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CHANGING PERIPHERY OF THE BALTIC CITIES: LITHUANIAN CASE

Matas CIRTAUTAS

Research Laboratory of Urban Analysis, Department of Urban Design,
Vilnius Gediminas Technical University, Pylimo g. 26/1, Vilnius, Lithuania
E-mail: archimatas@yahoo.com

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Abstract. Urban sprawl is one of the dominant types of urban development in the world. Although outer growth started from the outset of cities, urban researchers, planners and policy makers are highly concerned about its current extent. Recent development of the Baltic cities and especially trends of their suburban growth have been analysed only partly, because of the relative novelty of the phenomenon and well-established dominance of western cities in the field. This paper attempts to fill this gap and presents a research on conditions and consequences of extensive development of Lithuanian cities. Evidences from the recent growth of the Baltic cities show that decline and sprawl take place simultaneously in major urban regions with possible long-term consequences on their spatial structure. Therefore, this article advocates a need to revise urban policy in the Baltic countries and promote coordinated development of urban and suburban areas in the context of prevailing negative demographic trends and limited capacity of central and local governments to interfere in urban development processes.

Keywords: urban sprawl, suburban form, post-Soviet city, Baltic States, CEE, urban monitoring, CORINE Land Cover.

Introduction

European cities have rather different histories of urban development, particularly after World War II. The Baltic cities are a perfect example of this diversity. Over the last century, they experienced several social and political overturns, which fundamentally changed the context of urban development. At first, under the socialist sway, from historical compact towns they became large cities with distinct characteristics of the late Soviet era[1]; whereas in recent decades, they once again have been exposed to multiple transformations, determined by accelerated social and economic transition in the broader space of post-socialist countries in Central and Easter Europe (CEE) (Hirt, Stanilov 2009; Milerius *et al*. 2009). Therefore, evolution of urban development in the Baltic States can be divided into three major phases: pre-Soviet (till 1945), Soviet (1945–1990) and post-Soviet (since 1990). In case of present urban transformations, the Soviet and post-Soviet periods are of great importance, as they had a crucial impact on the current form of the Baltic cities and represent conceptually opposing urban development condition in action, namely, state-led centralised and free-market driven decentralised planning systems.

The Soviet period was marked by a significant growth of urban population in the Baltic countries, amounting from approx. 30 to almost 70 per cent. This was mainly determined by preferences of central governments, which promoted specialisation of large industry as a base for development of urban networks and stimulated concentration of employment opportunities in major cities. To overcome growing housing shortage in urban localities, unified and standardised technologies for residential constructions then were introduced (Dijokienė, Džervus 2011), which due to the absence of private property encouraged rapid expansion of cities with relatively no restrictions on location and scale of new developments (Bertaud, Renaud 1995). After political changes in 1990, urban development of

[1] Cities at that time had rather completed polycentric structure, which was based on the multi-level system of services and was intended to provide urban population with basic amenities for living, working and recreation (Šešelgis 1970).

the Baltic countries has abandoned the former course. Thus, previously centrally planned cities had to adapt to a completely different political and economic situation, which consequently led to the strengthening of private and commercial interest in the urban development processes (Juškevičius, Vitkauskas 2001). Therefore currently, the Baltic cities, as all post-socialist cities in CEE, experience intense commercialisation of their inner parts and suburbanisation of their peripheries (Sýkora, Ouředníček 2007).

Physical structure of post-Soviet cities is frequently conceptualised as consisting of three rings: central, middle and peripheral (Sýkora 1999; Hirt 2006). In case of the Baltic cities, these zones correspond with historical stages of growth (pre-Soviet, Soviet and post-Soviet) and serve as a basis for evaluating the current urban transformations (Fig. 1). Furthermore, referring to this distinct urban composition, three major challenges, which are facing cities in the Baltic countries, must be acknowledged: regeneration of central parts, modernisation of large housing estates and development of emerging suburban zones. Although urban sprawl is recognised as the predominant type of urban development (Bardauskienė, Pakalnis 2011; Cirtautas 2013), suburban structures are still poorly investigated because of their relative newness and complex form.

Suburban periphery is often referred to as the most recent zone of the Baltic cities (Burneika 2008). However, evaluation of emerging semi-urbanised landscapes is often limited to a simplified interpretation of the phenomenon, based on experience from the Western countries (Leetmaa 2008). Therefore, this article presents a study on transformations around major Lithuanian cities assuming that gained knowledge can upgrade urban planning and design principles for suburban areas and entire urban regions. The research covered a study of centrally collected statistical (demography and housing) and geographical (land cover) data with detailed analysis of urban structure of settlements. This helped to identify zones of intensive suburban development and establish a causal link between development processes (as condition) and the prevailing form of a suburban settlement (as a consequence).

Giving the scale of suburban growth and negative demographic trends in the Baltic countries, the current development of suburban zones in long-term can lead to environmental and social decline of central cities. Therefore, investigation and monitoring development of suburban areas are necessary. The article does not try to be a comprehensive work on external growth of the Baltic cities. However, based on findings from the study of the current suburban development trends in the Baltic States and, more accurately, in Lithuania (Cirtautas 2014), it presents a wide range of urban development challenges in the region and highlights possibilities for further research of urban sprawl.

