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Landscape structure changes on the coastal plain of Lithuania during 1998–2009

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Abstract This paper addresses changes of landscape structure, mainly by analyzing land use, in the Lithuanian coastal plain. The study marks the changes in the region's land use, which changed in this period because the coastal area became free from the strictly militarized State border limitations that existed during the Soviet period. The main source of data for the investigation are aerial photographs of three dates – 1998, 2005, and 2009, at a scale of 1:10 000. Digitalization of the aerial photographs and data overlay were the main methods for obtaining findings on changes of the landscape structure. The results of the cartographic and statistical analysis reveal two different patterns of land use change, namely before and after 2005. Despite the high tension created by various economic activities, the region experiences forestation processes in its land use structure due to the emergence of abandoned lands, especially those that were clear between 1998 and 2005. One further aspect of landscape change that is noted is the extent of deforestation, characteristic for the period between 2005 and 2009. Being unique to Lithuania, the narrow and short strip of the coastal sea landscape requires much attention for natural protection, but on the other hand, is lacking proper care in some places and has been abandoned. The author's data and findings on land use changes in the coastal region can be used as an additional aid for planners and decision-makers.

Keywords *Land use • Urbanization • Spontaneous forestation • Deforestation • Lithuanian coastal plain • European Green Belt*

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INTRODUCTION

In Lithuania, the Baltic Sea coastline of 90.66 km (Žilinskas 1997) is relatively short compared to 494 km of Latvia, 788 km of Poland or 3794 km of Estonia (Lingė 2007) that makes it a concentrated place of various economical and social activities forced together to share the area with natural landscapes of great value. The southernmost 51 km of the coast belongs to the Curonian Spit that is entirely included in the National Park of the same name and therefore protected, in some places quite strictly. Being a World Heritage Site, the Curonian Spit is also an object of great and long discussions in Lithuanian society as how to effectively use it for recreation and other economic activities and conservation at the same time. The prevalence of nature conservation in this unique landscape spared this land–strip from any major land use changes during the last decades. Therefore, the highest potential of invasion into natural areas seems to be concentrated in the remaining 40 km of the Lithuanian sea coast – the coastal plain, merging into the Latvian territory in the north.

The land use changes are an inspiration to continuously perfect land use survey technologies (Winter 2009), and are studied for various purposes, such as landscape dynamics (Ihse 1995) and monitoring (Aaviksoo, Muru 2008), evaluating relations to climate change (Rounsevell, Reay 2009), assessing sustainability (Haberl 2004; Renetzeder *et al.* 2010), supporting land management (Booth 2009), and evaluating the impact to ecosystems and biodiversity (Kleijn *et al.* 2008; Potschin 2009). Various analyses have been carried out in various scales (local, national, global)

and covering different periods of time, each study being important for different purposes.

The coastal plain of Lithuania is an intensively used area and a prestigious place to own land. Here the Baltic Sea swashes the almost entirely sandy beaches, creating an attractive place for tourism. These 40 km embrace a part of the third largest Lithuanian city, Klaipėda, in the south, the most popular summer beach resort, Palanga, in the central part, and its satellite city, Šventoji, in the north. In the most northern segment of the Lithuanian coast there is the Būtingė Oil terminal, situated just a few kilometres away from the Lithuanian–Latvian border. Additionally, in the coastal area to the north of Palanga, there is an international airport of medium importance and also many camping sites that are open during the summer season. In addition to intense social and economic activity, the Lithuanian sea coast experiences pressure from natural coastal processes like abrasion, which threaten the most valuable recreational areas along the seaside (Žilinskas 2008).

During the Soviet period, the Lithuanian sea coastline was a part of the strictly protected western border of the Soviet Union, therefore the access for common citizens to the beaches was allowed only during daylight. There were 72 Soviet military bases in the coastal area of Lithuania (Fig. 1) (Baubinas, Taminskas 1998). Those former military polygons that were passed on to the jurisdiction of the Seaside Regional Park are now areas of strict nature conservation or with limited economic functions. Thus, besides the quite intensive anthropogenic pressure, which is potentially growing, the continental coast of Lithuania, along with some nature protection activities represent a rather complex situation for land use change in this specific area.

