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# EMERGENCE OF THE COASTAL URBAN REGION OF KLAIPEDA (LITHUANIA)

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## Introduction

Coastal zones are among those areas that have been subject to intense human pressure due to their natural resources. As a transitional zone, between land and sea, coastal zone holds some of the most valuable and productive habitats on earth. Huge amount of energy circulate in these zones, which attracts all sort of human interest and activities (Rivis et al., 2016; Schlacher et al., 2014; Bicknell et al., Sperr et al., 2006). A great number of population lives near the coastal zone.

Direct and indirect degradation of coastal zone and waters has been reducing natural productivity, as well as mutilating environmental functions that human being using. Due to chaotic coastal zones occupation and their unsustainable patterns of uses, it will lead to resources exhaustion (Sperr et al., 2006).

Landscapes have been shaped over the centuries by processes related to human land use, which are reflected in regional landscape patterns (Juskevicius et al., 2013; Renetzeder et al., 2009). It is important to gain a better understanding of the nature and magnitude of urban climate modification, in order to assess the contribution of urban areas to climate change and also what impact climate change may have on urban areas (Hughes, 2006).

The goal of this study is to analyze the impact of urban sprawl on landscape around Klaipėda, Lithuania (Fig. 1). The main aims are: (I) find differences in location of settlements during period since 2005 to 2013; (II) predict possible settlements expansion till 2020; (III) evaluate possible urban sprawl impact on Klaipėda city and suburbs.

## Results

Study shows, what the biggest suburbanization processes in Klaipėda have been spotted in 5-10 km eastwards and not significantly in south – east and northern direction from the city (Fig. 2;3;5). Territory in 5 km distance from Klaipėda city centre have increased by 632,65 ha, as well as in all studied area enlarged by 1090,94 ha. The most significant suburbanization processes have been in settlements of Klaipėda district: Slengiai, Triušėliai, Budrikai, Mazuriškiai. Here was recorded by 56,63% of all changes in Klaipėda district.



Fig.2. Urban sprawl in Klaipėda district 2005-2013, ha.

