha (Povilaitis, 2000).

However, not all agricultural land was used effectively. Many lands were uncultivated. This trend revealed itself not only in 1919 in the beginning of the Land Reform, but later on as well, when part of the distributed village lands was uncultivated. Furthermore, there was a shortage of equipment, fertilizers, tools for cultivating the land. Not all peasants' expectations were fulfilled. Many lands were unusable. However, an annual increase of abandoned land areas began to decline since 1930. These trends suggest that the current structure of the agricultural land was sufficiently dynamic and unstable. It was dominated by arable land, surrounded by meadows and pastures as well as virgin soils. Agricultural land was located in the mosaic way in small areas situated between the swamps, scrubs and forests.

The most important works that were carried out during the land reform were the parcelling of estates, distribution of villages into individual farmsteads, the abolition of easements and rearrangement of land plots. In addition, land evaluation (grading) was important for land use regulation, which was necessary for the correct allocation of land taxes. The evaluation was based on the parish land productivity and its average selling price. State tax accounted for about 1% of the land price.

Conclusions.
1. After Lithuania had regained independence in 1918 one of the main tasks of the Government was to start the land reform without delay: to provide poor and landless peasants with land, liquidate or reduce obsolete ownership status (land holdings belonging to mansions, banks, religious organizations), restructure the strip three-field system of land use, liquidate easements in estates' pastures and forests, distribute collectively owned land - common rural pastures.
2. In total during the period between 1919 and 1940 1,443 estates were parcelled, easements were eliminated in the area of about 100 thousand ha. In total parceling affected 720,282.1 hectares, of which 81,837 parcels of land were made up. The parcelling of estates in Lithuania covered about 25% of the state's territory.
3. In the period of the analysis, the change of land use trends were as follows: 1) agricultural areas increased by almost 3% during the analysed period, of which: arable land increased by 13.3%, gardens - more than 0.3%, while meadows and natural pastures decreased by 2.7%; 2) forest coverage has increased by more than 3.8%.
4. Since 1930 abandoned land areas began to decline. Agricultural land was located mosaically in small areas between scrubs, swamps and forests.
5. Land evaluation (grading) was necessary for land use regulation in order to correctly allocate land taxes. The evaluation was based on land productivity of the small rural district and the average selling price of the land. State tax accounted for about 1% of the land price.
6. The drawback of the Land Reform was that the newly created private farms were too small therefore irrational for practical use, though the Law of the land reform provided the farm size from 8 to 20 hectares as sufficient for one family to feed.

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FUNCTIONAL ROLE OF GREEN AREA SYSTEM IN KAUNAS SPATIAL PLANNING

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Abstract
The aim of the research is to assess the system peculiarities in terms of green areas and plantations in Kaunas. Together with the analysis of Kaunas recreational system, the problems of the system of green areas functioning in the city emerged, because urbanization in the city has split up the system of green plantations into small areas and violated their functions. The available General Plans of the city have already attempted to improve the current situation. However, the real endeavors or actions taken, which could shape or structure the unified system of the territorial greenery are very insignificant. The location of territorial green plantations in Kaunas is not equivalent, the majority of them coincide with the green plantations of the local residential areas, but in the newly developed neighborhoods could be vividly witnessed the shortage of green areas. To optimize the system of green plantations of the city it is suggested, when designing new residential areas to be developed, to plan areas for greenery, introduce green connections into the system of green plantations, to create migration corridors and structure the integral system of green areas.
Key words: green areas/green plantations, green connections, green space system.

Introduction

Kaunas distinguishes itself by the abundance of trees and shrubs, pleasant greenery, which adds to the cosines and charm of the landscape. Kaunas has a great number of green plantations, but those adapted to the needs of the residents and nicely arranged is considered to exist very few. The areas of greenery in the city fulfill very important functions, namely architectural, social, economical, compensatory, technical protective role for an inhabitant of the city. It is very important to pay attention to the formation and expansion of green plantation zones in the city, because due to the rapid increase of urbanization, due to the growth of the number of cars and motoring, the attempts have been made to make profit from the tiniest land parcels and therefore, in the context of the above mentioned factors more often that problem is forgotten and left out. Besides that, it is obvious that when developing new residential areas there is practice to pay insignificant attention to the formation of green areas.

The Law on Green Areas issued on January 1, 2008 m (Lietuvos..., 2007), legitimized the major goals concerning the protection and management of green areas, the tasks and ways for their enforcement. The main objectives of the law are to ensure the protection of green areas and take care of their usage, safeguard them from the devastation or total loss, to uphold the biological diversity; to ensure the stability of the landscape and quality of the environment, possibility to perform ecological, economical and social functions for vegetation at present and in future; to regulate the terms and conditions in the field of protection, usage, and development of green areas approved and agreed by with the municipality and other institutions, organizations, legal and natural person, especially the owners of private land parcels.

When viewed optimistically, the maintenance and protection of greens plantations (trees, flower gardens, shrubs, lawns and other areas of greenery) should have to improve gradually and the measures taken against pests, diseases, activities should have to be changed for better. However, the casual attitude is still present there and it has not diminished currently in terms of environmental protection, unreasonable usage of natural resources, relevancy for recommendations concerning damage caused and etc.

The aim of the research is to assess the peculiarities of green areas in Kaunas city.
The main objectives of the research:
1. To analyze the documents of territorial planning and legal framework protection of plantations for Kaunas city.
2. Identify an existing distribution of green space and optimal opportunities of development.

Methodology of the research and materials

One of the most significant documents determining the order of planning green areas in Kaunas is the General Plan of Kaunas Municipality for 2013-2023 (Kauno…, 2014). The objective of the plan is to generate the vision of the city, to assess and continue the process of the planning of the city and improve the environment of the city. One of the future points concerning the vision is the city with

the optimally developed environmental system of green plantations such as parks, forests, green connections and everything that is essential for the perfection of the state of the environment and conditions for recreation and relaxation. Besides, the General Plan points out that public places in the city have to be open to green areas and water reservoirs, the city has to make efforts to clean and tidy up idle and messy territories in the city. Moreover, the General Plan for 2003 – 2013 (Kauno…, 2003) prescribed the urban vision of the city; so far it is relevant even today. The newly approved General Plan for 2013 – 2023 which is valid for all the areas of land under the jurisdiction of Kaunas municipality (Kauno…, 2014) prescribed the necessity for continuing the determined urban vision described in the General Plan for 2003 – 2013 even though slightly amended.

The objective of the study is directed towards the system of Kaunas city green areas.

With reference to the documents on Kaunas spatial planning and on the scientific works, there was identified and analyzed the current and future system of green areas. The comparative analysis was carried out and by applying the method of generalization the visions and conclusions were formulated.

The main functions regarding the green areas and plantations in the city are the following: urban-ecological, technical protective and architectural social. It is possible to have ecologically, esthetically, functionally, economically reliable environment by properly and intentionally applying the specific characteristics of green vegetation. Therefore, the network of green areas and plantations has to be incorporated into the unified and integral system of the city.

Distribution of green areas in Kaunas city

Nature frame performs a significant place when determining the system of green area formation, the tasks of the sustainable development of the city. It comprises a significant part of the spatial structure of the city, ensuring the ecological balance of the landscape, rational use of natural resources, preservation of natural and cultural heritage and harmonious development of the city. Kaunas nature framework was provided not only in the former General Plan (for 2003 – 2013), but also in the newly approved General Plan (for 2013 – 2023) of the city. The background of the nature frame comprises the objects and protected areas, registered in the registers at the corresponding institutions. The Law on the Protected Territories (Lietuvos..., 2001) defines the term of a nature frame as the integral network of natural ecological compensation, connecting the territories protected by natural ties as well as territories and habitation relevant for the environmental protection, assuring the migration of animals and plants, as well as maintaining the ecological balance of the landscape. Thus, it is possible to state that the main objective of the nature framework is to integrate the territories bearing the highest ecological significance into the integral territorial network and protect them.

The functions of the ecological compensation in the city more or less are performed by all the green areas. The green area sections of indefinite extent (forests) cope with the task best of all; they are interconnected by green connections and possess huge biological diversity. The largest forests allocated under the jurisdiction of Kaunas municipality are Kleboniškio, Pažaislio, Panemunės forests, which are significant for their considerably large biological diversity and they contribute to the ecological state and conditions of the city. However, the possibilities of ecological compensation of those huge forest sections are not fully made use of, due to their territorial fragmentation, the absence of green connections leading to the other areas of green plantations.

The nature frame of the city and the system of green areas is not completely judicially legitimized and protected. The issues of the ratio of green plantation systems with the city nature frame have not been solved yet.

The inventory of Kaunas green areas was made in 1999. Then Kaunas green areas comprised 64.75 % of the total area of the city (10175.662 ha). Today not all the green areas have the approved boundaries. Forests occupy 2998.27 ha; parks and squares make 731.91 ha. All the green areas of Kaunas are divided into three groups having their own land use. They are the following:

- Forestry land (all groups of forests);
- Agricultural land (territories for amateur, specialized gardening);
- The other land use (territories for separate green plantations, territories for general land use, recreational territories).

The General Plan for 2003-2013 (Kauno..., 2003) indicated the categories of the systems of green areas with individual determined land parcels having the approved boundaries and included into any of the category of green areas. They are recreational forests i.e. forest parks, green areas of general use (disconnected), green plantations such as parks, squares, green connections. Unfortunately, during the current period the status only for four (4) forest parks was approved by special documents and detailed

plans issued by the municipality (but seven more forest parks will be approved). By issuing special documents and detailed plans the municipality validated the status of twenty (20) parks (25 will be approved), the status of eight squares (63 will be approved) but not a single green connection (21 will be approved) got the status.

With reference to the norms and standards of individual green areas (Atskirųjų.., 2007), the recreational plantations are standardized, as well as classified according to their position, significance for the city. Recreational green areas and plantations include city parks (Table1.), squares, and green connections, open green areas located close to the enterprises, institutions and undertakings.

Table 1

City parks in Kaunas

No	Park title	Area ha
1	Oak park (Žaliakalnis)	78.4
2	Petrašiūnų (Petrašiūnai)	56.48
3	Lakštingalų (Palemonas)	45.0
4	The Nemunas Island (Naujamiestis)	25.0
5	Santakos (Senamiestis)	13.54
6	Armališkių (Vaišvydava)	7.37
7	Aukštosios Fredos (Freda)	3.00
8	Aukštųjų Šančių Oak park (A. Šančiai)	39.82
9	Brastos g. park (Vilijampolė)	32.1
10	Draugystės (Dainava)	15.82
11	Kalniečių (Eiguliai)	21.2
12	Naugardiškių (Kazliškiai)	2.6
13	Nepriklausomybės (Rokai)	125..
14	The Neris riverfront(Vilijampolė)	26,0
15	Veršvos (Smėliai and Linkuva)	108.8
16	Vieviržio (Palemonas)	9.21
17	Žemųjų Šančių (Ž. Šančiai)	15.05
18	Old city graveyard(Naujamiestis)	8.37
19	IX fort (Panerys)	22.0
20	Marvos mansion(Marvelė)	6.14
21	Sargėnų mansion (Sargėnai)	3.43
22	VI fort (Amaliai)	13.3
24	Sargėnų water ponds (Sargėnai)	15.0
25	Vaišvydavos (Vaišvydava)	54.60

In terms of the significance, the recreational green areas are divided into central, regional, territorial. Kaunas city central green areas include large areas of land, used for recreation such as Ąžuolynas (Oak park), Santakos Park, the Nemunas Island Park, Petrašiūnų Park, Lakštingalų Park. In accordance with the standards of the individual green areas (Individual .., 2007), the mentioned above green areas could be moved away from the residential territories not longer than 1-3 km away. To the green areas of regional significance green plantations are attached which are located not more than 500-1000 m from the residential neighborhoods (Dainavos Park, Kalniečių Park, the Neris Riverfront Park and etc.) Besides that, it was determined that a certain part of the territory of the city did not have regional green areas. The demand for recreational areas in Kaunas city is not equivalent. According to the quotation of Mr. M. Pilkauskas, private investors, who are engaged in the development of new residential neighborhoods, are obliged to allocate 20 percent to green areas and plantations from the territory to be developed. However, it is not enough to have just a formal notice on the point. The investors, many a time, in order to construct as much as possible living space, leave out the undeveloped spaces, forming narrow passages between the buildings, or form green areas in other unsuitable locations (Fig.1.). The spaces are unavailable to be used for recreational green areas. The governmental officials responsible for the approval of the plans and projects of the developed territories of the city have to be designated to take into consideration (Inytė..., 2013) the violations.

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Fig.1. Green areas at the residential buildings (Eitkūnų str. 1,3) (Google..., 2014)

When analyzing the General Plan of Kaunas, it was determined that some parts of the spaces of the city did not have their own regional green areas. Those territories were rather far from the larger zones of green areas to be used for recreation. The disadvantages concerning the regional recreational green areas are in the neighborhoods of Aleksotas, Freda, Birutė, Romainiai, Milikonys, Sargėnai. The distribution of recreational green areas allocated for general use, the size of the territories, do not exactly correspond to the urban structure of the city or, in other words, the shortage of green areas is mostly registered in the most densely populated neighborhoods; but they are in abundance in the rarely inhabited suburban neighborhoods. The neighborhoods with multistoried residential buildings most of all lack well preserved recreational green areas in those territories.

A certain group of recreational green areas, belonging to lower category, in terms of their significance, are called territorial green areas. They are located close to the residential spaces. In terms of the standards and norms applied in designing of the territorial green areas, there are spaces situated within 300-400 m from the residential territory (Atskirųjų..., 2007). The distribution of such green areas in Kaunas is not irregular. The network of these green areas is very well developed in the residential areas of multistoried buildings (Dainava, Eiguliai, Kalniečiai). In case, the distance to the recreational green areas increases, their attendance is greatly reduced, but, if the distance is more than 1km, residents visit them mostly during the weekends (Grahn et al., 2003). Thus, the most significant fact for the recreational territories to be attended is rather easy and quick accessibility to those territories.

When assessing the distribution of territorial green areas, the majority of them coincide with the regional green areas. The greatest shortage of the territorial green areas is determined currently in the newly developed territories allocated for the city expansion (Romainiai, Linkuva, Aleksotas, Kazliškiai, Amaliai, Vaišvydava); in the traditional homestead territories, in the suburbs (Panerys, Veršvai, Sargėnai and etc.). Milikonys neighborhood with multistoried buildings has the shortage of the territorial green areas. Therefore, the main conceptual task necessary for the formation of the territorial recreational green areas was mentioned in the General Plan for 2013-2023(Kauno..., 2014). It had to ensure the standard accessibility from the most far away residential area to recreational green areas (regional and especially territorial recreational green areas).

New communications and urbanization divide the extent areas of the forests of the city into small parcels, which lose their protective and recreational functions (Pažaislio, Kleboniškio, Lampėdžių forests parks, Romainių forests). The impact of the urbanized insertions has larger area than the developed area.

The optimization of the territorial system of Kaunas green areas has to proceed in two directions:
- the nature frame is formed from green areas, by forming the migration corridors;
- the system of green areas is expanded by matching them with the urban expansion of the city, by planting green areas in the newly designed residential areas.

Formation of green areas by green connections in Kaunas

Green connections are very valuable for the formation of recreational territories and for the systems of green areas. Based on the previously prepared documents (Kauno..., 1983; Kauno..., 2003), it was decided to join the most significant zones of recreation into the general recreational system of the city by these connections. The designed linear connections had to serve the routes for pedestrians and cyclists (in winter time for skiers), linear recreational green areas with the observation sites and recreational zones. However, at that time the system was not created. To the functional linear connections only separate routes of the bicycle paths could be allocated, but so far they are only the components of the system but do not comprise the total system.

In the previous General Plans of the city (Kauno..., 1983; Kauno..., 2003) there were presented the proposals to organize the system of green areas by connecting them by green connections but that idea was not implemented. The green areas were not connected into the nature frame. Majority of many small individual green areas did not play the functions of the ecological compensation, which serve the territorial system of larger green areas connected by green connections. A large part of the territories intended for green connections were restituted to their owners, privatized and developed.