The aim of this study was to test whether the pressure created by high socio-economic needs on the continental coastline of Lithuania affected the land use structure and possible impacts on the landscape, and if so, at what intensity. The coastal plain was taken as an investigation subject and analysed regarding its land use structure and its changes during the quite recent years (1998–2009) of Lithuanian independence. This land is a segment of the European Green Belt (EGB), established along the borders that separated former so-called 'socialistic' and western European countries. To determine the changes of land use in the afore–mentioned area is also important for the scope and evolution of the whole Green Belt, and for comparison with other Green Belt areas and wider Eastern European landscapes (Terry *et al.* 2006; Wrbka *et al.* 2009).

METHODOLOGY

The territory of research was the Lithuanian coastal plain, with an area of 186.7 km². The material for the study consists of the aerial photographs, one performed in 1998, the second in 2005, and the third in 2009, officially abbreviated as *ORT10LT* (National Land Service under Ministry of Agriculture of the Republic of Lithuania, © 1998–2011). The aerial photograph from 1998 was in grey scale, while the ortho–photo views of 2005 and 2009 were in true colour. The scale of the photograph is 1:10 000 with a raster resolution of 0.5 m. The main principle of obtaining comparable data for each period was the digitalization of land use plots using Arc/View 9.3 software. The three layers of land use data for 1998, 2005, and 2009 were intersected to determine the changes. Statistical methods (summarizing, calculating averages, etc.) were applied to reveal the major pattern of land use changes.

Several remarks should be made regarding the agricultural and built-up land use types. Merging arable lands, meadows, and pastures into one type of agrarian fields sets some degree of generalization on the work that might be disputable. The reason of merging them together was that all three types of land use (arable lands, meadows, and pastures) are interchangeable, and during the respective period of 14 years they could be used as any of these types several times.

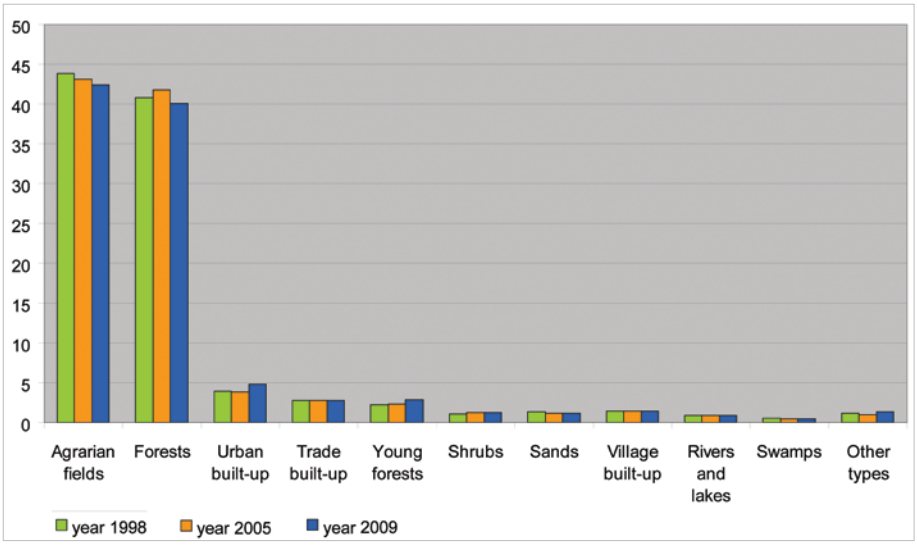

Fig. 1 Land use structure (in %) of the investigated area in years 1998, 2005, and 2009. Compiled by D. Veteikis, 2011.

For determining the general land use change course in the observed area, an index of relative naturalness was offered. Naturalness of landscape has already been a topic of several papers (Jansen *et al.* 2009; Machado 2004; Reif, Walentowski 2008; Renetzeder *et al.* 2010; Ridder 2007; Skorupskas 2006), but there is still a problem of scale and generalization required to evaluate the naturalness of landscapes. Thus we used our own expert evalu-

ation of each land use type's naturalness score (Table 1). Generally, naturalness score was associated to the

Table 1 Index of naturalness of different land use types (authors' expert evaluation).