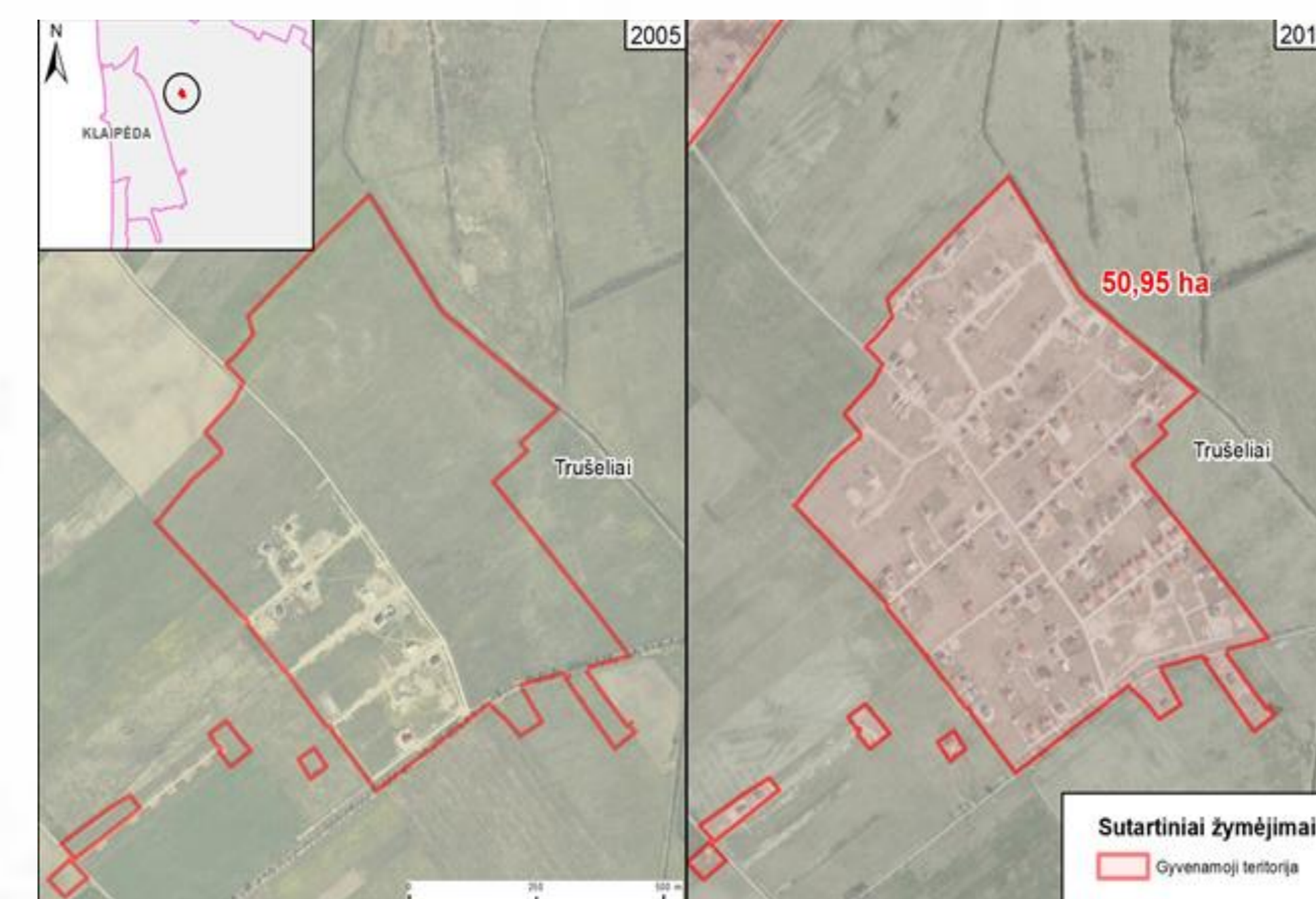


Fig.3 The biggest territorial change (Trušėlių km.) 2005-2010, ha.