The green connections in the nature frame serve many functions. They fulfill all the functions of green areas as the static component of the environment and therefore they are very significant part of the system of the urbanized territories of green areas. However, the most important function is to make it possible for the flows of the citizens between the places of residence, work and recreational sites to move and have adequate environment. Traditionally the greatest attention in city planning is paid to the motor transportation and according to its demand the network of the streets is planned, comprising the urban frame. The sidewalks are left for pedestrian traffic and cyclists. But cycling or walking very closely along the intensive traffic of the streets is considered to be not a hygienic and attractive experience. Therefore, the promotion to cycling or walking when there no specially built paths for pedestrians and cyclists are considered to be only moral declaration. Several segments of the bicycle paths available do not fill the shortage list of such paths in the general system of the city. If the streets allocated for the car traffic routes comprise the urban frame then the nature frame of the city or the system of the green areas should have to create the conditions for the expansion of the system of pedestrian paths and bicycle routes. The axis of the recreational natural territories has to comprise green connections, which are more or less of the natural type, in the shape of the band, parts of the system of green areas of the towns, connecting in between the territories of the city having recreational function as well as connecting residential districts. In all the previous plans of Kaunas there was stated that the major pedestrian and bicycle paths having the function of the general city have to be directed towards:

- the riverfronts of the Nemunas and Neris;
- the embankments of Kaunas Lagoon;
- along the historic roads of the south and northeastern fortifications;
- to connect the city centre with the residential areas and then with the suburban forests.

These provisions are relevant even nowadays. It is important to preserve green connections between the central green areas of the city, streets, by changing them into the alleys, by constructing transit pedestrian paths along the neighborhoods of residential areas and paths to nowhere or untidy green areas.

It is possible to distinguish separate bicycle paths as the functioning linear connections. In the General Plan for 2003-2013 there were planned 59 km of the green corridors, the area of which had to exceed 142 ha. At present, Kaunas has more than 47 km of bicycle routes (Kauno..., 2010). But they were constructed fragmentary; they did not form the integral system. From the point of green area formation, the paths constructed in the green environment comprise very significant connections. These are the paths laid in the inner spaces of the neighborhoods as well as the paths along the streets, which are separated from the carriageway by green zones. Those paths in green environment as well as further away from the carriageway create the environment of the higher comfort zone for the citizens and guests of the city when walking or cycling. The paths mostly do not have the required 20m wide lanes for green connections to be formed; therefore, they get under the territories of residential areas, territories of engineering infrastructure. They are very significant for the supplement of green connections and for changing the territories as such where due to the historic type of development there are no possibilities to develop green connections. The most densely is the network in Žaliakalnis; the similar system is also developed along the main streets in Dainava, Kalniečiai,

Eiguliai residential areas. The green paths could be assessed as one of the most valuable element forming the territorial recreational environment. Therefore, the territories, where there are many of the above mentioned paths, it is possible to assess as the territories possessing higher quality for the residential environment.

Although the system of green areas has a significant social value (Jakovlevas-Mateckis 2005; Bučas, 2007; Conway et al., 2000), for ensuring the health of the citizens of the city it is not expressed by financial indices; it is not depicted when preparing the budget for the city as well as applying it. Table 2 indicates that it is required 17.58 ml Lt for the general demand for the system of green areas to function. The greatest investments (83%) from the total sum to be allocated for the maintenance of green plantations.

Table 2

Indicative investment demand for green area system to be formed (annually) (Kauno..., 2003)

Recreational green areas	Area ha	Annual demand for funds ml Lt			
		General demand	For maintenance of forests	For maintenance of green plantations	For formation of infrastructure
Forest parks	1,339	4,.1	0.05	4.46	0.4
Parks	665	7.57	0.014	7.2	0.36
Squares, street flower gardens	78	2.96	—	2.92	0.05
Green connections	142	2.14	—	—	—
Total:	2,224	17.58	0.064	14.58	0.81

When analyzing the city budget of the last decade (Fig. 2.), the municipality, even during the best periods for the budget, were able to allocate about 2 % of the budgetary resources for the protection of the environment and the total sum received did not satisfy the general demand for green areas to be formed.
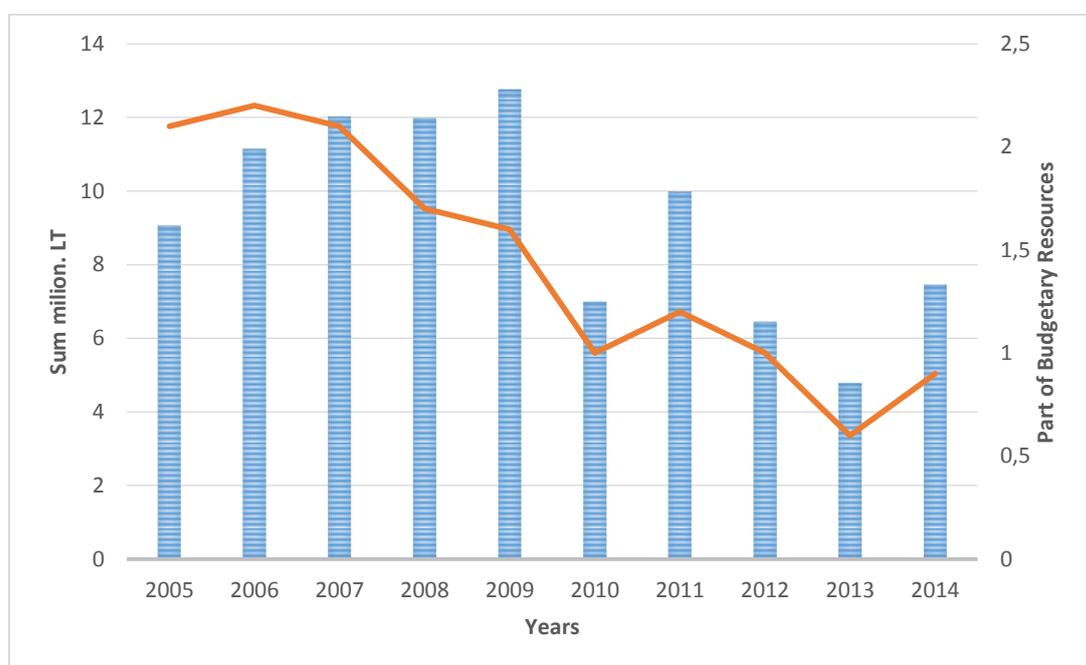
Fig. 2. City budget appropriations for environmental protection for 2005 – 2014 (Patvirtinti…,2014)

When assessing the economic value of green areas, only the direct expenses for the construction of green areas and maintenance, direct income received for the timber grown in the green areas and for the other bio-production are calculated. After such estimation, green areas are seemingly considered to cause the losses, but in reality it is necessary to evaluate, how the green plantations tend to increase the

value of the parcels located adjacent to green areas. The increase in the prices exceeds the costs for the maintenance of the parcels. The economic optimization of the usage of green areas has to start from determining the financial aspect of their social value.

The optimization of the system of green areas means combining recreational territories by green connections and that experience could be adapted in a number of cities and towns of Lithuania. For the modern society, when more and more people are interested in ecology, the creation of the unified system could not only improve the visual and esthetic state of the city, but also could create positive conditions for the citizens to migrate by green connections. At the same time, green connections supplement significantly the ecological stability of Kaunas.

Conclusions and proposals

1. The nature frame of the city and the system of green areas are not entirely judicially legitimized and preserved. The issues concerning the relations of the green area system and the nature frame of the city have not been solved yet. During the period of the General Plan for 2003-2013 implementation, the municipality issued documents and provided detailed plans and approved the status of only four forest parks (57 % from the planned ones), twenty parks (80 % from the planned ones), eight squares (13 % from the planned ones) and not a single green connection (will be approved 21). The legal steps to assure the targets and goals on the protection and maintenance of green areas are proceeded step by step in Kaunas.
2. The distribution of the territorial green areas in Kaunas is not equal. The network of green areas is developed in the multistoried areas best of all (Dainava, Eiguliai, Kalniečiai). When assessing the distribution of the territorial green areas, the majority of them are matched with the regional green areas. The greatest shortage of the territorial green areas has been currently determined in the newly developed territories when expanding the city.
3. The optimization of the territorial system of Kaunas should have to be continued in two directions, i.e. submission of green connections into the system of green plantations and areas by developing migration corridors and forming the entire integral system of green areas and the system of green plantations by expanding them in the neighborhoods of newly designed territories.

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ISSUES OF ABANDONED LANDS IN LITHUANIA (FOLLOWING THE EXAMPLE OF RASEINIAI DISTRICT, SUJAINIAI CADASTRAL AREA)

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Abstract
The media frequently refers to the concept of abandoned land. The reasons for its occurrence are discussed and the ways to diminish the problem are being searched for. Various sources of information were used for the research. They enabled the authors to identify the concept of abandoned lands. In addition, the situation of abandoned lands was analyzed and causes of occurrence of such lands in one cadastral area of mid-Lithuania municipality were defined. According to the set of data, concerning abandoned lands (AŽ_DRLT), the data, provided in the mentioned data set and the data obtained during field testing were compared. The survey of the terrain was conducted in the early autumn of 2013 and repeated in the late spring of 2014. In order to find out why the land was abandoned, the surveyor of cadastral area was additionally interviewed. On the basis of the latest data of 2014, 123 spaces of abandoned lands, which occupy 59.74 ha, were found in Sujainai cadastral area. Having analyzed the set of abandoned land data, it was identified that boundaries of 95 abandoned plots corresponded to the situation in the area, whereas boundaries of 28 areas should be corrected. Moreover, the abandoned areas that had not been marked were found while the land abandonment in the terrain was obvious. Although the amount of abandoned land is decreasing in both the area analyzed and throughout Lithuania, the situation is not favorable. Having conducted the research, it was found that the main reasons for land abandonment in Sujainai cadastral area were as follows: poor fertility in non-productive lands (up to 32 points) and reclamation; no potential land consumers, purchasers or tenants of land areas of high productivity or it is complicated and expensive to pursue agricultural activity there.
Key words: abandoned land, agricultural land, agricultural utilities.

Introduction

Recently one issue related to land consumption, namely land abandonment, has been more widely discussed and analyzed. Abandoned land can be found in both private and state-owned areas. Not only productive agricultural land, containing high fertility score, good roads for transport but also low-productivity land is being abandoned.

There is a huge amount of research into abandoned land, especially conducted by foreign scientists. One of them, Ambar Margarida, analyses what the impact of a farm size on land abandonment is. She claims that larger farms get more profit, having consumed a smaller amount of resources and, thus, are more competitive. Technologies dominate on such a farm and, thus, there is no land abandonment (Ambar, 2011). The other author, Dirk Strijker analyses possibilities to undertake alternative agricultural activity in abandoned areas whereas Coppola Adele discusses how abandoned lands depend on the age of inhabitants (Terres et al., 2013). In Lithuania this problem has been more thoroughly discussed by the scientist P. Aleknavičius. He asserts that abandoned land areas could be used reasonably if they were located closer to perspective farms as it would provide favorable possibilities to let this land to farmers or agricultural enterprises (Aleknavičius, 2012).

The aim of this research is to investigate the abandoned areas in Sujainiai cadastral area and identify the possibilities of their occurrence.

The following objectives have been set:
1. to identify the concept of abandoned lands;
2. to review the reasons and consumption possibilities of abandoned lands;
3. to analyze the plots of Sujainiai cadastral area abandoned lands and to assess them by field-testing way;
4. to find out the reasons for land abandonment in Sujainiai cadastral area.

Methodology of research and materials

Plots of abandoned agricultural land in Sujainiai cadastral area were selected as a research object. The location selected is in Raseiniai district. It is in the western part of Lithuania, almost the very centre of Lithuania. High fertility soils dominate in Raseiniai district. On the other hand, rather large areas of abandoned land could be found as well.

The following sources were used for the research of abandoned lands:

- various sources of Lithuanian and foreign literature, scientific works, which thoroughly described the problematics of abandoned lands, the reasons for their occurrence and employment possibilities;
- data sets of geoportal (ŽIS), out of which the data set of abandoned lands (AŽ_DRLT) was analyzed in detail; on this basis the situation of abandoned lands in Sujainiai cadastral area was investigated;
- assessment plans of land productivity, according to which the score of abandoned land productivity was defined;
- orthographic maps of four periods (namely 1995, 2005, 2009, 2014).

In addition, the following research methods were applied:
- analysis of literature sources and statistical data, which enabled the authors to compare opinions of different authors concerning abandoned lands and the causes of their occurrence;
- comparison, which allowed to find out if the information provided in the set of abandoned lands corresponds to the situation in the terrain;
- logical thinking, which allowed the authors to identify the situation and the potential causes of land abandonment in Sujainiai area;
- expert assessment, which was undertaken in order to define the precise causes due to which the land was abandoned in Sujainiai cadastral area. The surveyor of Sujainiai cadastral area, who prepares land management projects of land reform and pursues other related work in the area, was interviewed.

Two field-testing procedures were carried out for the abandoned agricultural areas, which were provided in the set of abandoned land data: the first one in the early autumn of 2013 and the second one in the late spring of 2014. During the testing abandoned areas of Sujainiai cadastral area were examined, surveyed and described. Moreover, it was analyzed if the information given in the previously mentioned data set corresponded to the situation of abandoned lands within the area.

Discussions and results

There has been no uniform definition of abandoned land (AL). Each legal act or scientific source provides a different one. Two basic categories of abandoned lands are distinguished, on the basis of which this concept is described. First of all, land abandonment is assessed as the state of land or the process. Secondly, a question arises if the land or only agricultural activity is abandoned. (Rico et al., 2008).

Land abandonment has been a debatable issue in Europe because it is difficult to identify and assess. The definition of abandoned lands differs in various states. In Germany in 1956 AL was described as land, which is not cultivated due to social and structural changes. In England, Greece, Denmark, and Lithuania AL is defined as the land which has not been used for more than five years (Pointereau et al., 2008). Food and Agriculture Organization of the United Nations (FAO) defines land abandonment as a process when the land previously cultivated can become totally abandoned. In such a case it is not worthwhile to cultivate the land again owing to legal, natural, or economic conditions (The..., 2006). Standards for Good Agricultural and Environmental Condition can be applied to identify abandoned land. In the majority of EU countries the undesirable vegetation is cut down for the sake of more beautiful landscape. It is better for the land itself because there is no threat that in the future it will grow with trees and bushes and finally remain unused. (Kuliešis ir kt., 2011).

Having analyzed all concepts provided by the authors, it is possible to provide one AL definition. It is primarily the land not used for agriculture. In addition, it is not the means of production any more. It is overgrown with bushes, trees, and stiff plants. As there are many definitions of abandoned land, similarly numerous reasons for abandoned land to appear are found and they are varied. Formation of abandoned lands can be determined by certain factors of the period unfavorable for agricultural activity when one ceases to cultivate the land plots formerly cultivated. Having analyzed various Lithuanian and other countries' literature sources, the following reasons for land abandonment can be identified: natural, social, economic, and political factors as well as geographical position and structure of the farm. Restoration of land property rights in rural areas could be added to the dominating causes of land abandonment in Lithuania. According to Zuzo's (2012) analyzed data, the ownership for people is restored far from their residence and consequently, it is more complicated for them to use and cultivate their land. Gradually it becomes abandoned.

Using the data set of abandoned lands (AŽ_DRLT), in the third quarter of 2013 in Sujainiai cadastral area there were 66.0 ha of abandoned land whereas upon the latest data of 2014 the amount of abandoned land has decreased and currently there are 123 abandoned plots, which occupy 59.74 ha. Thus, the area of such a land decreased by 6.26 ha per half a year. The situation is similar throughout Lithuania because recently the abandoned land has had the tendency to decrease (Fig. 1).
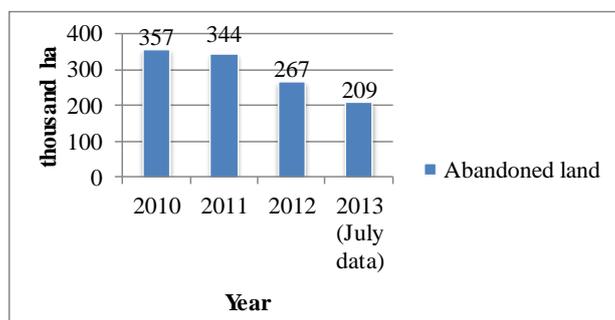
Fig. 1. Changes in abandoned land 2010-2013 m. Source: Mano..., 2012; Valstybės..., 2013

The largest amount of abandoned land was found in 2010. The gradually diminishing area of abandoned lands means that people look after their land more responsibly, plant forests in the abandoned areas or it was influenced by the taxes for land abandonment.