Land use type	Index of naturalness	Land use type	Index of naturalness
Forests	10	Ditches	4
Lakes	10	Forests cuttings	4
Swamps	10	Village built-up	3
Rivers	10	Allotment gardens	3
Young forests	9	Cemeteries	3
Shrubs	7	Urban built-up	2
Sands	7	Infrastructure	2
Shrubby meadows	7	Commercial built-up	1
Stony land	7	Quarries	1
Gardens	6	Roads	1
Agrarian fields	5	Dams	1
Ponds	5	Dumping sites	1
Stadiums	4		

overall integrity of natural components. The larger the number of anthropogenically modified landscape components (relief, hydrography, soil, vegetation) and the greater the intensity of this modification, the lower is the naturalness score. As a result, forests, swamps and natural water bodies were evaluated by ten points, whereas commercial built-up, quarries and similar each received only one point. The difference between scores that was calculated after the change was observed in each plot, indicated the course of the landscape change: towards anthropogenization (decrease of the score) or naturalizarion (increase of the score).

In order to see the coastal landscape changes in the context of the entire Lithuanian landscape transformation and to give some basis for additional discussion, a short control research test was conducted using 29 transects (total length 69.34 km, average length 2.4 km). These were delineated randomly in various places of Lithuania using an additional rule that the line of the transect starts in the centre of the urban territory and ends in the natural countryside periphery. This idea was generated by the theory that landscape takes a polarised or cellular structure that gives a reference frame for integrated landscape analysis, covering the whole scale from urban to natural (Veteikis 2007). The investigation of polarisation transects echoes some currently highlighted demands of landscape ecology for cultural integration in landscape research (Wu 2010) and could be related to the idea of landscape gradients (McDonnell, Hahs 2008). The difference of landscape gradients from transects, delineated based on landscape polarisation units, lies in that the latter have clearly defined ends – one in the centre of the urban focus and the other in the mathematically calculated cultural landscape divide, i.e., the most natural area on the line between the two closest urban nuclei. Land use structures that were crossed by these transects were evaluated using the analogous aerial photographs *ORT10LT* of 1998, 2005, and 2009.

RESULTS

The largest part of the investigated territory during the period of 1998 to 2009 was occupied by agrarian fields (about 43%), forests (40 %) and urban areas (5%). Some types of land use such as built-up commercial (developed) land, young forests, sands, shrubs, and shrubby meadows took up between 1 and 3% of the land each, while others such as villages, swamps, lakes, and rivers, covered less than 1% (see Fig 1).

It is notable that the summarized land use structure, especially the largest land use types, experienced very little change, the largest changes not exceeding 1% of the total area. The most noticeable (6.72%) are the territorial transformations, scattered throughout the investigated area during quite a short span of 11 years, and still too small to observe while comparing the three map situations of 1998, 2005, 2009, thus only the latest situation, 2009, is presented (Fig. 2).

Two different land use change patterns are observed before and after the aerial photography of 2005 (see Tables 2 and 3). The most extensive changes during 1998 and 2005 were those of spontaneous forestation, i.e. related to the increase of the natural vegetation. In this way, for example, the meadows that were covered by scarce shrub vegetation, and that appears only if the meadows or arable land category is not cultivated for several years in an ecological zone of mixed forests, became a young forest. Generally, more than 54% of the land use transformation is from scarcer vegetation to more abundant vegetation (Table 2). The rest of the occurred changes, taking up more than 45% of all transformed land, can be generally described as occupying small areas and infrequent, but more directed towards anthropogenization. More frequent examples of such anthropogenically oriented land use transformations were "forests to forest cuttings", or "forests to agrarian land" (Table 2). The time span between 1998 and 2005 seems quite long regarding happenings in some sites, whereas aerial photographs of 2005 have recorded greatly advanced new cycles of ecosystem succession compared to the year 1998. There are many cases when former forests in 1998 are substituted by shrubs or even young forests in 2005, implying that there was forest cutting activity in between the two dates.

The situation after 2005 changed significantly, as between 2005 and 2009, the landscape endured through three times fewer types of land use change, though suffered from remarkable forest cuttings that covered almost 2 % of the investigated territory. This means that the total landscape change territorially decreased only by one third compared to the previous period, from 778.6 ha between 1998 and 2005 to 557.5 ha between 2005 and 2009. Generally the second period