## Study area and methods

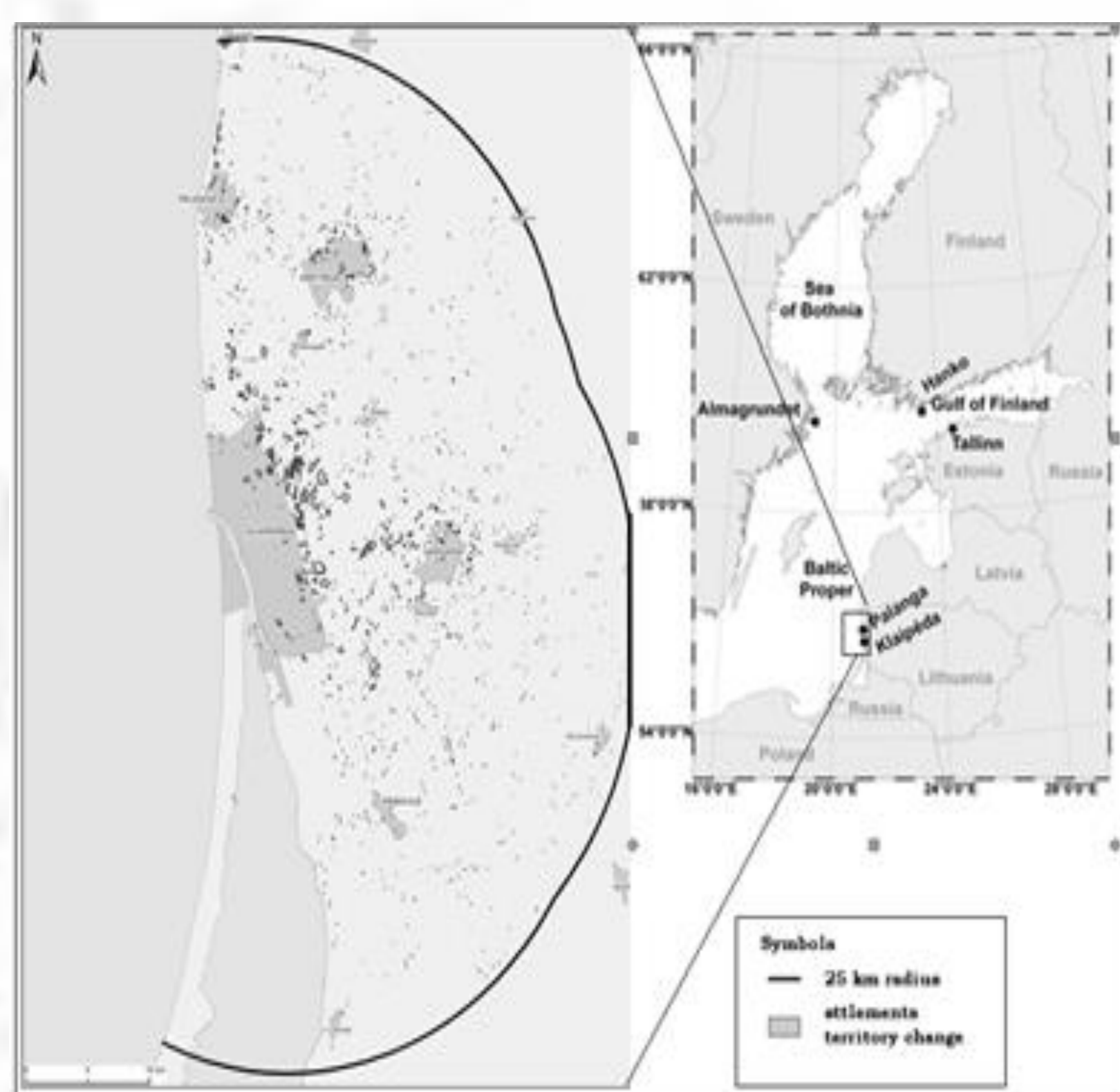


Fig.1. Settlements expansion 2005-2013 in study area.

Baltic Sea and coast is one of the most vital natural resources of Lithuania. Only a small part of Baltic Sea coast belongs to Lithuania (~91 km.). On the Baltic Sea coast situated Klaipėda city is the largest town at the western Lithuania, with the number of 158 541 population (2013 Census data). Here is located one of the non-freezing harbors at the south-eastern part of Baltic Sea. In Klaipėda surrounding settlements is located several tourist recreation attraction points, and summer resorts, such as well-known Palanga and Nida, Marine museum with the only one dolphinarium in all Baltic countries and many others.

At the same time almost 0,5% of Klaipėda city territory and 48% of Klaipėda district territory belongs to the National park area and Natura 2000 or other prohibited area (State Cadastre of Protected Areas, 2014). As notes Darijus Veteikis (2011) very short line of coast (almost 91 km) belongs to Lithuania, but despite this, more when a half of it (51 km) is under various restrictions. Despite this, in this area has been concentrated various economic and social activities which forcing together to share the area with natural landscapes of great value (Veteikis et al., 2011).

In study area was included territories in 25 km radius from Klaipėda city according to D.Cesnavicius (1998) and M.Cirtautas (2013) methodology. Regarding this methodology, in study area were included Klaipėda city, part of Klaipėda district, part of Kretinga district, Palanga city, Neringa and part of Silute district, municipalities (fig. 1).

In order to get the most accurate data on suburbanization processes, was gathered several methods: GIS, using orthophoto and georeferential GDB10LT databases and also mathematical – statistical method in comparison with received visual results. GIS methods were used to identify changes in the land cover change in Klaipėda and its surroundings. Both – macro (city level) and micro level (suburbs) changes were investigated during research.

In this study, was used year 2005 and 2013 layers of Lithuanian territory M 1:10 000 georeferential database year 2005 and 2013 and the 2005 and 2010 Lithuanian territory digital orthophoto M 1:10 000 map ORT10LT (Fig.1). Orthophoto's map layers were used to make geometrical correction of georeferential GDB10LT database layers in order to look for settlements territorial change during analyzed period.

One of the best indicator, showing urban sprawl and change of physical landscape is the change of number of population in city and suburban areas (Cirtautas 2015, Newman et al. 2014; Europos Sąjungos regioninė politika 2007). Correlation shows, what population number in Klaipėda city is decreasing but in Klaipėda district increases exponentially ( $r = -0.8613$ ) (fig. 4).

According georeferential data analysis, settlements territory of Klaipėda city suburbs expanded by 1090,94 ha during by 2005-2013. Mostly, suburbs have expanded eastwards and northern in 5 km distance from Klaipėda city (632,65 ha) that is directions parallel to the highway Klaipėda-Vilnius, and on the way to Palanga resort.

If territorial growth of settlements around Klaipėda city will be the same as during 2005-2013 period, settlements around Klaipėda city in 5 km radius, would expand up to 1245,77 ha till year 2020. Future urban sprawl direction should remain the same – eastwards and northern from Klaipėda city.