When analyzing the abandoned lands, it is important to identify whether the situation of abandoned land has changed, if a few years or several decades ago one could have foreseen that in the future it would be abandoned or vice versa, formerly the land was arable while only at present it has become abandoned. Having analyzed all abandoned areas, which are pointed out in the data set of abandoned lands, on the basis of orthographic maps, encompassing the period of four years, it was discovered that the largest area, even 83 plots, had already been abandoned since the beginning of the first period analysed. The majority of them were distributed near forests; the others were being abandoned only after certain time (Fig. 2). Boundaries of most abandoned plots investigated (95) correspond to the situation in the terrain.
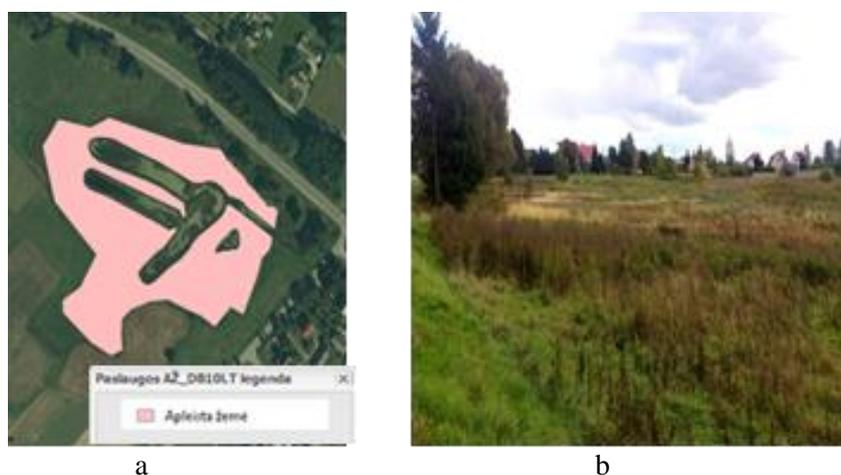
Fig. 2. Area of abandoned land: a) – the area of the terrain drawn in the data set AŽ_DRLT (pink color - abandoned land); b) – survey of the terrain

However, 28 abandoned lands, which did not comply with the existing situation, were found because smaller amount of abandoned areas were marked in the data set of abandoned lands than they were in reality – their boundaries ought to be adjusted (Fig. 3).
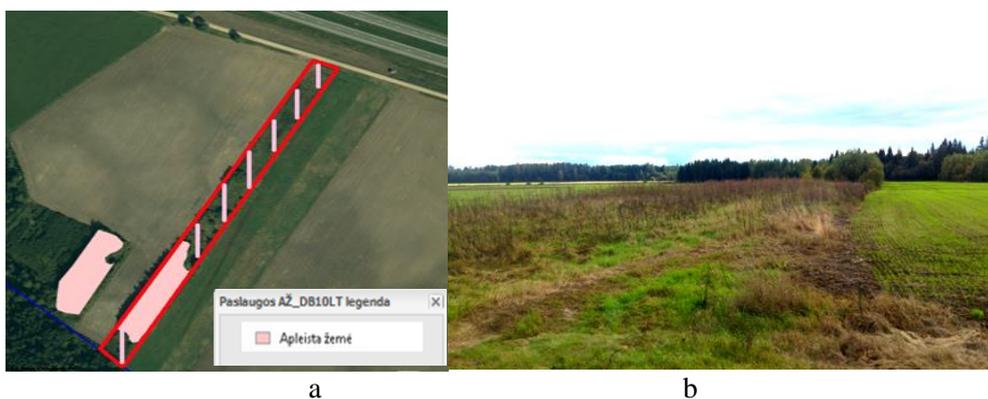
Fig. 3. Area of abandoned land a) drawn area of the terrain in the data set AŽ_DRLT (pink color - abandoned land); b) – survey of the terrain

In Sujainiai cadastral area during the examination, two abandoned land plots, not marked in the data set, were found. Nevertheless, land abandonment is obvious. The first one occurs in the western part of cadastral area, the plot being 1.16 ha. The second unmarked plot is found in the southern part, the area being 1.00 ha. It is grown with grass stiff plants, which destroys the landscape and impoverishes the soil.

After the analysis of mean productivity in abandoned lands, it was discovered that the abandoned areas, the productivity score of which was lower than 32 dominated in the cadastral area whereas areas with productivity score exceeding 41 comprised the smallest part of abandoned lands (Table 1).

Table 1

Productivity score of abandoned land areas

Productivity score	Number of areas abandoned
Up to 32	106
33-40	9
> 41	7

Having conducted the analysis of abandoned land soil, it was discovered that in Sujainiai cadastral area the majority of abandoned lands featured low productivity.

Numerous reasons why the lands are abandoned can be found. Data sets of Geoportal were used to find them out in Sujainiai cadastral area. In addition, the surveyor of Sujainiai cadastral area, who prepares land management projects of land reform and pursues other related work in the area, was interviewed.

As it has been stated above, low productivity lands dominate among abandoned lands. Therefore, the main reason for abandonment is low productivity score and poor fertility. Poor reclamation can be the second cause of abandonment in low fertility lands, because almost all abandoned land plots in Sujainiai cadastral area fall within not reclamated land. The surveyor of Sujainiai cadastral area during the interview confirmed the statement that the main reason for abandonment of all abandoned lands, the fertility of which is low, is unreclamated, low fertility land. In this case one cannot gain profit in lands of poor farming state. As a result, there are no people willing to cultivate such land.

The abandoned plots were selected for the analysis, the productivity of which exceeded 32 points. There were 16 of them. Two of them were found in the free state land whereas the rest appeared within a private area. Having interviewed the surveyor of Sujainiai cadastral area, it was identified that the main reasons for land abandonment were as follows:
1. Defects of reclamation systems.
2. No potential land consumers, purchasers, or tenants.
3. Complicated relief.
4. It is complicated and expensive to renew agricultural activity in abandoned lands.

When finding out the reasons for land abandonment, it was discovered that the main reason in both free state and private lands was complicated and expensive renewal of abandoned lands, which aggravates their restoration (Fig. 4).
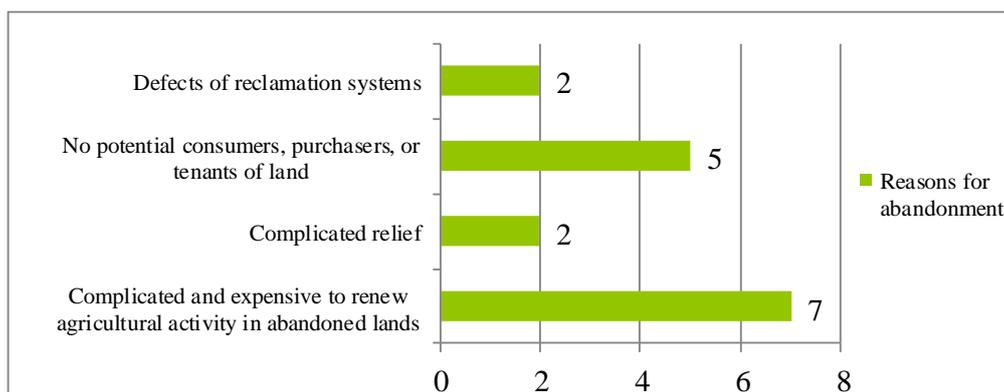

Fig. 4. Reasons for land abandonment in fertile abandoned areas discovered during the interview

Land abandonment also depends on the owners of land, i.e. on their willingness to cultivate and manage their land. The problem is that in some plots there are no potential land consumers, purchasers or tenants and, thus, the land is abandoned.

Abandoned agricultural lands can be restored using ecologically and economically alternative ways. One of them is reforestation. It could be a perfect solution to use the abandoned land. Besides, the landscape would be improved. The other way to restore the abandoned land is to sell it to other individuals, who might use the land up to its real purpose and the land itself would start providing economic benefit. In addition, the areas of abandoned lands could be diminished by reducing taxes for abandoned lands.

Conclusions
1. Having analysed the opinion of various authors one can define the abandoned land in the following way: it is the land not used for agricultural activity, not suitable as the means of production, often entirely grown with trees and bushes as well as stiffed plants.
2. According to the set of data concerning abandoned lands (AŽ_DRLT) currently in Rasaeiniai district there are 2690.22 ha of abandoned land, which comprises 1.7 % of the district area (157.3 thousand ha), while in Sujainiai cadastral area 59.74 ha, which correspondingly makes up 1.6 % of cadastral area (3745.96 ha), can be found.
3. According to recent data, there are 123 abandoned plots in Sujainiai cadastral area, which occupy 59.74 ha. Having estimated the data set of abandoned lands by field-testing method, it was found that 95 abandoned areas corresponded to the situation, provided in the data set of abandoned lands whereas the remaining 28 plots did not show compliance with the situation described.
4. The main reasons for land abandonment in Sujainiai cadastral area were as follows: low productivity (up to 32 points) in non-fertile lands and poor reclamation whereas abandoned areas, the productivity of which exceeds 32, there are no potential consumers, purchasers, and tenants of land or it is complicated and too expensive to undertake agricultural activity.

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PROBLEMS OF ABANDONED BUILDINGS USE IN KAUNAS CITY

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Abstract
Economic and social problems and emerged threat to human life are the main reasons for abandonment of buildings or even the whole cities in different countries. Mainly abandoned buildings are found in the USA and in the countries of the former Soviet Union. Abandoned buildings in Kaunas city are analysed in the article; their condition is assessed and the ways for handling are proposed. The legal status and the purpose of use of abandoned buildings in Kaunas city are also defined. There are 46 abandoned buildings in Kaunas city. The majority of them are located in Šančiai neighbourhood, but the least amount – in Vilijampolė and Gričiupis neighbourhoods. As regards the purpose of the use, 85 percent of abandoned buildings in Kaunas city are attributed to non-residential buildings, and 44 percent of them are former industrial buildings. Due to the condition of constructions, threat to people and environment, as well as visual appearance, the state of 72 percent of abandoned buildings is poor. 52 percent of abandoned buildings are ascribed to be demolished, while the remaining 48 percent of buildings could be repaired or renovated.
Key words: abandoned building, derelict building, land plot

Introduction
There are many abandoned buildings in both urban and rural areas all over the world. Detached abandoned buildings as well as totally derelict towns or cities can be found in various places of the world. The reasons of such abandonment are different: from changing economic or social structure to bankrupt of cities or nuclear catastrophes. However, two main reasons can be distinguished why people gradually or at once abandon the places of residence. They are: hazards and economic factors. It is not surprising to hear about abandoned buildings present in countries with long political history where economic and social problems dominate. However, it is strange to learn about so many abandoned buildings and places in such a country as the USA. Namely, the USA and the countries of the former Soviet Union are designated as the countries possessing the major part of abandoned buildings (Miles, 2013). Military bases and former medical institutions compose the major part of abandoned buildings in the USA. It can be observed that during the period of the Soviet Union aerodromes, shipyards were abandoned and left empty; cities were also abandoned after the change of economic conditions (Web Urbanist).

Due to the changes in the economic system of Lithuania two decades ago, a lot of industrial buildings and various other buildings that were no longer suitable for their intended purpose remained in the whole territory of the country. Quite often such buildings and constructions did not have owners and therefore they had been unattended for many years so they became a threat for both environment and people. Currently, there are more than nine thousand abandoned and derelict buildings in Lithuania; 80 percent of them are located in rural areas.

Abandoned and unused buildings cause huge harm for big cities. Important infrastructural projects, development of the cities are hampered because of abandoned buildings. These buildings also worsen the image of the cities. Many abandoned, collapsing, dangerous buildings are also present in Kaunas city. They are located not only in the city centre but also in remote districts. Abandoned buildings reduce the landscape attractivity, harm the image hampering tourism development which year by year is becoming more and more important for the city's economic development. Unattended environment also diminishes investment attraction. Thus, currently the issue of abandoned buildings become increasingly relevant for Kaunas city. This problem has been tried to be solved using the following means: introduction of higher real estate tax, maximum fines for the owners of abandoned buildings, adjusting legal base.

The problems of abandoned buildings in the biggest cities of Lithuania are not analysed in detail. As rural areas have a plenty of abandoned buildings, quite a few data is collected about these abandoned objects, their state, distribution and possibilities of further use are analysed. The tasks of handling of abandoned buildings and their environment must be solved according to sustainable social, economic and environmental development of the country. The work concerning the sale of these buildings for commercial use or their demolition and clearing should be included in the activity programmes of every municipality. Thereby, the prevention actions in order to ensure more qualitative natural and

residential environment could be liquidation, proper handling of abandoned buildings and decrease of harm for the environment.

There is not much Lithuanian scientific literature available analysing the questions and problems of abandoned buildings. However, the legal base of Lithuania analysing the issues of clearing, liquidation of abandoned buildings and decrease of visual landscape pollution includes more than 50 legal documents (laws, articles of the Civil Law, Government decrees and normative acts adopted by various state institutions) and is continually supplemented and amended. The legal base is being prepared and improved since 1998. Unfortunately, until now it is not efficient concerning clearing and liquidation of abandoned buildings. The description of abandoned buildings is provided in the programme for abandoned buildings' liquidation: these are mismanaged and (or) technically unattended buildings requiring immediate action for their processing or liquidation (Apleistų..., 2008).

Tom Cochran in the conference of the USA mayors emphasized that abandoned buildings are considered as objects damaging the environment that despoil the landscape and are the threat for environment and human health and life. Abandoned buildings of commercial or residential purpose cause many problems for the cities. Firstly, it has a negative impact on a city's budget. They also decrease the living quality and economic possibilities of surrounding inhabitants (Vacant..., 2008).

It is stated in the publication of the USA National Association of Unclaimed Property Administrators (National..., 2005) that generally the reason for buildings' abandonment is fast cities' development, demographic changes, unemployment and changes of people needs. Abandoned buildings require the resources of local police, firefighters, construction and health department. Decreasing value of property results in lower income from real estate tax. Such buildings attract criminal and degraded part of the society and worsen the life quality of surrounding inhabitants.

Various means are used against the owners of abandoned, unused buildings in foreign countries. Lėka (2012) noticed that in the Western European countries land tax would be increased if abandoned buildings are present in the land plot, the owner does not receive construction permit, or he/she does not begin to use buildings during the set term after the purchase of the land plot in the developed area.

According to Atkocevičienė et al. (2013), abandoned buildings can be named as the objects of landscape visual pollution. Landscape is an important resource of the country which is like a guarantee of natural environment and life quality. Antuchevičienė (2002) emphasized that abandoned buildings should be handled in the way that they would not worsen the country's landscape. **The aim of the research**: to perform the analysis of abandoned buildings in Kaunas city, to evaluate their condition and to provide the ways for their clearing. **The tasks** set for the achievement of the aim are as follows:

1. To analyse the distribution of abandoned buildings in Kaunas city;
2. To define the purpose of use and legal status of abandoned buildings in Kaunas city;
3. To determine the state of abandoned buildings in Kaunas city and to provide the priorities for their handling.

Methodology of research and materials

The object of the research is abandoned (derelict) buildings located in Kaunas city. The analysis of literature sources was conducted; data were analysed using analysis and synthesis approaches, the field research was accomplished. The main information source used in this work was "The list of unused, used not under intended purpose, derelict or abandoned premises and buildings" approved by Kaunas city municipality in 2013.

For the purpose of obtaining the newest information and accurate data about abandoned buildings noted in the list, the field research was performed, and the territories, where listed buildings were located, were visited according to available data. These buildings were pictured; their state, caused damage and possible threats for both people and landscape were assessed. After the analysis and systemization of obtained data, abandoned buildings were classified according to neighbourhoods where buildings were located, their purpose of use (residential or non-residential) and types of owners (natural or legal entities). For distribution of these buildings in Kaunas city neighbourhoods the scheme was prepared where all abandoned unused buildings mentioned in the list were marked according to their location. Abandoned buildings were assessed according to their present state. An attention was also paid to possible threat, and handling possibilities of the buildings, their further use according to threat priorities were determined.

Discussions and results

According to the list of Kaunas city Council of 2013 there are 46 abandoned buildings in Kaunas city. Comparing the list of 2014 with the list of 2013, it was supplemented with 4 abandoned unrepaired real estate objects in emergency condition.

The major part of abandoned buildings is located in Šančiai neighbourhood according to the data presented by Kaunas city municipality (Fig. 1).