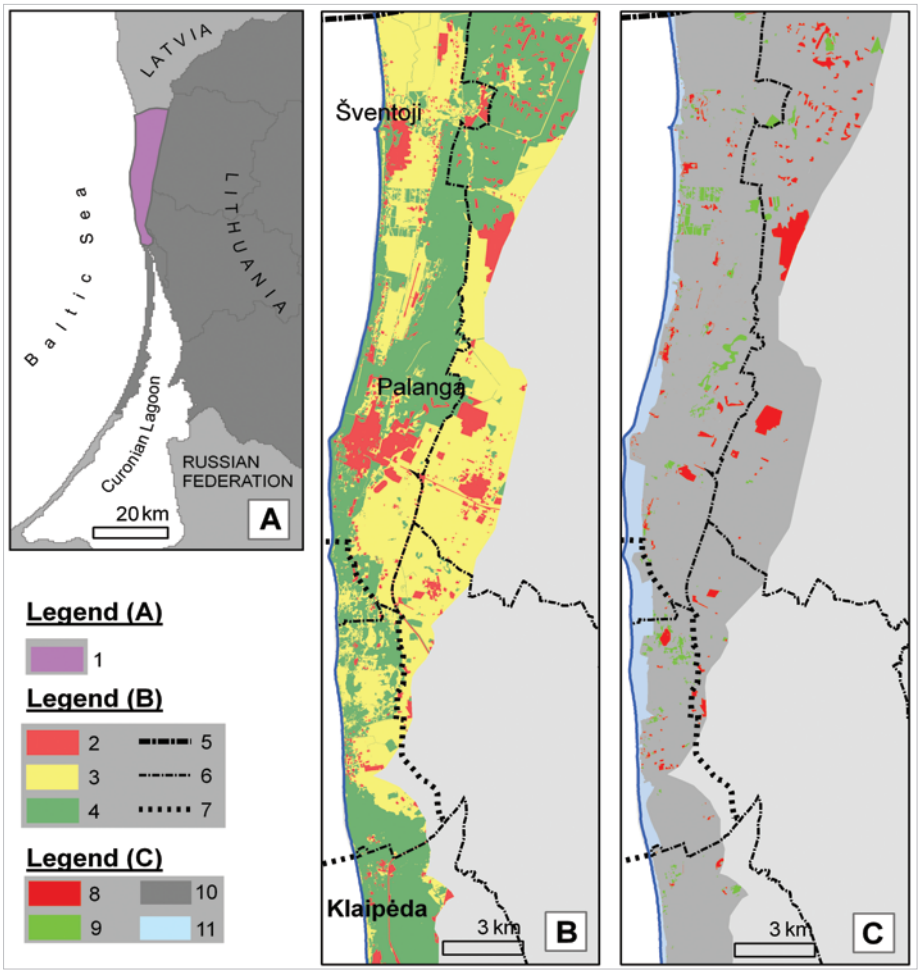

Fig. 2 The overview of the investigated area: A – geographical situation of the Lithuanian coastal plain; B – land use structure in 2009; C – evaluation of land use changes between 1998 and 2009. Legend: 1 – investigated area; 2 – anthropogenic landscape areas; 3 – agrarian landscape areas; 4 – natural landscape areas; 5 – State border, 6 – limits of local authorities; 7 – bound of the Seaside Regional Park (protected area); 8 – anthropogenic course of landscape change during 1998–2009 (decrease of naturalness index); 9 – naturalization course of landscape change during 1998–2009 (increase of naturalness index); 10 – areas without significant landscape change; 11 – coastal zone determined by the Law of the Coastal Zone (2011 project). Compiled by D. Veteikis, 2011; land use structure vectorized by S. Šabanovas, 2011.

Table 2 Most prevalent land use changes during 1998–2005 years.

Change type during 1998–2005		Area in ha	Sum in ha	Part of the whole area (18,672.7 ha) in %
Land use in 1998	Changed to land use in 2005			
Young forests	Forests	157.0	167.3	0.90
	[*via forests and forest cutting*] Shrubs	10.3		
Agrarian land	Shrubby meadows	67.5	164.9	0.88
	Village built-up	14.1		
	Young forests	28.1		
	Forests	35.2		
	Shrubs	20.0		
Shrubby meadows	Young forest	97.9	149.0	0.80
	Forests	51.1		
Forests	Agrarian land	18.0	76.8	0.41
	[*via forest cuttings*] Young forest	20.7		
	Forest cuttings	18.2		
	[*via Forest cuttings*] Shrubs	19.9		
Forest cuttings	Young forest	29.5	45.9	0.25
	Forests	16.4		
Other 91 types of changes		-	174.7	0.94
All the 106 types of changes		-	778.6	4.17

can be characterised by increased anthropogenization, as prevailing land use changes are forest cuttings and occupying agrarian land, both by urban and rural settlements (Table 3).