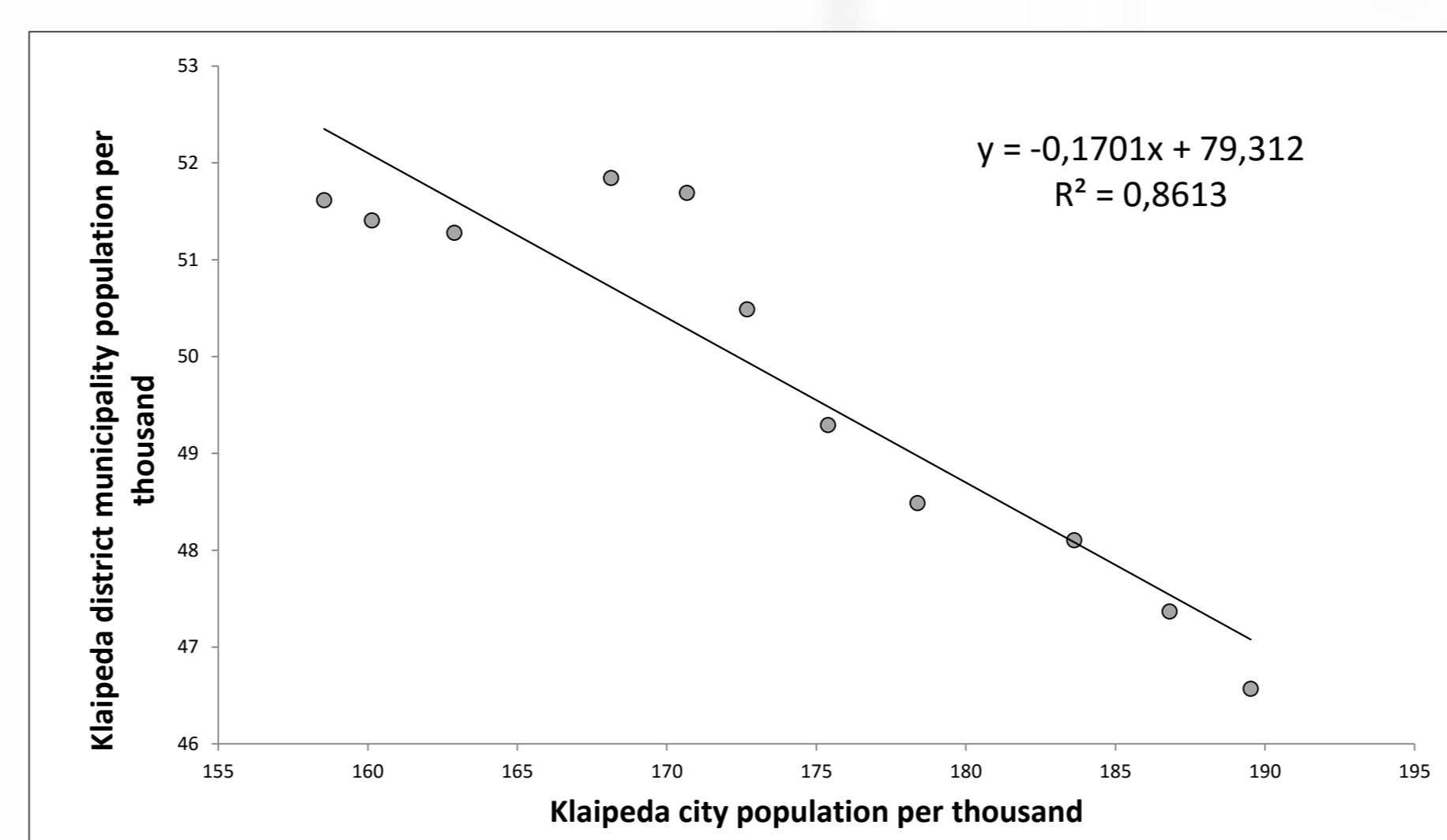


Fig.4. Correlation between Klaipėda city and Klaipėda district municipality population, per thousand. Source: Lithuanian Statistical Department, 2013. N=11;  $r = -0.8613$ ,  $p < 0,005$ ,  $\alpha = 0,05$ .