Fig. 1. The distribution of abandoned buildings in Kaunas city neighbourhoods.

39 abandoned and unused buildings situated in Kaunas city are attributed to non-residential buildings, and 7 other buildings are attributable to the group of residential buildings. Non-residential buildings are further divided into subgroups (Fig. 2).
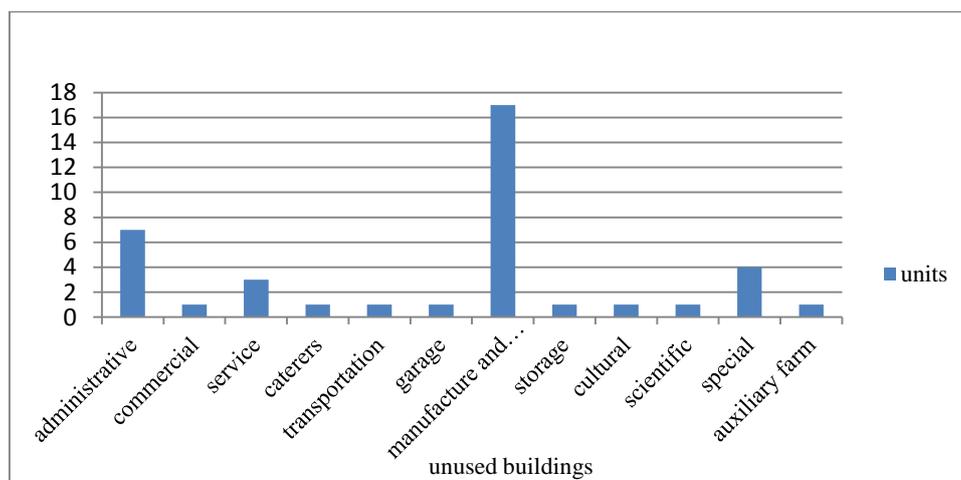
Fig. 2. The structure of abandoned non-residential buildings in Kaunas city according to intended purposes, units.

Manufacturing and industrial buildings compose the major part of abandoned (derelict) non-residential buildings. These buildings account for 44 percent of all abandoned non-residential buildings, and include buildings intended for production, factories, workshops, plants of production processing, energy buildings etc. Buildings of administrative purposes account for 18 percent, buildings of special purpose – 10 percent of all non-residential buildings present in the list. The number of buildings intended for other purposes is small and does not exceed 3 buildings.

All abandoned buildings in Kaunas city have owners but are improperly attended and technically inadequate. According to the list provided by Kaunas city municipality, 37 abandoned buildings in Kaunas city belong to legal entities and the remaining 9 buildings belong to one or several natural persons.

The research results show that the condition of buildings depends on several factors: construction of building, its age, maintenance or nature of operation, quality and also degree of renovation.

Due to environmental impact, improperly used buildings lose their mechanical stability and steadiness, resistance to fires, do not meet the requirements of hygiene, health and environmental protection and do not satisfy the provisions of safe operation. Decaying and crumbling constructions of unused and abandoned buildings might also influence the fall of other unused buildings that are situated nearby. It is particularly relevant while speaking about buildings located in densely populated and urbanized territories. Besides, surrounding buildings can flare up from the fire in an abandoned building in densely populated areas. One of the reasons that causes the increased strain of abandoned buildings' construction is the thieves of metal and construction products. Namely, insufficient stability and mechanical resistance of abandoned buildings' constructions cause the biggest hazard for the surroundings.

In order to avoid the tendency of deterioration of buildings' condition, it is provided that owners, users or tenants of the buildings must constantly administer and repair buildings, paint and maintain their facades and ensure aesthetically neat appearance of facades. Thus, all buildings including abandoned and unused buildings must be orderly and used according to their intended purpose.

Visual object's survey provides primary information about the condition of building and its constructions. Therefore, the condition of unused abandoned buildings was estimated not only according to the data of "The list of unused, used not under intended purpose, derelict or abandoned premises and buildings", but the field research was also performed to obtain an accurate and new information about these buildings. While doing this analysis, the data given in the list were compared to the data collected during the research. It should be noted that that the list of abandoned buildings was confirmed in the beginning of 2014, and therefore several discrepancies were found after the field research. There are 46 abandoned buildings mentioned in the official list but the condition was determined for six of these buildings. Thus these six buildings were not included into the assessment process when evaluating the state of abandoned buildings. The condition of abandoned buildings was assessed as poor, satisfactory or good. The main criteria taken into consideration when determining the present state of these buildings was as follows: exterior, technical and physical condition, environment were the building is located, safety measures ensuring proper safety of the structure.

A visual survey of buildings during the field research showed that the condition of the majority of abandoned buildings in Kaunas city is poor (Table 1). They compose 72 percent of all investigated abandoned buildings in Kaunas city. The state of 13 percent of abandoned buildings is satisfactory. Buildings whose main load-bearing structures can be strengthened, buildings can be used under their intended purpose or the purpose can be changed and building can be reconstructed are attributable to this group. The state of the rest 15 percent of abandoned buildings in Kaunas city is good. Generally simple repair is enough for the renovation of such buildings.

Table 1

Condition evaluation of abandoned buildings

Address	Construction	Walls	Windows	Safety measures	Total
1	2	3	4	5	6
Savanorių av. 321	1	1	-	1	3
Islandijos road 217	1	1	1	2	5
Šiaurės av. 44	3	3	1	1	8
H. and O. Minkovskių str. 71	2	2	1	1	6
Garšvės str. 12	2	3	1	3	9
Perlojos str. 81	1	1	1	3	6
Jonavos str. 220	3	3	2	1	9
Vydūno av. 13	2	1	2	1	6
Mosėdžio str. 67	1	1	1	1	4
Dujotiekio str. 30	3	2	3	3	11
Jonavos str. 3	3	3	2	2	10
Karaliaus Mindaugo av. 16 / Druskininkų str. 1	3	3	3	2	11
Nemuno str. 27	1	2	2	1	7
Gedimino str. 46	3	3	3	3	12

Table 1 (continued)

1	2	3	4	5	6
Kaunakiemio str. 9	1	1	1	3	6
Radvilėnų av. 1A	1	1	1	1	4
Žalioji str. 10	3	3	3	3	12
Europos av. 96	2	1	1	2	6
Vaidoto str. 127A	1	2	2	1	6
Perlojos str. 35A	2	1	2	1	6
V. Krėvės av. 4A	1	1	-	1	3
V. Krėvės av. 9C	1	1	2	1	5
V. Krėvės av. 9D	1	1	2	1	5
V. Krėvės av. 55A	1	1	3	1	6
Partizanų str. 50B	1	1	3	1	6
Partizanų str. 72A	1	1	2	1	5
T. Masiulio str. 9	3	3	3	1	10
Naglio str. 5	2	1	2	1	6
K. Griniaus str. 2	2	2	1	1	6
A. Juozapavičiaus av. 19	1	2	1	1	5
A. Juozapavičiaus av. 25D	1	1	1	1	4
A. Juozapavičiaus av. 3F	2	1	1	2	6
Švenčionių str. 12	1	1	1	1	4
Švenčionių str. 53	1	1	1	1	4
A. Juozapavičiaus av. 120	1	1	1	1	4
Ukrainiečių str. 4	3	3	1	1	8
Savanorių av. 277	1	1	1	1	4
Savanorių av. 279	1	1	1	1	4
Vilties str. 1	1	1	2	1	5
A. Juozapavičiaus av. 21B	2	2	2	1	7

Explanations: 1 - poor, 2 - satisfactory, 3 - good; total 3-6 - poor, 7-9 - satisfactory, 10-12 - good.

After accomplishing the analysis of abandoned buildings' condition it can be said that the majority of such buildings in Kaunas city are derelict or physically damaged, their territory is not ring-fenced. The condition of the large part of these buildings is poor or even wrecked. However, there are cases noticed when buildings are brushed up or readjusted for a new life.

Improper maintenance and necessity of liquidation of abandoned buildings are some of the major problems that should be noted currently. The main factors causing urgent liquidation and clearing of abandoned buildings are the threat for people, their life and health, and also damage for landscape.

If construction or its part did not meet essential requirements it must be either repaired or demolished.

To determine the priorities of demolition of abandoned buildings, attention should be drawn to buildings' current condition, their location and potential threat for people and landscape. According to the present condition and possible threats, abandoned buildings in Kaunas city are grouped according to priorities of their arrangement. Three ways for clearing unused abandoned buildings were suggested: urgent demolition, demolition and renovation. Building should be urgently demolished in the case when it is heavily physically threadbare, worn-out and cause threat for people. It is appropriate to renovate the buildings in good condition and a possibility to reuse them after renovation. It was determined that almost half, i.e. 48 percent of abandoned buildings in Kaunas city can be renovated. These buildings have strong although damaged constructions, and these buildings could be further used if they were properly repaired or renovated. Further use of such a building can be based on its current purpose or it might be provided to change the intended purpose and to adjust it for a new activity.

32 percent of all abandoned and unused buildings should be demolished urgently. These buildings cause actual threat for people and damage the landscape. A considerable part of such buildings is wooden, and therefore the risk of fire increases. In case of fire the surrounding buildings and natural environment would suffer.

20 percent of abandoned buildings in Kaunas city could be demolished without urgency. These buildings cause less damage to environment and are less dangerous for people compared to those

attributed to urgently demolishable. However, it is advisable to liquidate these buildings eventually because their condition will continually grow worse. Besides, the possibility to adapt such buildings for reuse is very small.

According to a geographical position of abandoned buildings and the degree of their condition, the following methods for clearing abandoned buildings and decreasing their negative impact can be applied:

- Renovation and modernization of buildings changing their intended purpose or adjusting for further activity without changing the intended purpose;
- Clearing of garbage present in building zone and disposal of dangerous chemical and biological substances;
- Demolition of buildings and all infrastructure related to them, herewith ensuring restoration of landscape and good environmental condition;
- Surounding buildings with quickly growing trees or pathless shrubbery. This method can be applied when a building or its remains does not cause any threat for human life or health.

However, one of the most beneficial methods for handling abandoned buildings is to adjust such buildings for further use. This method would also have a positive impact on the country's economic development. When abandoned buildings are adapted for reuse, the costs for demolition are reduced and increased income to the municipal budget is expected.

Conclusions

1. In accordance with the purpose of the use, 85 percent of abandoned buildings in Kaunas city are attributed to non-residential buildings, and 44 percent of them are former industrial buildings. 80 percent of abandoned buildings in the city are administered by legal entities.

2. As regards the condition of constructions, threat to people and environment, visual appearance, the condition of 72 percent of abandoned buildings is considered as poor. The state of 15 percent of abandoned buildings is considered as good and 13 percent – as satisfactory.

3. The principle priority of clearing of poor condition abandoned buildings in Kaunas city should be their demolition. 52 percent of abandoned buildings are considered to be demolishable, while the remaining 48 percent of buildings could be repaired or renovated and adjusted for a new use.

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RESEARCH OF THE RELIABILITY OF GEOREFERENTIAL SPATIAL DATASET (GDR10LT) OF THE REPUBLIC OF LITHUANIA

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Abstract

The systemized and methodically arranged according to the principles of geographic information systems set of the most important objects of Lithuanian territory's geodetic base and topographic databases (GDR10LT) is collected and kept in data storage and covers the whole territory of Lithuania. The purpose of the georeferential base GDR10LT at the scale 1:10 000 is to collect, keep, use, renew and provide data to users. The literature analysis shows that the majority of authors presented studies about data composition and application but they did not analyse their reliability.

The aim of the research was to revise the chosen territory of the georeferential base map by the field method and to determine the discrepancies between the situation in the area and in the map as well as the reasons of such discrepancies. It was necessary to verify the data reliability and outdated map information due to changes of the situation. The field research was conducted in three different areas, and the data was processed using tools provided by www.zis.lt. Statistical data analysis was performed using Microsoft Excel software. The object of the research was information depicted in georeferential base map (GDR10LT) of the chosen territories. The following research methods were used: literature analysis, analysis of cartography material, collation of field data, statistical data processing, interviews. The conclusion can be made that GDR10LT data are reliable; two mistakes were found in the plot of 6407.5 hectares: a navigational obstacle and 800 metres of asphalt cover were not marked. Other determined discrepancies covered the territory of 17.46 hectares. The outdated map information was found. The marking of settlements generally mismatched because of many new buildings in the area that were not mapped. Therefore GDR10LT should be updated more often in accordance with ORT10LT data.

Key words: Georeferential base map, GDRLT, ORTLT, georeferential data.

Introduction

The object of georeferential base is natural and anthropogenic features of terrene, geodetic points, state boundary, names of cities, towns, villages, swamps and forests, hydrographic objects and their names etc. The spatial data set of the reference base of territory of the Republic of Lithuania at the scale 1:10 000 (abbreviated name – GDR10LT) is the state spatial data set. This spatial data set consists of the features related to water bodies, land cover, transport network, engineer communications, geodetic points, elevation values, geographic names etc. Each object has unique identification and information about its life-circle (GDR10LT..., 2014). National Land Service under the Ministry of Agriculture pursues the policies of the Republic of Lithuania in the spheres of geodesy, cartography, georeferenced public datasets of the Republic of Lithuania and infrastructure of spatial information of Lithuania. It conducts state geodetic and cartographic works, compiling of state geodetic base and public georeferential datasets, improvement and activity assurance of Lithuanian spatial information infrastructure and coordinates the use of spatial datasets (Papišienė L., 2014).

Since 1992 the state enterprise "GIS-Centras" responsible for development and administration of geographic information portal of Lithuania (www.geoportal.lt) and state georeferential base cadaster, administration of georeferenced public spatial datasets and data delivery for society is acting in Lithuania.

All legal and natural persons in Lithuania who purchase and use these data can be the users of georeferential data (Kryžanauskas A. et al. 2010). Recently data are more often applied for plot accounting of agricultural land and performing analysis of changes ((Bykovienė A. et al. 2014), (Plieninger, et al. 2013)). Lately GIS technologies and georeferential base data as the background are very widely used when accomplishing scientific research ((Abalikštienė, Aleknavičius P., 2013) (Aleknavičius A., Aleknavičius P., 2010)).

Georeferential spatial dataset at scale 1:10 000 of the Republic of Lithuania (GDR10LT) covers the territory of the whole country. GDR10LT is created and updated using digital raster orthophoto map at scale 1:10 000 of the Republic of Lithuania (ORT10LT), spatial data of Geodetic and cartographic base information system GKPIS, administrative boundaries of address register of the Republic of Lithuania, register of cultural heritage, section lines and openings of forest cadaster; also spatial data provided by pipeline (Joint stock company "Mažeikių nafta") and information given by administration

of civil aviation about high constructions. Layers of georeferential data in Lithuania were updated in 2011 and 2012 according to available ORT10LT, and a new layer of heights was created. The state enterprise "State Land Fund" constantly updates the layers of georeferential spatial base according to the observations of residents. Since July, 2013 additionally each object has unique identification, and information about its life-cycle, the reason of the last change and mean used for the change is collected (GDR10LT..., 2014).

The above mentioned facts allow stating that georeferential base data are very widely used and thus it must be accurate and updated timely. Data are collected using remote methods, performing digital and visual interpretation of orthographic maps in a cameral way. The earlier mentioned additional information is also used. The literature review showed that most of authors presented studies about data composition and their application but they did not analyse their reliability and did not perform the field research. The accuracy is analyzed only by Kryžiauskas and Motiejauskas (Kryžiauskas, Motiejauskas 2010) but only for hydrographic objects. Therefore the authors conducted the research and revised the georeferential base map of the chosen territory by the field method, i.e. it was checked if the situation presented in the map corresponded to the real situation in terrain. It was accomplished in order to find out the reliability and outdated information of GDR10LT data.

The aim of the research: to revise the chosen territory of the georeferential base map by the field method and to determine the discrepancies between the situation in the area and in the map as well as the reasons of such discrepancies. It was necessary to verify the data reliability and outdated map information due to changes of the situation.

Methodology of research and materials
The available literature on the problem was analysed. The detailed analysis of cartographic material in work place was performed. During the analysis, ORT10LT data, used as additional means, allowed getting acquainted with the specific aspects of the terrain's data interpretation and to prepare for the field research. The highest labour costs included the revision of cartographic material by the field method. Statistical data processing was applied for data accounting and generalization. The interview method was used in order to find out whether there was a mistake in the map or just deterioration. Data were processed using tools provided by the website www.zis.lt. Statistical data analysis was performed using Microsoft Excel software.