It is also interesting to track the behaviour of separate land–use types, i.e. to what they tend to become and with what land–use types do they refill their territorial extent. In the observed area between 1998 and 2005,

Table 3 Most prevalent land use changes during 2005–2009 years.

Change type during 2005–2009		Area in ha	Sum in ha	Part of the whole area (18,672.7 ha) in %
Land use in 2005	Changed to land use in 2009			
Forests	Forest cuttings	338.3	357.2	1.91
	[*via Forest cuttings*] Young forests	18.9		
Agrarian land	Village built-up	79.9	137.7	0.74
	Urban built-up	46.1		
	Shrubby meadows	11.7		
Young forests	[*via Forests*] Forest cuttings	17.3	17.3	0.09
Other 33 types of changes		-	45.3	0.24
All the 39 types of changes		-	557.5	2.99

the largest land–use type, agrarian fields, diminished by 0.63% due to two opposite processes. In some places, agrarian lands were lost mostly, but not only, in spontaneous forestation process, such as, 1.28% of it became shrubby meadows, 0.65% grew into forests, 0.39% reached the stage of young forests, 0.51% were built-up, and so on. In other places, agrarian lands were extended by converting other types of land use. Thus, 0.21% of agrarian lands were created by draining swamp water, 0.20% were created from shrubby meadows by clear-cutting the shrubs, and so on.

In the previously mentioned 6.72% (1255.5 ha) of the territory that was transformed, the change sequence that was recorded in 1998, 2005, and 2009 follows the simple pattern: 94.5 % of transformed territories endured land use conversion only in one of the two periods (during 1998–2005 or 2005–2009). The rest of the minority (only 69.4 ha) of transformed lands, endured so called complex change sequences when one conversion was followed by the other. Out of these, 50.2 ha were young forests in 1998 that became mature forests in 2005, and were recorded as forest cuttings in 2009 (Fig. 3). Other complex sequences involve many