## Conclusions

- Study shows, what the biggest suburbanization processes in Klaipėda have been spotted in 5-10 km eastwards and not significantly in south – east and northern direction from the city (Fig. 5). Territory in 5 km distance from Klaipėda city centre have increased by 632,65 ha, as well as in all studied area enlarged by 1090,94 ha. The most significant suburbanization processes have been in settlements of Klaipėda district: Slengiai, Triušėliai, Budrikai, Mazuriškiai. Here was recorded by 56,63% of all changes in Klaipėda district.
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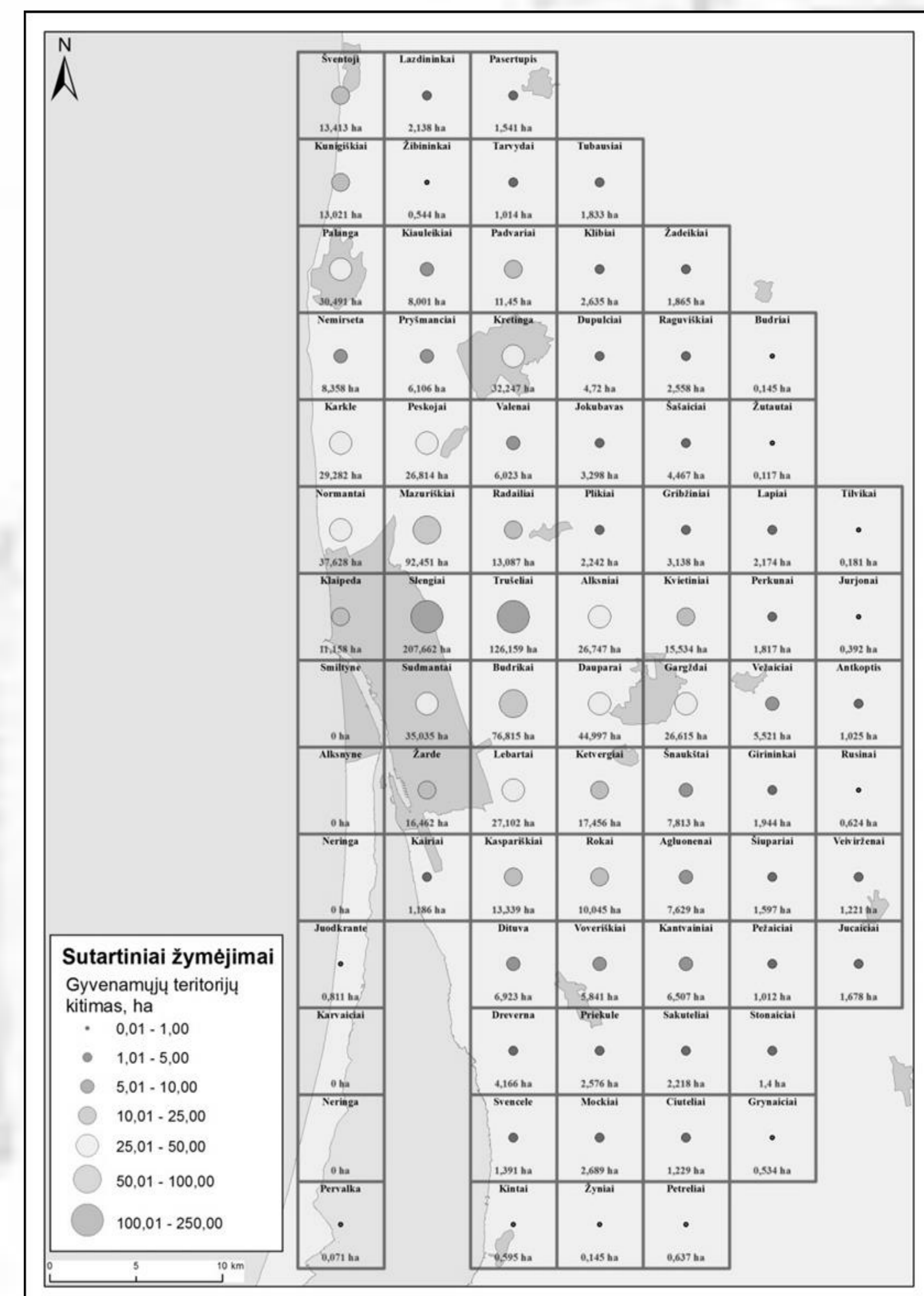


Fig.5. Settlements territorial change after digitalization (a) and change in ha (b) during period of 2005-2013.

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