The object of the research - information of land objects depicted in the georeferential base map (GDR10LT) of the chosen territories.

Results and discussion
During the research three areas were chosen for the revision using the field method. The first territory (I) was chosen in Šakiai town and suburbs. It was selected because Šakiai is a compact Lithuanian town, and thus the field research did not require high labour costs. The next area was chosen in Kaunas and its suburbs (II) because it is one of Lithuania's biggest cities with characteristic development. The third territory was chosen in the rural area, i.e. Žasliai cadastral area. Three localities of different situations were chosen: a rural area, a small town and a part of the city. Such a choice of various situations allowed a versatile research which helped to determine the reliability of GDR10LT in both urban and rural areas.

The research was performed in the spring and summer of 2014. The authors present a brief discussion of the main discrepancies between the map and the real situation in each of three areas before summarizing the data.

Settlements dominated in the first research zone (equal to 453.50 hectares) and therefore the major part of discrepancies were new buildings that are not mapped yet and newly formed homesteads. Another considerable part of discrepancies referred to newly dug out ponds that were not included in the map as well. Not a single significant mistake was found because all detected discrepancies showed outdated map information therefore it can be said that the map is reliable and no mistakes were determined.

The size of the second research object is equal to 530.0 hectares. It includes both the area in the city and in the suburbs. This makes the object quite similar to the first one, but it is also expected as the area is located in the city. The change of buildings' density (more buildings are present in this area) is also estimated in this zone. The extent of new buildings has considerably increased; the entire

neighbourhood of new buildings and roads to these areas are not marked in the map. The extent of the change is significantly larger compared to the first area. It is worth mentioning that the mistake of cameral interpretation was found in this territory (Fig. 1).
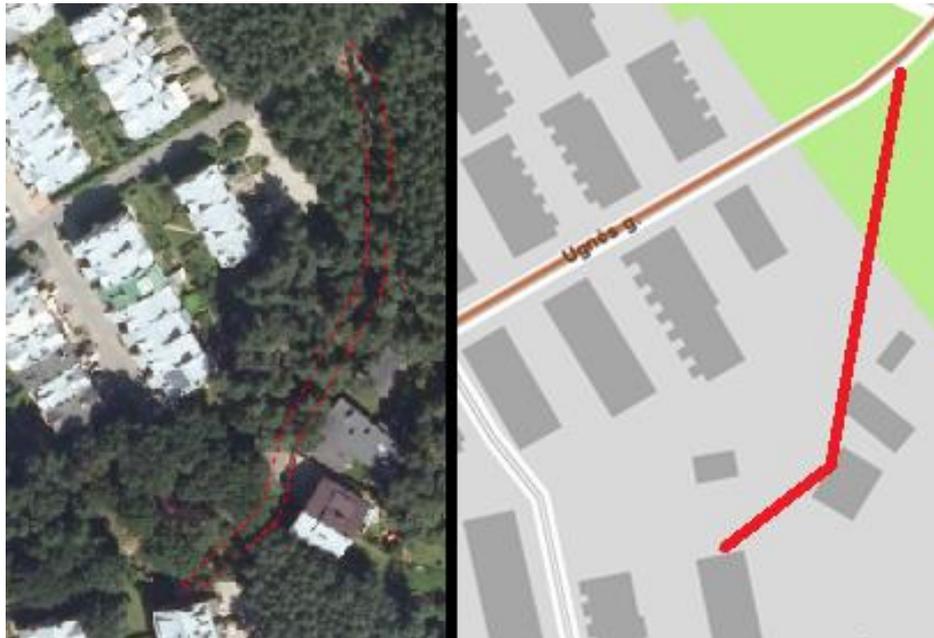

Fig. 1. Unmarked road section in ORT10LT and the approximate location in GDR10LT

A discrepancy found during the research can be considered as a mistake because asphalt road (street) is depicted in the orthographic map of 2012, and the plan of this road was aproved in Kaunas city municipality in 2007. The street is paved in the forested territory and thus it is hardly distinguished in the orthographic map according to interpretation method. This mistake can be considered as significant because the asphalt road is an important element of the terrain. The roads marked in georeferential base are often used for the base of other thematic and special maps, and such a mistake can be automatically repeated in other maps.

The third chosen area (III) is the largest and different from the first two as it is a rural territory with the abundance of agricultural land. It is Žasliai cadastral area in Kaišiadorys district. Minor map discrepancies were found in this area compared to the terrain situation but their amount was the least. It should be emphasized that three communication towers are located in Žasliai cadastre locality. Two of them are present in the northwest part of cadastre; their approximate coordinates are as follows: (1: X 538026, Y 6079502 and 2: X 538023, Y 6079620). The coordinates of the third tower are: X 538958, Y 6079553. All the mentioned towers are seen in the orthographic map; they can be interpreted according to the contrasting colour and shadow falling on the farming land. During the field research it was determined that one tower (X 538958, Y 6079553) was not marked in GDR10LT (Fig. 2).
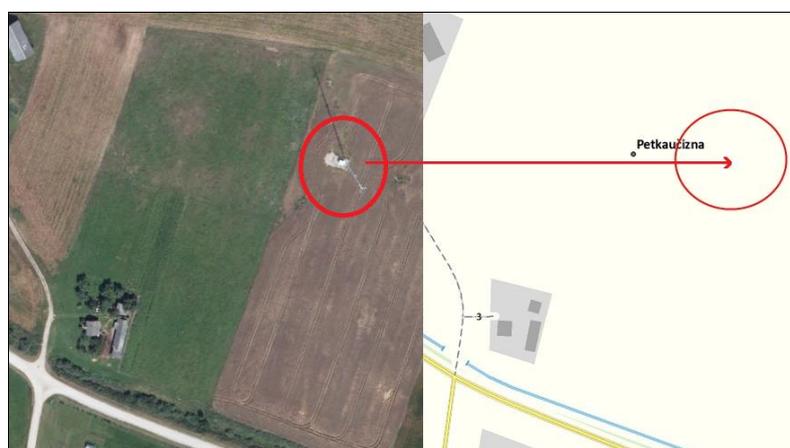

Fig. 2. Unmarked navigational obstacle in ORT10LT and approximate location in GDR10LT

The communication tower interpreted in the orthographic map is seen on the left side of Fig. 2, while it is not marked in GDR10LT on the right side of the figure. In case of doubt whether it was a mistake in the map or the change of the situation, ORT10LT data was revised and the object was found. In addition, local residents were interviewed and they stated that the tower was built approximately five years ago. Thus this case can be considered as a mistake.

The table of variation of georeferential data was composed after performing the revision of georeferential data of the whole area by field interpretation method and generalizing the received data.

Variation of georeferential data

Amount Land	Plot or amount of objects before the revision			Plot or amount of objects after the revision			The change of plot (ha) or amount (units)		
	I	II	III	I	II	III	I	II	III
Hydrography (ha)	8.96	3.04	172.35	9.06	3.04	172.35	+0.1	-	-
Swamps (ha)	-	-	26.52	-	-	26.52	-	-	-
Settlements (ha)	327.59	165.62	254.34	329.06	180.04	254.44	+1.47	+14.42	+0.1
Forests, gardens (ha)	11.22	132.03	1180.72	11.22	131.91	1180.74	-	-0.12	+0.02
Meadows, farming and other land (ha)	65.08	176.95	3699.28	63.11	161.75		-1.97	-15.20	-0.17
Roads, streets (ha)	40.50	37. 70	90.79	40.9	38.67	40.55	+0.4	+0.9	+0.05
Unused land (ha)	0.67	14.66	-	0.67	14.66	-	-	-	-
Towers, navigational obstacles (units)	-	3	2	-	3	3	-	-	1
Total plot (ha)	453.50	530.0	5424.0	453.50	530.0	5424.0			

After the statistical analysis of georeferential data of land surface objects, it can be said that the most of discrepancies were determined in marking of settlements, and this discrepancy is the most frequent. According to the field interpretation data 15.77 hectares of additional settlements should be marked. A part of newly paved roads, composing 1.35 hectares, was not marked as well. Territories, where these objects should have been marked, generally are marked as farming land in the map.

The majority of discrepancies are determined in the second area chosen for the investigation, i.e. the part of Kaunas and its suburbs. Although this area of the research is the smallest, many discrepancies were found. It can be concluded that GDR10LT data of big cities and their suburbs should be updated more often because a large part of these objects are already pictured in ORT10LT but are not drawn in GDR10LT. It was determined that a part of objects were not depicted in ORT10LT, and therefore could not be remotely interpreted and drawn in GDR10LT. They create almost 50 percent of all discrepancies.

The smallest amount of discrepancies were estimated in the third area although this territory is the largest. It should be noted that this territory is in the rural locality 5 – 8 km away from the district centre where farming land dominates and the situation has changed insignificantly.

The research findings show that georeferential base data is quite accurate as only two mistakes were found in the plot of 6407.5 hectares. This number is small; in order to avoid such mistakes, the method of ORT10LT data field interpretation should be used but it would greatly increase labour costs.

Conclusions

1. The majority of discrepancies, i.e. 15.99 hectares, were estimated in marking of newly built houses. This discrepancy was found in most cases, and therefore georeferential data in suburbs of the cities should be updated more often.
2. Almost 50 percent of discrepancies are because of outdated ORT10LT data, and the rest – due to not updated GDR10LT information.
3. Two mistakes were found in the map: the street paved in 2007 and an aeronavigational obstacle built in 2010 were not marked. Most likely, these mistakes were made due to the lack of the skills or cameral interpretation of the data.
4. Georeferential base data are quite accurate because only two mistakes were found in the plot of 6407.5 hectares. This number insignificant; in order to avoid such mistakes, the method of ORT10LT data field interpretation should be used but it would greatly increase labour costs.

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THE ACCURACY OF DETERMINING OF THE ZONES OF RESTRICTED USE OF TERRITORIES ALONG THE TRANSMISSION LINES TAKING INTO ACCOUNT THE MAGNETIC FIELD INFLUENCE

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Abstract
The article highlights the issue of accuracy of determining of the zones of restricted use of the territories along the transmission lines taking into account the magnetic field influence around the wires of transmission line during the passage of electric current. The procedure of establishing of such zones near transmission lines requires a clear substantiation of limits of physical parameters of the electric and magnetic fields` influence of transmission lines on human resources and environment that leads to the establishment of scientifically based boundaries of safe and rational management of land use.
The authors` task was the substantiation of a mathematical expression that describes the relationship between the accuracy of determining the radius of dissemination of the magnetic field along the transmission lines and physical parameters of the magnetic field.
As a result of the conducted research the formulas for determining the standard deviation (SD) of the radius of dissemination of the magnetic field were presented taking into account the value of magnetic induction, capacity, voltage and amperage that were inherent to the particular transmission line.
Keywords: zone of restricted use, electrical transmission line (ETL), magnetic field.

Introduction
Due to the negative impact of electric and magnetic fields of transmission lines (TL) and difficulties in their exploitation, the territories of restricted use are established along the objects of TL. One of the major problems that needs solving is substantiation of the sizes and accuracy of determining the zones of restricted use of the territories to ensure normal conditions of their exploitation, to prevent the injuries and to reduce their negative impact on people, environment, adjacent lands and other natural objects. Cadastral land zoning within the influence of electrical networks is based on geodetic support. It is necessary to envisage the possibility of application of the geodetic surveying methods that are sufficiently providing the requirements for the accuracy of determining the zones of restricted use of the territories and safe conducting of the works in zones of influence of transmission lines.
Many studies of modern scientific world are devoted to the problem of the influence of electrical networks on the environment and, in particular, on human and land resources. In the works of the group of European experts (Jack M. Lee, 1989), (Mileusnic, 2006), (Elschenbroich, 1996), (Bundesamtes fur Strahlenschutz, 2010) fundamental research was conducted on the influence of electric and magnetic fields of transmission lines on the environment. However, the question about the accuracy of determining the zones of restricted use of the territories along the transmission lines taking into account the influence of magnetic field remains open.

Methodology of research and materials
The methods of analysis and synthesis were used during the research. Studies that have been conducted during the last years in this field (Perovych, Tkachyk, 2011), (Bundesamtes fur Strahlenschutz, 2010), (Gaida, 2011) as well as mathematical and physical laws as the basis for the substantiation of the formula of mean square error of the radius of dissemination of magnetic field along the transmission lines were used as initial data.

Discussions and results
The research (Perovych, Tkachyk, 2011) conducted in 2011 showed that during the installing of zones of restricted use of the territories along the transmission lines the influence of magnetic and electric fields that arise in the wires due to the passage of electric current should be taken into account. At the same time, it was found that the permissible value of the magnetic field has significantly greater influence during the determining the limiting distances of the zones of restricted use of the territories along the transmission lines than electric, when it comes to safety of population. And that is why it is

necessary to pay more attention to the influence of the magnetic field during the formation of the boundaries of the territories of restricted use.

The zone of dissemination of magnetic field depends largely on:

- structural and operational parameters of electrical networks;
- amperage which are flowing through the wires;
- the number of wires and their spatial arrangement;
- sagging of overhead transmission lines and depth of underground cables;
- mutual arrangement of phase wires and current asymmetry;
- proximity arrangement of elements of electrical networks;
- climatic conditions.

One of the basic physical parameters characterizing the magnetic field is the magnetic induction, the value of which can be determined by the expression (Bundesamtes fur Strahlenschutz, 2010):

$$B = \frac{\mu_0}{2\pi} \cdot \frac{I}{r} \tag{1}$$

Where:

B - magnetic induction, T;
I - the current in the wire, A;
r - the distance to the wire, m;
$\mu_0 = 4\pi \cdot 10^{-7}$ - magnetic constant, T * m / A.

From the formula (1) we can find the possible radius of dissemination of the magnetic field around the wire depending on the available value of magnetic induction:

$$r = \frac{\mu_0}{2\pi} \cdot \frac{I}{B} \tag{2}$$

The value of the amperage can be determined by knowing the value of natural capacity for transmission lines of appropriate voltage. For transmission lines of alternating current as a practical interest is an average over periods value of capacity (Gaida, 2011):

$$P_c = \frac{1}{2} \cdot U \cdot I_c \text{ , або } I_c = \frac{2 \cdot P_c}{U} \tag{3}$$

Where:

I_c - operating value of amperage, A;
P_c – the capacity of transmission line, Watts;
U – the intensity of electrical grid, V.

Taking into account (3), formula (2) will be rewritten as:

$$r = \frac{\mu_0}{\pi} \cdot \frac{P_c}{B \cdot U} \tag{4}$$

The radius of magnetic field dissemination characterizes the zone of restricted use in the form of a cylindrical space, the axis of which is the outer wire of ETL. The zone of restricted use is a part of the territory of the land which boundaries are defined from the projection of the wire to the ground in the perpendicular to the electric line direction, and therefore we take into account the dissemination of the magnetic field of ETL on the earth`s surface (Fig.1).
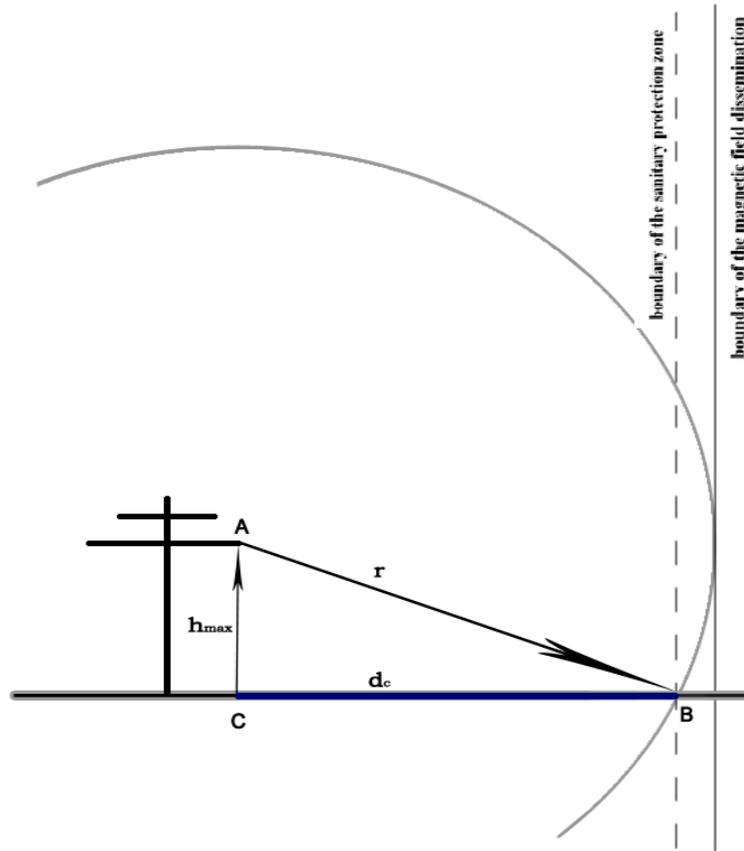
Fig. 1. Determination of zone of restricted use along the ETL

In Fig. 1 the triangle ABC displays: A - the point of outer wire; B - an intersection of the radius of the magnetic field dissemination with the physical surface of the earth; C - the projection of the outer wire (p.B) on the physical surface of the earth; segment AC = h_{max} - the height of the outer wire; AB = r - the radius of magnetic field dissemination; BC - the width of sanitary protection zone.