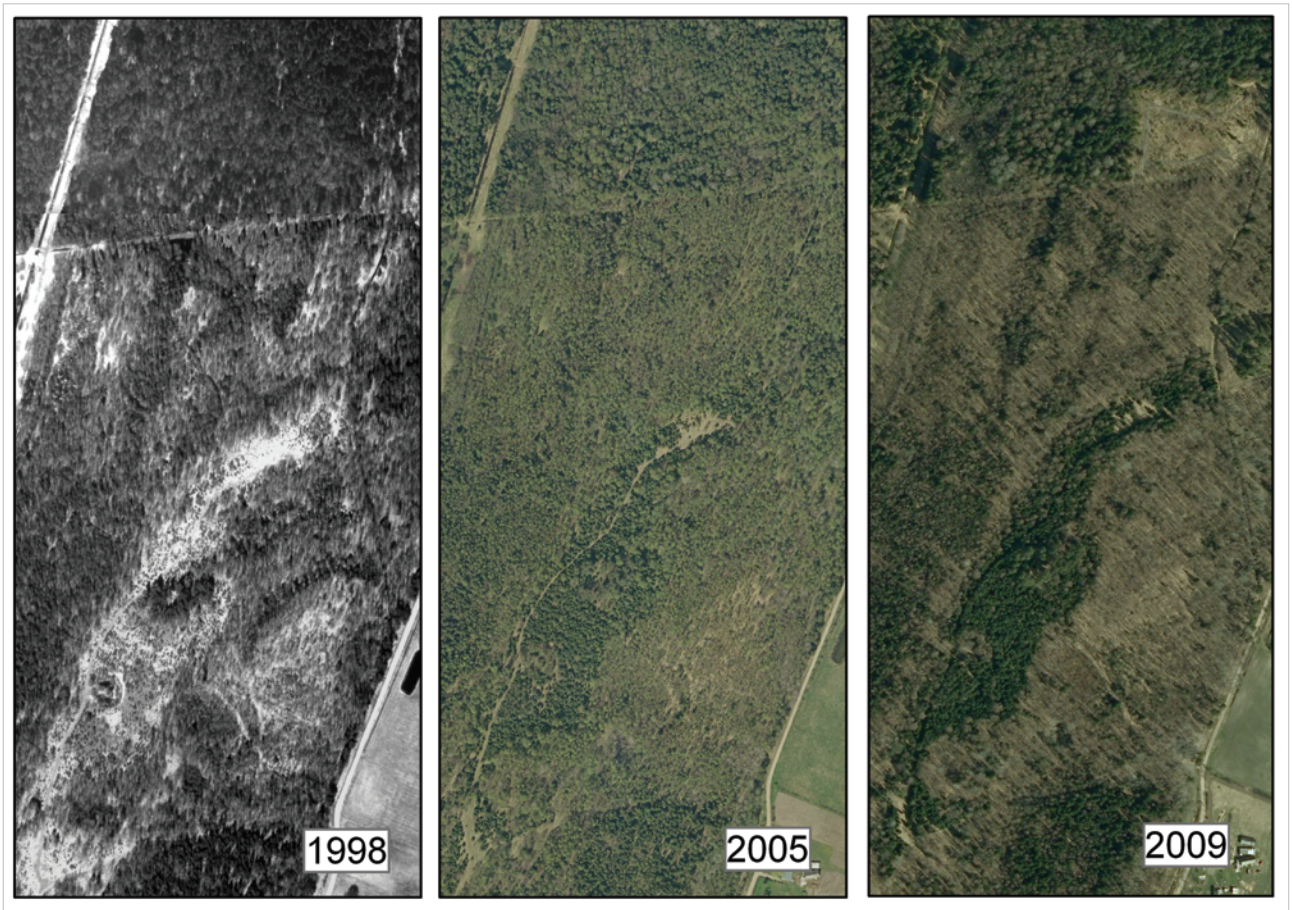

Fig. 3 An example of complex natural-anthropogenic landscape change sequence (forest growth during 1998–2005 and forest loss during 2005–2009). The site is situated close to the north-eastern margin of the coastal plain. Compiled by D. Veteikis, 2011; aerial views used by courtesy of National Land Service under Ministry of Agriculture of the Republic of Lithuania, © 1998–2011.

other anthropogenic factors like building, exploiting natural resources, creating ponds, etc. (Fig. 4).

An overall evaluation of the observed land use change in the area regarding its course (naturalization or anthropogenization) revealed that when the size of land plots was used as weighed coefficients, in the first period (1998 to 2005), naturalization processes prevailed; the summarized naturalness index for the whole territory is 650.1. Whereas in the second, though shorter, period (2005 to 2009) the summarized naturalness index fell as low as -2488.6. Therefore, changes in the coastal plain between 1998 and 2005 are clearly anthropogenic, the overall naturalness index for the whole area being -1838.5. That means that out of 1255.5 ha of transformed land, 707.5 ha endured disturbances towards a more anthropogenic landscape, 502.6 ha shifted towards a more natural landscape, and the rest remained at the same naturalness level.

When mapping land–use change, the results indicated that the largest concentration of naturalization occurred south of Šventoji, related to the growth of the forests, and also inside the Seaside Regional Park, related to increases of vegetation in abandoned agricultural lands (see Fig. 2). The areas of anthropogenization are largest and most frequent between Palanga and Šventoji and in the north–eastern part of the investigated territory, close to the eastern border of the coastal plain.

It seems that there is an interdependence of land use change and the distance from the coastal line. In several circum–marine zones, calculations have been done in order to evaluate these territorial differences. An official coastal zone, still under consideration by the Ministry of Environment of Lithuania, covers about 1285 ha and ranges in width between different places from 70 to 850 m from coastal line. The main changes are mostly related to vegetation cover that spreads in dunes and sands. The other zones show the increase of land–use change receding from the coast (Table 4). The zones of 2–5 km and 5–8 km are characterized mostly by forest cuttings between 2005 and 2009, and their land-use change exceeds the average percentage for the investigated area.

Comparing the results to those of the whole of Lithuania, represented by 29 randomly distributed urban–to–natural gradient transects, it is notable that the total area that experienced changes during 1998–2009 is generally larger in Lithuania (11.19%) than in the narrow coastal plain. It comprises 125 types of land–use conversion, out of which four major types occupy more than 5% each, if the changed area is taken as 100%: agrarian fields to forests (7.8%),

Fig. 4 An example of complex anthropogenic landscape change sequence: the red circles indicate loss of the objects in landscape; the yellow circles show appearance and development of new elements in landscape. The site is situated in Šventoji settlement. Compiled by D. Veteikis, 2011; aerial views used by courtesy of National Land Service under Ministry of Agriculture of the Republic of Lithuania, © 1998–2011.