Thus, the boundaries of sanitary protection zone can be defined by the formula:

$$d_c = \sqrt{r^2 - h_{max}^2} \qquad (5)$$

Where

    d_c – the width of sanitary protection zone, m;

    r – the radius of the magnetic field dissemination, m;

    h_{max} - the height of the outer wire above the ground, m.

Geodetic support of the establishment of zones of restricted use of the territories on the terrain includes two main aspects: the accuracy of determining the boundaries of the zones of restricted use and safe conducting of geodetic works in these zones.

From the formula (5) we can determine the accuracy of the width of the zone of restricted use taking into account the magnetic field dissemination:

$$m_d^2 = \frac{1}{d_c^2}\left(r^2 m_r^2 + h^2 m_h^2\right) \qquad (6)$$

Where

    m_d - mean square error of the width of the zone of restricted use, m;

    d_c – the width of the zone of restricted use, m;

    r – the radius of the magnetic field dissemination along the ETL, m;

    h - the height of the outer wire of ETL above the ground, m;

    m_h – the accuracy of determining the height of the outer wire, m;

    m_r – the accuracy of determining the radius of the magnetic field dissemination, m.

The formula for calculating the mean square error of the radius of the magnetic field dissemination for the function (4) will be as follows:

$$m_r^2 = \left(\frac{\partial r}{\partial P_c}\right)^2 m_{P_c}^2 + \left(\frac{\partial r}{\partial B}\right)^2 m_B^2 + \left(\frac{\partial r}{\partial U}\right)^2 m_U^2 \tag{7}$$

Where
  r – the radius of magnetic field dissemination, m;
  P_c – the capacity of transmission line, MW;
  B - magnetic induction, µT;
  U – the intensity of electrical grid, kV;
  $\dfrac{\partial r}{\partial P_c}$, $\dfrac{\partial r}{\partial B}$, $\dfrac{\partial r}{\partial U}$ – the partial derivatives from the function (4) for variables P_c, B, U;

  m_{P_c}, m_B, m_U – the accuracy of determining the function`s (4) variables P_c, B, U.

The calculation of partial derivatives is disclosed in the formulas (8) - (10).

$$\left(\frac{\partial r}{\partial P_c}\right)^2 = \left(\frac{\mu_0}{\pi} \cdot \frac{1}{B \cdot U}\right)^2 = r^2 \cdot \frac{1}{P_c^2}; \tag{8}$$

$$\left(\frac{\partial r}{\partial B}\right)^2 = \left(-\frac{\mu_0}{\pi} \cdot \frac{P_c}{B^2 \cdot U}\right)^2 = r^2 \cdot \frac{1}{B^2}; \tag{9}$$

$$\left(\frac{\partial r}{\partial U}\right)^2 = \left(-\frac{\mu_0}{\pi} \cdot \frac{P_c}{B \cdot U^2}\right)^2 = r^2 \cdot \frac{1}{U^2}; \tag{10}$$

Thus, the formula for calculating the mean square error of determining the radius of magnetic field dissemination can be written as an expression:

$$m_r^2 = r^2 \left(\frac{1}{P_c^2} m_{P_c}^2 + \frac{1}{B^2} m_B^2 + \frac{1}{U^2} m_U^2\right), \tag{11}$$

If among the available data on the magnetic field parameters there are the value of current in the wire and the value of magnetic induction, as described in formula (2), then the formula for calculating the mean square error of determining the radius of magnetic field dissemination will be as follows:

$$m_r^2 = r^2 \left(\frac{1}{I^2} m_I^2 + \frac{1}{B^2} m_B^2\right), \tag{12}$$

In order to achieve the specified accuracy of determining of the coordinates of zones of restricted use of the territories along the transmission lines we can use as terrestrial and aerial geodetic methods and means of surveying.

Conclusions and proposals
As a result of conducted research on the issue of accuracy of determining the zones of restricted use of the territories along the transmission lines a methodical approach is proposed on the basis of consideration of the errors of dissemination of the magnetic field, which can be characterized by different physical parameters.
Depending on the physical values that are inherent to the proposed magnetic field two mathematical expressions that solve this problem are received. In the first case, the mean square error of the radius of magnetic field dissemination and, thus, the mean square error of the width of zone of restricted use of the territories can be defined taking into account magnetic induction, capacity of electrical grid and

voltage, and in the second case, it can be defined taking into account a function of magnetic induction and amperage in the wires.

These mathematical expressions should be used in the cadastral zoning of lands located in the zone of influence of transmission lines as well as in geodetic surveying of electrical grids.

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THE CURRENT SITUATION ANALYSIS AND ECOLOGICAL FARMING IN THE AUKŠTADVARIS REGIONAL PARK

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Abstract

The analysis of the current situation of Aukštadvaris Regional Park and ecological farming (RP), which is in southeastern Lithuania, is presented in the article. The Paluknys subdistrict was chosen for the comparison of the use of ecological farming in the regional park. Ecological farming is relevant to protected areas. The aim of the study was to perform the analysis of farms applying organic farming measures as well as the analysis of the change of their areas in Aukštadvaris regional park (RP). Comparative, analytical as well as statistical and logical analysis methods were used for the investigation. The object of the investigation - the farms of Aukštadvaris Regional Park. The study was carried out to determine how many farms, forming the territory of the regional parks, are managed according to the principles of organic farming. The change of the above-mentioned farming area for 2011-2013 is analyzed as well. Paluknys subdistrict, not incorporated into the territory of regional parks, was chosen for the comparative analysis.

The analysis of the 2011-2013 period showed that the number of organic farms increased by 1.5 times in Aukštadvaris RP over the period of 2011-2013, and the area has increased by 187.36 ha. The percentage calculations revealed that in 2013 the area of farms applying organic farming measures in Aukštadvaris RP made up 18.89 per cent of the total area declared, the number of farms - 6.61 per cent.

Key words: regional park, agricultural lands, ecological farming measures, declared areas.

Introduction

Protected areas throughout the world are the key for preserving biodiversity, and land use is the key for providing food, fiber, and other ecosystem services essential for human sustenance. As land use change isolates protected areas from their surrounding landscapes, the challenge is to identify management opportunities that maintain ecological function while minimizing restrictions on human land use (DeFries et. al., 2007).

The aim of protected areas is to preserve natural habitats and species (common on agricultural land) of the European Community interest. Such rate of the conservation and use of treatment of the territory is determined that non-intensive farming, forming natural values, should not be interrupted and should be continued in environmentally-friendly manner. If the extensive farming is not carried out in natural grasslands, pastures and wetlands, such areas will overgrow with shrubs, trees and biodiversity would face the biggest threat. As a result, only those activities are limited which could suddenly and irreversibly destroy natural values, for example, grassland ploughing, drainage works, liming, fertilizers and so on.

So, the aims of organic farming are to protect the environment, by using organic management practices that do not have the adverse effects of conventional practices, and the health of consumers by the provision of organic products (Argyropoulos et. al., 2013). Protected areas are necessary to comply with the principles of sustainable farming, expansion of area under organic farming and organic farming for measures to preserve the landscape, the importance of biodiversity, natural and cultural heritage values (Ivavičiūtė, Gurskienė, 2010). Ecological farming and environmental measures are very important for the sensitive and vulnerable plant and animal species and habitats. The intensification and expansion of modern agriculture is amongst the greatest current threats to worldwide biodiversity (Hole at al., 2005). Sustainable development in agriculture – is an organic farming helping solve important problems in rural areas (Brazauskienė, 2002).

Most protected areas require the cooperation and support of local communities and an understanding of stakeholder values and perspectives (Tanner-McAllister, Rhodes, Hockings, 2014).

So, farming in protected areas is difficult, because faced with environmental and economic problems. Protected areas are divided into zones, which are subject to different restrictions of economic activity, and therefore economic activity differs as well.

The object of the research - the farms of Aukštadvaris Regional Park.

The aim of the research is to carry out the comparative analysis of the years 2011 and 2013 of farms applying organic farming measures as well as the analysis of the change of their areas.

Tasks of the research:
1. To carry out the analysis of the current situation of the Aukštadvaris Regional Park.
2. To perform the analysis of farms of Aukštadvaris RP and Paluknys subdistrict applying organic farming measures as well as the analysis of the change of their areas.

Methodology of research and materials

Comparative, analytical as well as statistical and logical analysis methods were used for the investigation. The analysis of the areas declared in the Aukštadvaris Regional Park and the Paluknys subdistrict was carried out following the data of the Agriculture Information and Rural Business Center on the declared agricultural land areas.

The survey was conducted to determine whether environmental measures for the Aukštadvaris regional park and the Paluknys subdistrict differ because of the restrictions and recommendations (on the regional parks) to protect and enhance biodiversity, promote environmentally friendly farming methods and organic farming measures.

The study is carried out to determine how many farmers' farms, forming regional parks' territory, apply organic farming measures. The change of above farms' area for 2011-2013 is analyzed as well. Paluknys subdistricts, not incorporated into the territory of regional parks, were chosen for the performance of the comparative analysis.

Discussion and results

The current situation analysis of Aukštadvaris Regional Park. Aukštadvaris Regional Park is situated in southeastern Lithuania, in the most remarkable part of the Dzūkai upland. Aukštadvaris RP is situated in the medium potential recreational area Aukštadvaris-Daugai (Pileckas, Gulbinas, 2004). Almost entire territory is situated in Trakai district.

When the government of the Republic of Lithuania had approved the plan of the buffer and protection zones of Aukštadvaris Regional Park and its zones on March, 9, 2005, the area of Aukštadvaris regional park increased by 482 ha (according to the new plan) and at present covers the area of 17,032.43 ha. After the changes, the largest area is occupied by the functional priority zone – the territory of conservation priority zone - reserve covering 44.20 percent (10,551.10 ha) of the whole park's territory, and the ecological protection priority zone, covering 16.47 percent (3,932.69 ha) of the whole park's territory. There are 15 reserves in Aukštadvaris Regional Park. The largest reserves in the park - Mergiškiai (2138.10 ha) and Verknė (1972.71 ha) landscape reserves, the Moša archaeological reserve (9.49 ha) occupies the smallest area.

The smallest area is occupied by the functional priority zone - the territory of reservation covering 0.66 percent or 156.39 ha. The living zone occupied 225.32 ha (0.94 percent), recreational priority zone covering 6.18 percent or 1474.29 ha. The area of the buffer protection zones of Aukštadvaris RP covering 28.65 percent (6839.62 ha).

The average efficiency of the agricultural lands in Trakai district is 33.4 points, i.e. is smaller than the average point of the Republic of Lithuania (39.1). The agricultural lands in Aukštadvaris RP make up 38.09 percent of the whole park's territory (Raudonytė, 2009). The efficieny score in the Regional Park is larger than in Trakai district, but lower compared to the national average.

Forests cover the largest part of agricultural lands (51.12 percent). They are divided into forest massives 100-1700 ha each. Park forests are very different (from the point of view of types, age, etc.). Pine-trees, birches, oaks, hornbeams grow in these forests (Aukštadvario…, 2013).

No forests have been planted in Aukštadvaris Regional Park during 2011-2012. In 2012, three requests for afforestation were considered, however, they were not satisfied. Nine requests for forest planting were considered in 2013. Four requests for the afforested in 5.378 ha area were rejected, but five requests for afforestation in 5.56 ha of forest area were satisfied (Aukštadvario…, 2014 a).

The aim was to preserve the open landscape spaces in the Regional Park, therefore new forests should not be planted in landscape reserves and other areas distinguished by expressive landscape, as well as in valuable areas from botanical and zoological point of view, near observation decks, tourism objects and picturesque hiking trails (Aukštadvario..., 2014 b).

Agricultural land in the park makes up 38.09 per cent. Agricultural activity in the Regional Park is less cost-effective due to not very fertile soils and difficult terrain. Part of the land is abandoned, overgrown with high grasslands, shrubs and trees – which results in the disappearing of protected traditional landscape, valuable grassland and wetland habitats. More support is needed in less-favored for farming areas, for meadows and wetland habitat management.

Water reservoirs make up 7.63 per cent, swamps – 0.55 percent. (Fig. 1). The park has 89 lakes and ponds (Pileckas, Gulbinas, 2004).
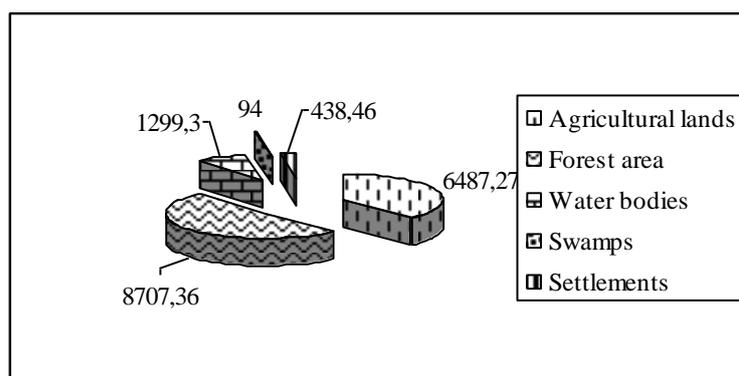

Fig. 1. Distribution of agricultural lands in the Aukštadvaris regional park, in ha

Settlements in Aukštadvaris RP occupy 438.46 hectares and make up 2.57 per cent of the park's territory. There are 100 villages in the Regional Park (the largest – Čižiūnai with about 180 inhabitants), Aukštadvaris town has 1,000 inhabitants (Aukštadvario…, 2014 b).

In 2014, the number of farmsteads of towns, villages and steadings situated in Aukštadvaris Regional Park – 1,322 pcs. and 2,729 residents. The number of abandoned, unused buildings in the regional park, spoiling the environment, is 16 pcs., however, none of the above buildings has been removed since 2005.

The number of violations of the joint landscape protection requirements in Aukštadvaris Regional Park varies slightly. The majority of violations were recorded in 2005 - 16 cases. The minority of violations were recorded in 2013 - 2 cases. Unauthorized constructions and reconstructions mainly were recorded in 2006 - 9 cases, no unauthorized constructions and reconstructions were observed in 2010-2013. There were 2 cases of other landscape violations observed in 2006 and 2013, in 2012 -15 cases. The non-compliance of the project was observed only in isolated cases.

Having performed the landscape change analysis of Aukštadvaris town, which is part of the regional park, the most obvious change was highlighted in a northeasterly direction. The photofixation method was used for the performance of the change analysis. The fixation in the park takes place twice a year. It was found that the development of new constructions goes on according to the Aukštadvaris Regional Park Management Plan approved in 2005. The biggest changes in the landscape (the overgrowth with naturally growing trees) occured in farm and ecological protection priority zones.

Other land occupies 6.04 hectares and makes up 12.04 per cent in Aukštadvaris Regional Park. There were three damaged areas in the analyzed Regional Park in 2005: Aukštadvaris dump (0.25 ha), a former gravel quarry in Gedanonys village (0.3 ha), a former gravel quarry in Pakalninkai village (0.05 ha). For the time being, there is only one remaining damaged area: the former gravel quarry in Pakalninkai village.

27 territories in the Aukštadvaris RP correspond to the criteria of the habitats of European importance. There are over 100 objects of cultural heritage in Aukštadvaris regional park (RP): 39 archeological places, 33 places of interment, 20 mythological places, over 20 valuable constructions and paraphernalia and urbanized localities (Aukštadvario…, 2013).