Table 4 Most prevalent land use change sequences (years 1998–2005–2009) in coastal plain in different circum-marine zones.

Zone by distance from the coastal line	Zone area ha	Most prevalent land use change sequences				Total change in a zone %
		1st most prevalent	% of the zone area	2nd most prevalent	% of the zone area	
Coastal Zone*	1285.5	Beach sands (1998), sand meadows (2005, 2009)	1.14	Beach sand (1998), sand shrubs (2005, 2009)	0.93	6.48
Coastal zone – 2 km	6443.8	Shrubby meadows (1998), young forests (2005, 2009)	1.13	Agrarian lands (1998, 2005), village built-up (2009)	0.53	5.83
2–5 km	8077.2	Forests (1998, 2005), forests cuttings (2009)	2.49	Young forests (1998), forests (2005, 2009)	0.97	7.22
5–8 km	2866.2	Forests (1998, 2005), forests cuttings (2009)	2.95	Forest cuttings (1998), young forests (2005, 2009)	1.02	7.44
The whole coastal plain	18672.7	–				6.72

* The belt of 70 to 850 m wide from the coastal line (the coastal zone is determined by the Law of the Coastal Zone. The special plan of management of the continental part of the coastal zone is currently under consideration in the Ministry of Environment of Republic of Lithuania.

forests to cuttings (7.7%), water bodies to swamps (6.4%), and shrubs to forests (5.2%). Changes of the separate land use types accordingly have differences from those of the coastal landscape, as well. Thus agrarian fields, built-up commercial land, and ponds experienced more decrease, while built-up residential land, swamps, and forest cuttings showed a remarkably higher increase generally in Lithuania than in areas close to the coast.

DISCUSSION

Although similar on the surface, the results of this study are hardly comparable to the studies of land use change in other European countries, for example, the United Kingdom, where the decrease of agricultural land due to the expansion of planted forests (forests not naturally occupying abandoned land) and urbanized areas has been observed (Bibby 2009; Rounsevell, Reay 2009). According to recent land–use change studies, it seems that forest and urban spaces will grow in many parts of Europe, though showing quite different patterns in different regions, depending on the applied land–use policy (Rounsevell *et al.* 2006). According to other modelling and assessment research, it seems that land abandonment, at least in the short term of landscape evolution, is unfavourable from a cultural viewpoint for causing land devaluation and ecologically, for causing biodiversity loss during the succession period (Verhulst *et al.* 2004; Öckinger 2006, Tarrega *et al.* 2009; Kobler *et al.* 2005; Palo *et al.* 2005). However, this might be an unavoidable step in the evolution of the Lithuanian landscape, where the originally highly–fragmented natural landscape, consisting of small elements such as hill and lake remnants of the last glaciation, experienced the highly homogenizing impact of Soviet agriculture between 1940 and 1990 and requires restitution of smaller fields surrounded by a micro–frame of woods and swamps (Kavoliūtė 1997).

The current situation of land–use structures in the investigated area is different from that of the whole country. The sandy and sandy loam soil in the seaside plain prevents the area from intensive agriculture and therefore is a function of the percentage of forests in the area (39%) which is higher than the average for Lithuania (32.5%), including young forests, clear cuttings, and other types of forest lands (Statistics Lithuania 2009). At the same time, the extent of agrarian areas (41%) is much less than in Lithuania as a whole, where it reaches about 56–60%. The high percentage of urbanization in the coastal region is a result of the previously–mentioned high concentration of social and economical activities due to the shortness of the coastal line.

The main driving forces for land–use change in the area of the Lithuanian continental coast can be partly considered as the reshaping of the overall land use processes on the Lithuanian landscape after regaining independence in 1990. Since the end of the Soviet regime, processes of spontaneous forestation have been developing in most parts of the country, especially where agriculture is weak due to poor soils (Bauža 2007; Ribokas, Milius 2007; Ribokas, Zlatkutė 2009). This is related to the decrease of the Lithuanian agricultural economy compared with the Soviet and earlier interwar situations. However, some signs of stabilization are evident as European Union (EU) funding has provided some incentives for farmers since 2004.

According to poll data, a decreasing proportion of the population relate their future with agriculture as the main means of living (Ribokas, Milius 2007). There

are fewer farmers, farms are being abandoned, and thousands of fields are no longer cultivated. A statistical review of the country shows a gradual decrease in crop area from 2200 thousand ha in 1990 to 1400 thousand ha in 2003 and 1800 thousand ha in 2009 (Statistics Lithuania 2009). The old melioration equipment that encouraged good soil conditions by providing thorough drainage is now creating better conditions for the revival of natural swamps, yet changing the current biodiversity of cultural meadows and hayfields. It is worthwhile to mention that spontaneous forestation is a repetitive process in Lithuania and actually is a side effect of changes in political situations.

The other driving force that prevails in Lithuanian landscape change is deforestation, but forest cutting is calculated only for the state forests in official statistics (Statistics Lithuania 2009), private forests are not considered. Neither does there exist precise information on maps like Land Cover of Lithuania (CORINE), which gives only areas of 20 ha at the smallest, therefore small–scale forest felling cases are omitted. Furthermore, the CORINE land cover classification gives no direct type for the cut forest, calling it transitional woodland shrub.

In most cases deforestation is succeeded by plantations, but the situation is that the Lithuanian forest age profile reflects younger and younger tree stands every year. That is evident even at the small 1:100 000 scale land cover CORINE maps, while comparing situations for the years 1995, 2000, and 2006: every newer land cover map reveals more and more areas of transitional woodland shrub – a natural or artificially started forest cutting succession. The seaside is not an exception, especially because of its higher forest percentage. After the 1:10 000 scale aerial photograph analyses, it is evident that many cases of anthropogenization in coastal areas are related to forest cutting and forest plantations.

The other distinctive driving force is urbanization and, with increasing potential for growth, the increased housing stock in the region (Klaipėda and Palanga municipalities), which is clearly indicated by the official statistics (Statistics Lithuania 2009). Anthropogenic land use change is regularly occurring (see Fig. 4), although laws limit the urbanization of the land near the sea and a large part of the land is owned by the state. Needs for living space, prestigious dwellings, and recreation are causing pressure, created, for example, by lobbying, corruption, and illegal building. The problem in the coastal area of Lithuania for the last 20 years was related to the lack of regulating legislation, and strategic and territorial plans for the urban and green area balance (Stauskas 2006). It must be mentioned that the process of urbanization or suburbanization is directed into the areas neighbouring the investigated area (Grecevičius, Marčius 2006). Similar conclusions area drawn by research in neighbouring Latvia that shows that the prevalence of protective regimes in the coastal landscapes shift the major anthropogenic land use changes some kilometres away from the coast into the mainland (Veidemane, 2011). The authors' analysis of different circum–marine zones again reflects some similar effects.

Landscape protection is also an important driving force for land use change, being proven by the fact that about 25 km of the Baltic Sea littoral zone together with a small piece of coastal area inside the Seaside Regional Park is a special Natura–2000 protected area. The regional park plays an important role in protecting many habitats of European importance (Rašomavičius *et al.* 2001). Some limitations of land use are accepted by the National Defence in areas that belong to them and are included in the Regional Park territory.

CONCLUSIONS

The analysis of aerial photographs of 1998, 2005, and 2009 showed that the Lithuanian Coastal Plain land use changed quite notably in 11 years, involving 6.72% of the investigated area. The patterns of land use changes before and after 2005 remarkably differ. The main land–use changes between 1998 and 2005 are comprised of agrarian land abandonment and spontaneous restoration of natural (woody) vegetation like forests, young forests, shrubby meadows, etc. A small portion of agrarian lands is also being built-up for residential land use by this time.

In the period between 2005 and 2009, forest conversion to forest cuttings and successive ecosystems make up the largest part of the whole land use change in the Coastal Plain. Agrarian lands are being urbanized to a much larger extent than in the previous period. But the diversity of the ways of how land use can be changed diminished by three times after 2005.

The quantitative evaluation of land use change courses revealed differences between the two periods too. Between 1998 and 2005, the land use change trend was towards naturalization, while after 2005, it took a steep way down towards anthropogenization, determining the total negative (anthropogenic) result of the eleven–year time span.

These facts indicate quite intensive land cover fluctuation that are also characteristic of the rest of Lithuania. Thus, spontaneous forestation, urbanization, and forest cutting were the most important processes in the coastal region during 1998–2009, as similarly expressed in Lithuania as a whole.

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