The system of protected natural heritage sites in the regional park is not formed yet. Although the regional park has geological, geomorphological and hydrogeological objects abundance, very few have been announced as protected ones. The natural heritage sites condition in Aukštadvaris Regional Park varies little. In 2005, the good condition sites amounted to 37.9 per cent., the average state sites - 44.8 per cent., the poor condition sites - 17.3 percent. In 2013, the number of sites in good condition has increased and amounted to 63.2 per cent, the number of natural heritage sites of the average state has dropped to 31.6 per cent, the number of natural heritage sites of the poor condition also declined to 5.2 per cent. Thus, when evaluating the state of the Aukštadvaris RP natural heritage sites it was found that in 2005-2013 the number of natural heritage sites in good condition has increased by 25.3 per cent, the number of the sites in average condition decreased by 13.2 per cent, and the number of the natural heritage sites in poor condition decreased by 12.1 per cent (Aukštadvario..., 2014 b).

Ecological farming in Aukštadvaris and in Paluknys subdistrict. The performed comparative analysis of the declared farmers' farms areas in Aukštadvaris RP shows that the total farmers' farms area decreased by 1058.13 ha (Fig. 2) and the number of those declaring their farms decreased by 142 farms.
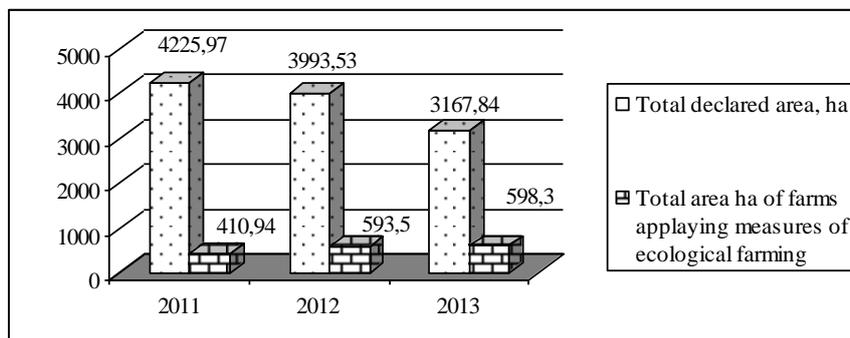

Fig. 2. Analysis of the declared areas change in Aukštadvaris RP during the period of 2011-2013

In 2011, the total area of declared farms made up 24.81 per cent of the total Aukštadvaris RP area, in 2012 – 23.45 per cent, in 2013 – 18.16 per cent.
The number and area of farmers' farms applying organic farming measures increased each year (Fig. 3). In 2011, these measures were applied by 3.47 per cent of the declared farmers in the 410.94 ha area, and it made up 9.72 per cent of the total area declared and only 6.33 per cent from RP's agricultural land area. In 2013 6.61 per cent of farmers applied organic farming measures in the area of 598.3 ha (18.89 per cent of the total area declared and 22.9 per cent from the RP's agricultural area). So, the number of organic farms increased by 1.5 times in Aukštadvaris RP over the period of 2009-2011, and the area has increased by 187.36 ha.
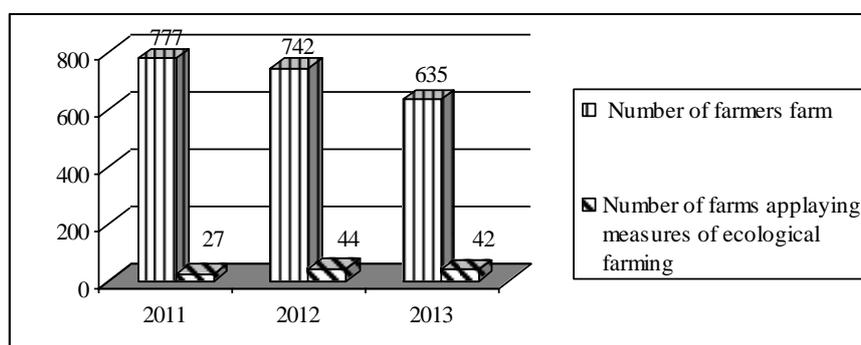

Fig. 3. Analysis of the number of farmers farm applaying measures of ecological farming in Aukštadvaris RP during the period of 2011-2013

Paluknys subdistrict, situated in the southeastern part of the Trakai district, outside the territory of Aukštadvaris RP, was chosen for the comparison of the use of ecological farming in Aukštadvaris Regional Park. The territory covers the area of approximately 14 thousand ha. A part of the inhabitants upholds the traditional agriculture.
The average efficiency of the agricultural lands in Paluknys subdistrict is 31.8 points.
In Paluknys subdistrict, unlike Aukštadvaris RP, the total area declared gradually increased for the period of 2011-2013 (Fig. 4), but the number of farms, which have submitted declarations, decreased by 19 farms. Only one farmer applied organic farming measures in the analyzed municipality in 2011 in the area of 11.85 ha. It made up 0.53 per cent of the total area declared.
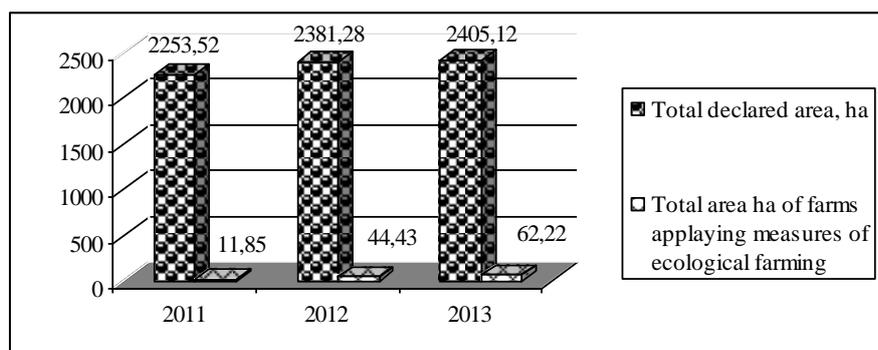
Fig. 4. Analysis of the declared areas change in Paluknys subdistrict during the period of 2011-2013

The number farms applying these measures, rose slightly - by one during one year period (Fig. 5), and the area has increased to 66.22 ha and made up 2.59 per cent of the total area declared. So, the number of organic farms in Paluknys subdistrict increased almost 6 times or by 50.37 ha in 2009-2011.
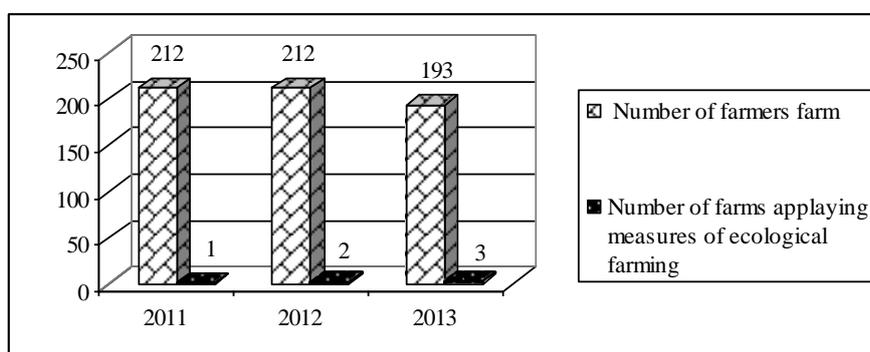

Fig. 5. Analysis of the number of farmers farm applaying measures of ecological farming in Paluknys subdistrict during the period of 2011-2013

The analysis of Aukštadvaris RP and the Paluknys subdistrict (which is not incorporated into the park's territory) of 2011-2013 showed that organic farming has been introduced at the number of farms and the area has increased. The percentage calculations revealed that in 2013 that the area of farms applying organic farming measures in Aukštadvaris RP made up 18.89 per cent of the total area declared, the number of farms - 6.61 per cent. In Paluknys subdistrict - 2.59 and 1.55 per cent, respectively.

Organic farming, clearly a viable option in many situations, is still not fully exploited and is not widespread in protected areas. Organic farming is important because conventional agriculture - which involves high-yielding plants, mechanized tillage, synthetic fertilizers and biocides - is so detrimental to the environment.

Conclusions
1. The largest area of Aukštadvaris RP is occupied by the functional priority zone – the territory of conservation priority zone – reserve covering 44.20 percent (10,551.10 ha) of the whole park's territory, and the ecological protection priority zone, covering 16.47 percent (3,932.69 ha) of the whole park's territory.
2. The number of organic farms increased by 1.5 times in Aukštadvaris RP over the period of 2011-2013, and the area has increased by 187.36 ha. The number of organic farms in Paluknys subdistrict increased almost 6 times or by 50.37 ha in 2011-2013.
3. The percentage calculations revealed that in 2013 the area of farms using organic farming methods in Aukštadvaris RP made up 18.89 per cent of the total area declared, the number of farms - 6.61 per cent. In Paluknys subdistrict - 2.59 and 1.55 per cent, respectively.
4. It is recommended to develop animal-breeding as well as ecological farming for the improvement of the condition of environment and landscape in Aukštadvaris Regional Park. It is necessary to form clear and sufficient policy over the compensation for the restrictions of the farming in protected areas, which should reduce the load of ordinary economic activity in protected areas, and their usage should become more favorable for protected valuables.

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THE SYSTEM OF MARIJAMPOLĖ GREEN AREAS

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Abstract
Development and management of green area systems is important to both the environment and a person. It bears social, economic, and ecological significance. This system must comply with principles of sustainable spatial development. Therefore, well-developed systems of green areas must become the basic aim of all cities. Marijampolė, the seventh biggest city of Lithuania was selected as the research object. In the article the system of Marijampolė city green areas is analysed. Two surveys, which included questionnaires, were conducted, i.e. city inhabitants and territory-planning and management specialists were interviewed. It was identified that the system of Marijampolė green areas is not balanced and there are enough green areas only in part. However, the current parks, squares and other green spaces do not ensure full-fledged citizens' life. Marijampolė lacks equipped, applied to various activities local green areas for different age groups of the community, the development and maintenance of which must primarily be the inhabitants' concern.
Key words: the system of green areas, green spaces, recreation, sustainable development.

Introduction
A city is a stimulator of sustainable development, the basis for competitiveness and prosperity of the state (Dargis, 2008). It is a rather complicated system, encompassing city community, its activities and demands, natural, anthropogenic elements and the environment, while human being takes the most important position. Thus, not only city planning but also the formation of green areas must be oriented towards people's needs (Yakovlev's–Mateckis, 2006). One of the conditions for sustainable city existence is a high-quality system of public spaces and green areas, oriented towards satisfaction of people's needs and assuring favourable living conditions in the city (Chiesura, 2004). Well-planned green areas make a city vivid and attractive (Duggal ir kt., 2014). As well as this, they add to economic prosperity of the city. Green areas within the city must be arranged and managed so that they could ensure full-fledged citizens' life.
Recreation is essential for full-fledged life, especially a short-term one, i.e. everyday recreation, because it helps restore individual's physical and mental capacities and is significant as a social phenomenon since it induces varied development of a personality (Urbonaitė, 2011). For green areas to effectively ensure recreational function, accessibility of such areas, quality and assurance of various activities are crucial. According to K. J. Mateckis (2004), separate sites for recreation and a recreation park of the whole area (green area of the district) with the equipment and greeneries in order to satisfy the needs of different age groups within the district community must be established. In a residential area of a district recreation gardens whereas in groups of houses recreation and sport sites must be set up (the so-called local green spaces). Therefore, public spaces are becoming lively when a variety of activities dominates; they take place in a different part of a day, throughout all seasons, are easily accessible and interrelated (Rogers et al., 2006). A problem arises that not always existing recreational territories can properly ensure their functions or there are no such territories within the residential area of a district.
The research analyses Marijampolė, the city situated in southern Lithuania, the centre of one of the five ethnographic regions. Recently administration of the municipality has been paying a big attention of the community to management of public spaces and infrastructure of the city as well as improvement of work and recreation conditions. The municipality is one of the first within the country with regard to application of GIS technologies in the fields of territory administration and management.
The aim of this research is to analyse the system of Marijampolė city green areas as well as to find out inhabitants and specialists' opinion about it. The objectives of the research are as follows: to identify the distribution of current green areas; to assess the quality and demand for green areas in Marijampolė city.

Work methodology
The research object is the system of Marijampolė city green areas.
The analysis of scientific and legal literature, statistical data, territory-planning documents and other sources was conducted for the research. Moreover, two questionnaires were filled.

The system of Marijampolė city green areas was analysed on the basis of the general plan (2012), the special plan of development and management of green area system in Marijampolė city (2012) and the map containing solutions for the system of green areas as well as certain laws of the republic of Lithuania, resolutions of the government, other standard acts, scientific literature and other information sources.

The data of Lithuanian Land Fund, announced by National Land Service under the Ministry of Agriculture and other institutions as well as the data provided by Lithuanian Department of Statistics and other sources of information were analysed.

Two questionnaires were compiled. The first one was developed in order to find out the needs of Marijampolė inhabitants and their opinion about green areas within the city. The second questionnaire was compiled so that one could know the position of experts of this field. 104 questionnaires (85 for inhabitants, 19 for experts) were prepared and distributed. The survey was conducted in February of 2015. The feedback of the questionnaires was 100 %. The collected data was analysed using MS Excel software. Descriptive and graphic depiction methods were used to assess the results and analysis of the research.

Results and their discussion

Marijampolė is a city in southern Lithuania, the centre of the county. It occupies the area of 2,412.71 ha. At the beginning of 2015, according to the data of Lithuanian Department of Statistics, the number of inhabitants in Marijampolė was 38,341 (Lietuvos..., 2015), i.e. 66 % of all dwellers in Marijampolė municipality. On the basis of Land Fund of Lithuania, according to the data of 01/01/2013, agricultural utilities in Marijampolė constituted 204.83 ha, which made up 8.5 % of the total city area. There have been no forests in the territory of the city. Roads constituted 131.00 ha or 5 %, the built territory made up 1,152.93 ha or 48 % whereas 127.23 ha or 5 % were covered with water and other land (which includes green areas as well) occupied 796.72 ha or 33 % (Lietuvos..., 2013). Following the distribution of agricultural utilities, one can make a conclusion that built territory and other land dominate in Marijampolė city.

On the basis of solution map for the system of green areas, compiled in 2012, the general plan of Marijampolė city (2012), the information provided by State Enterprise Centre of Registers and Regional Geoinformation Environment Service (REGIA) (2015), it was identified that the system of Marijampolė green areas is composed of separate green areas and other territories important for natural frame and a balanced system of green areas (Table 1).

Table 1

Distribution of green areas in Marijampolė city

Type of green areas	Amount, units	Area, ha	Area occupied within the total system of green areas %	Area within the total general city area %
Territories of separate green areas	15	92.70	44	4
Territories of common use	7	36.73	18	2
Recreational territories	3	28.27	14	1
Territories containing cultural heritage objects	7	50.89	24	2
Total	**32**	**208.59**	**100**	**9**

The system of green areas in Marijampolė city occupies only 9 % of all the city territory. However, it was discovered that one city dweller gets about 24 m^2 of separate recreational green areas. According to standards of recreational green areas (2007), knowing that in cities of medium size the standard must reach 20 m^2 for one inhabitant, one may claim that the area of the current green areas is sufficient. On the other hand, as it was shown by the data of questionnaire, not all of them satisfy people's needs.

The results of the survey reveal qualitative and quantitative situation of Marijampolė city green areas in certain city districts and the whole city as well as the assessment of state of certain green areas.

Having conducted the survey of green area designing specialists, architects and Marijampolė municipality environment protection department employees, 100 % of experts marked that creating a

single, functional system of green areas was an important step towards sustainable development of the city. 26 % of experts answered that green areas and greeneries in Marijampolė city were distributed evenly whereas 74 % of respondents said it was uneven.

The survey was intended to find out if there were enough green areas in Marijampolė city. 84 % of experts say the current green areas are sufficient while 16 % claim that the amount of green areas is sufficient only in part and there could be more greenery, i.e. the current parks, squares, etc. could be planted with trees and bushes as well as adapted to people's recreation. The rest 15 % think that there are not enough green areas to ensure the prosperity of city dwellers.

The survey was meant to provide information if city dwellers and specialists understood the significance of green areas in the city. They were asked for the opinion concerning the functions of green areas. Apparently, as it was expected, 100 % of specialists know that green areas perform ecological, technical-protective and architectural-social functions. 65 % of inhabitants also marked all functions. 16 % of people think that green areas only reduce pollution and cleaned the air, i.e. performed urboecological functions. 11 % believe that green areas are important in order to satisfy people's needs and maintain natural frame or, in other words, they perform architectural-social functions. The rest 8 % claim that green areas only protect from noise, dust, etc. In conclusion, it could be stated that the majority of Marijampolė inhabitants are aware of the importance of green areas. This awareness adds to the aspiration and realization of sustainable development in Marijampolė city.

Both city inhabitants and experts-specialists were asked what they thought about the amount of funding devoted to maintenance of Marijampolė city green areas. 74 % of experts think that the funding is not sufficient enough. 11 % feel that enough financial support is given whereas 15 % of respondents do not have an opinion about this issue. 60 % of dwellers do not have a clear opinion about the funding. Even 27 % of respondents think that enough funding is provided whereas 13 % believe it is not sufficient. The experts were also asked how more funding could be gained for management of green areas. 37 % of respondents say that the municipality could devote more money from the budget whereas 32 % of respondents claim that the support of EU structural funds could be used more often, which was the case with Poetry, Vytautas the Great parks and other public space management. 23 % of respondents think that it is possible to attract support from private persons by creating more favourable possibilities for investment. Several respondents believe (8 %) that the funding for ecologisation of the city, extension of green areas and improvement of quality must be foreseen not only in the city but also state budget.

Dwellers of Marijampolė city were asked to express their opinion about who should supervise green areas in the city (Fig. 1). In their opinion, the municipality and the inhabitants themselves (the society) ought to take care of green areas most. However, it is no less important that representatives of the private city sector, enterprises and offices should be concerned with green areas in the city.
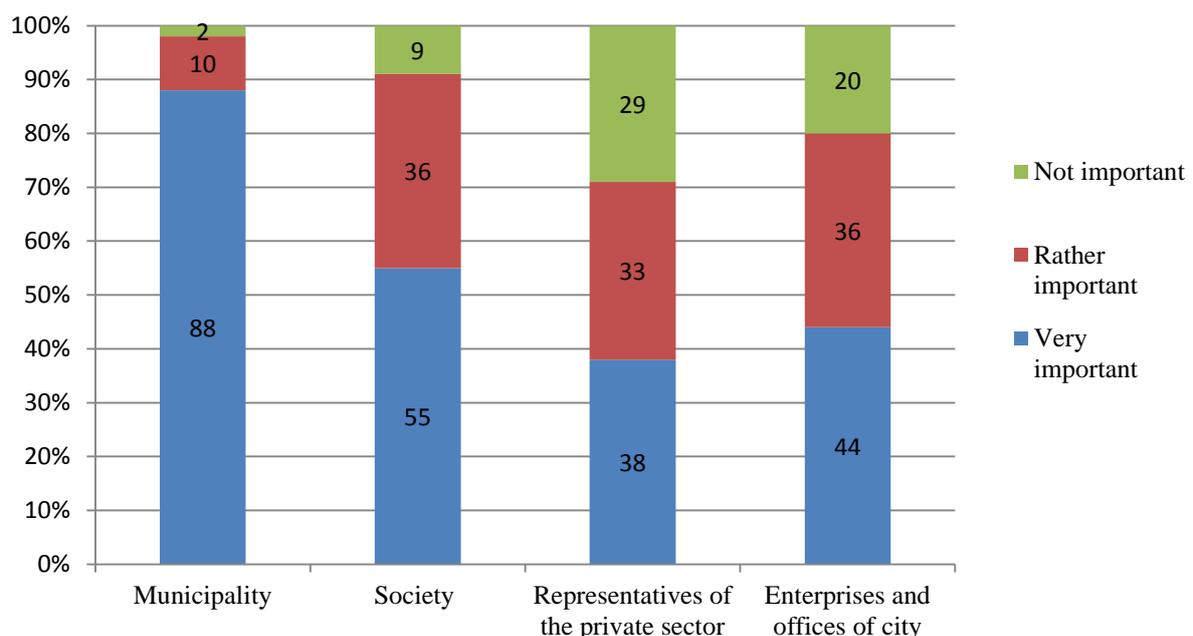

Fig. 1. Distribution of respondents' opinions about institution maintenance of city green areas, %

On the basis of sustainable development principles, establishment and management of the green area system must be equally important in all countries because only under common agreement and efforts it is possible to reach a high-quality system of green spaces, reduction of urbanisation consequences and, definitely, sustainable development of the city.

Another part of the questions included the quality of green areas and distribution in certain parts of Marijampolė city. City inhabitants were asked to assess sufficiency and availability of green areas in their residential area. After the analysis, it was identified that inhabitants of Degučiai district and the city centre were best supplied with green areas. In these parts of the city green areas are arranged conveniently and are easy to reach. Dwellers of these districts mostly mention that there are enough green areas for their needs. The worst situation is found in Laikštė and Draugystė quarters, where respondents mark that green spaces are too far and there are no green areas in their neighbourhood.

As experts assess, the mentioned districts, namely Degučiai and the city centre are best with regard to green areas, having collected on average 4 points out of five whereas the worst situation is found in Laikštė and Nartas, which scored only 2 points (Fig. 2).
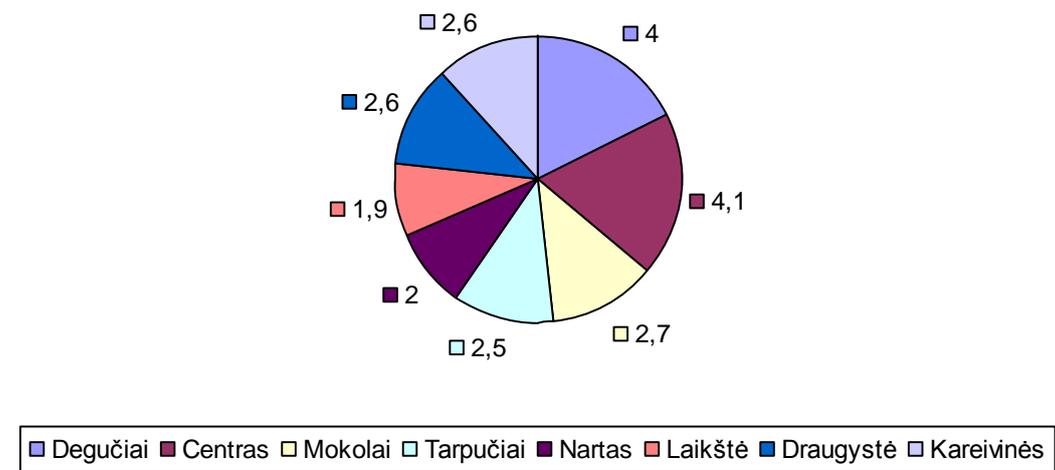

Fig. 2. The assessment of local green area sufficiency in microdistricts, conducted by respondents, points

Thus, the opinion of inhabitants and experts is very similar and, as a result, the assessment is valid. Furthermore, the research was carried out to find out inhabitants' social needs and recreational possibilities in the city. The inhabitants were asked if district and local green areas in their residence were adjusted to people's social and recreational needs (Fig. 3).
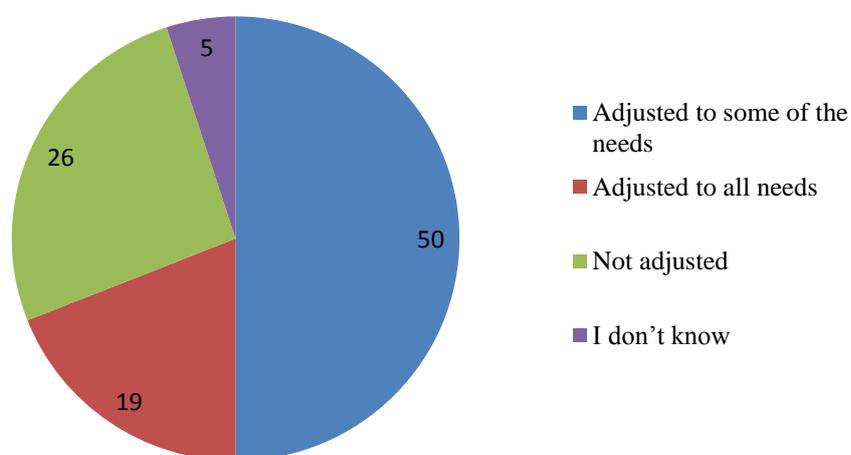

Fig. 3. Distribution of respondents' opinions about adjustment of green areas to inhabitants' needs, %

54

Half of the respondents think that Marijampole city green areas are adjusted only to some needs while 26 % of the respondents claim that green areas are not adjusted to people's needs at all. 19 % believe that green areas are well-suited to all needs and it is not surprising that almost all respondents who chose this option lived in the city centre where loads of equipped, arranged and adapted to various activities parks could be found.

The inhabitants, asked to say what is lacking in Marijampole green areas, those living far from the central green areas (Rygiškių Jonas, Poetry, Vytautas the Great, Mokolai, and other parks), emphasize that they lack well-equipped parks. The others mention insufficient sport and free time equipment in parks as well as lack of playing grounds and zones for children or picnics and cycling tracks. In addition, inhabitants are not satisfied with lighting of certain green areas, lack of benches, rubbish bins, parterre, trees and greenery as well as lack of cleanness.

The answers to the question what green area is mostly visited show that the most popular green spaces are Rygiškių Jonas, Poetry, Vytautas the Great and Pašešupys parks. The truth is that these parks are equipped and adapted to people's rest and, thus, they are visited. The other parks, still not equipped, were not mentioned.

In order to find out how city dwellers and specialists assess the state of elements in Marijampole city green areas, the table for assessment (from 0 to 5 points) was included in the questionnaire. According to the assessment obtained, the average point of each element assessment (table 2) was calculated.

The inhabitants best rated Rygiškių Jonas park. In 2013 its rearrangement was finished and, therefore, the inhabitants are satisfied with a still favourable condition of pedestrian and cycling tracks as well as a variety of sport equipment and active zones. J. Vaižgantas park, located in Vytautas Street, was considered as the worst one. Specialists' opinion slightly differed. They consider Poetry park, reconstructed in 2012, as one of the highest quality. The worst state of elements appeared in Youth park, which is being arranged at the moment. Thus, the state of park elements must improve and necessary elements are likely to appear, namely lighting, sport equipment, parterre, etc.)

Table 2

Assessment of the state of green area elements in the main Marijampolė parks

Elements \ Green areas	Pedestrian paths	Cycling tracks	Playgrounds	Sport/ Active zones	Sport equipment	Lighting	Benches	Other objects *	Trees	Parterre	Water reservoirs	Supply with rubbish bins	Total score
Rygiškių Jonas park	4.8	4.1	4.3	4.7	4.7	4.7	4.7	3.2	4.6	2.3	4.2	3.7	**50.0**
Poetry park	4.7	4.9	4.7	4.2	4.2	4.9	4.7	4.3	4.8	4.3	4.7	4.2	**64.8**
J. Vaižgantas park	1.0	0.6	2.9	0.5	0.5	1.3	1.4	0.5	2.8	0.5	0	1.4	**13.3**
Youth park	0.5	0.5	1.0	1.5	0	0	1	0	2.5	0	3.5	2.0	**12.5**

Explanation: * – elements of minor architecture (sculptures, etc.)

The results of the questionnaire show that the system of Marijampole green areas is not balanced. There are enough green areas only in part whereas the current parks, squares and other green areas do not satisfy all inhabitants' needs.

Seeking for improvement of Marijampole city green area system, it is important to regard inhabitants and specialists' opinion concerning actions, which could help improve the system (Fig. 4).

Respondents (inhabitants) suggest (about 70 %) rational managing of present green areas, enriching them with various recreational functions and equipment. 66 % of inhabitants believe that more attention should be paid to management of natural water reservoirs (the Šešupė, the Jevonis and other streams). 54 % of respondents say that having adjusted unequipped green areas to people's needs, the system of green areas in the city would be of higher quality. The smallest amount of inhabitants (30 %) maintain the idea that more green areas should be equipped in free territories because the problem is not the lack but the quality of green areas.

Experts have a slightly different opinion. They mostly support the idea (79 %) that more attention should be paid to management of water reservoirs and integration into spatial structure of the city. In addition, almost 74 % of experts propose cooperating with foreign cities. Their experience and knowledge might encourage representatives of Marijampolė municipality and business to undertake more sustainable initiative. A major part of experts, namely 63 %, the same as city inhabitants, suggest establishing new green areas in free territories (58 %) and reasonably arranging the existing (53 %) green areas. Specialists least support the idea of finding out separate district inhabitants' needs. (32 %).
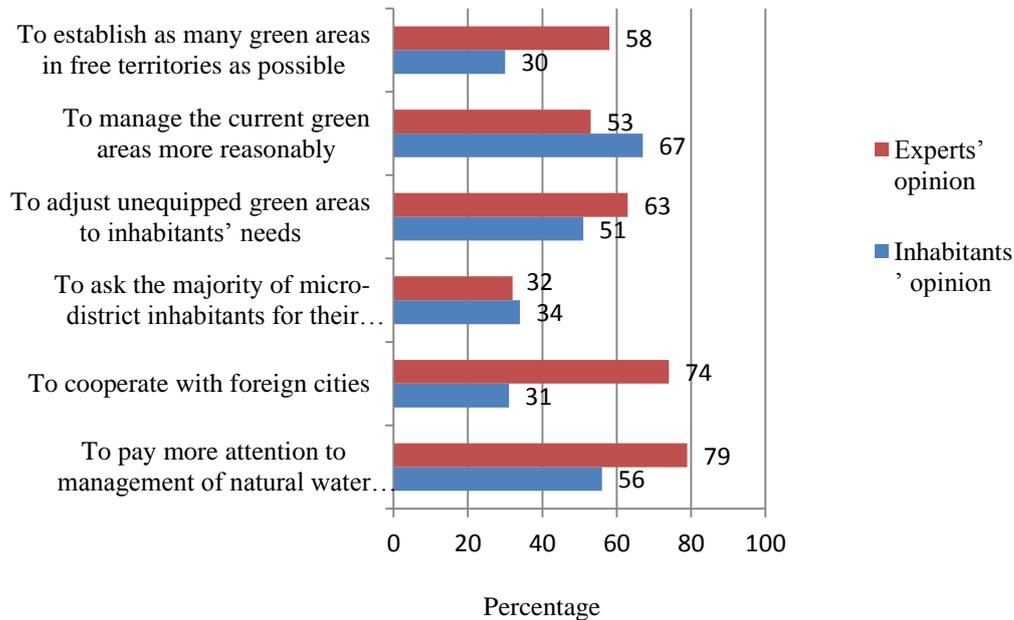

Fig. 4. Distribution of respondents' opinion about actions to improve the system of Marijampolė city green spaces

One may claim that it is crucial to take into consideration the potential of city resources, make use of the current green spaces, adjusting them to people's needs. Establishment of new green areas in free territories must be well-discussed, responsible and useful for both natural surroundings and inhabitants themselves. It is important to involve territorial communities into the process of developing the green space system. The initiative of communities to create the identity of their residential area through the system of public spaces should be promoted because only inhabitants themselves know their needs best.

Conclusions
1. It was found that green areas in Marijampolė city occupy 9 % of the territory. One inhabitant gets about 24 m^2 of separate recreational green areas. This index exceeds the minimum standard 1/5.
2. There are enough green areas in Marijampolė city though the number of well-equipped green areas, which could completely satisfy the city community needs, is not sufficient. 50 % of respondents claim that Marijampolė city green areas are adjusted only to certain needs. 26 % say that green areas are not adjusted to human needs whereas 19 % state that green areas are applied to all needs. When establishing green areas, more attention should be paid to people's health promotion, stimulation of active leisure and children's occupation.
3. Central green areas in Marijampolė are well-located. They constitute the biggest part of city green areas. It is obvious that there is insufficient amount of district and local green areas. What is more, their state is not good and, thus, when developing the system of Marijampolė city green areas more attention should be paid to the development of district, especially local green areas, promotion of their recreational functions and territory maintenance.
4. The main ways to solve the problems could be as follows: rational management and use of current green areas and water reservoirs, adjustment of green areas to inhabitants' needs (equipment of playing and sport grounds, pedestrian paths and cycling tracks), using the experience of foreign cities.

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