Pattern of urban sprawl in the Baltic countries after 1990

Studies of urban sprawl in Europe commonly acknowledge variations in trends between different countries and regions. Throughout the 20th century, European cities and their urban regions were randomly affected by two opposing development processes: growth and decline (Dematteis 2000). Both of them, to the point of spatial organisation of larger urban networks, can be simultaneously accompanied by processes of contain-

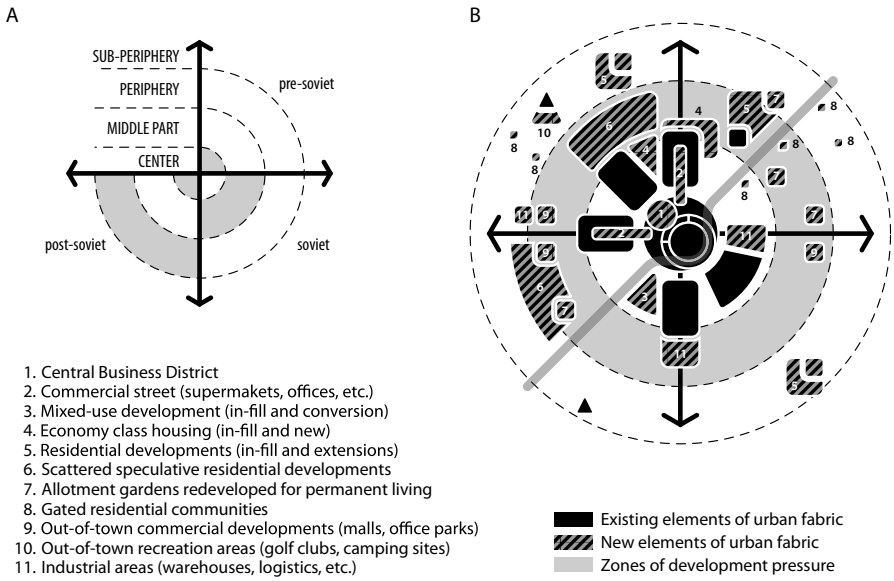

Fig. 1. The Baltic city: A – development model; B – current form

ment or sprawl. The latter, in case of large urban conurbations, occurs when the percentage of population living in the core city declines relative to the total population of the conurbation (Couch *et al.* 2007). In contrast to cities of the Western and Northern Europe, major urban regions in CEE are mainly dominated by various degrees of urban decline with sprawl (Sýkora, Ouředníček 2007; Schmidt 2011). Baltic cities are no exception either (Cirtautas 2013).

Table 1 shows the comparison of population data for the period 1990–2014 for major cities and their larger urban zones (LUZ)[2] in the Baltic States. Despite the dynamic nature of municipal boundaries[3], this information still helps to obtain a general impression about the extent of urban sprawl after 1990. It demonstrates high rates of urban shrinkage (from –8.2% in Vilnius to –37.1% in Liepaja) and suburban growth (from +3.4% in Kaunas to +26.3% in Tallinn). These trends also highlight an exceptional case of the current urban development in the Baltic countries, where physical expansion of urban fabric is usually accompanied by sometimes rapid decline of population in core cities and depopulation in remote rural areas of their functional regions. This situation affected not only regions of smaller cities in peripheral locations (Daugavpils, Liepaja), but also larger ones (Kaunas, Klaipėda), with no exception for capital cities (Riga). Overall, population decline in cities and growth in suburban locations not only show decreasing urban densities, but also reflect the shift of demographic potential from central cities towards their peripheral zones, where younger and more affluent residents usually tend to move (Leetmaa, Tammaru 2007; Brade *et al.* 2009; Krišjāne, Bērziņš 2012).

There are some trends in spatial patterns of physical transformations around major cities in the Baltic States as well (Fig. 2). During 1990–2006, expansion of urban morphological zones[4] around Lithuanian cities (Vilnius, Kaunas, Klaipėda) followed fairly concentrated pattern, while capital cities of Estonia (Tallinn) and Latvia (Riga) experienced highly dispersed growth. These differences might be determined by various development restraints and other spatial and legal conditions, such as presence of protected areas, availability of infrastructural networks (roads, public services) and supply and demand for undeveloped land suitable for construction. However, actual transformations of suburban landscape are expected to be even more

Table 1. Pattern of urban sprawl in the Baltic countries during 1990–2014

City	Percentage change in population of the core city (%)	Percentage change in population of the LUZ (%)	Percentage change in LUZ population living outside the core city (%)	Change in the percentage of LUZ population living in the core city (%)
Estonia				
Tallinn	–14.3	–5.8	+26.3	–7.1
Tartu	–13.8	–6.6	+10.4	–5.4
Latvia				
Riga [(a)]	–29.2	–21.6	+3.1	–7.4
Daugavpils	–30.9	–31.5	–33.0	+0.6
Liepaja	–37.1	–35.4	–31.7	–1.8
Lithuania				
Vilnius	–8.2	–6.5	–1.0	–1.4
Kaunas	–27.3	–22.1	+3.4	–5.5
Klaipėda [(b)]	–22.5	–15.7	+14.8	–6.6

Note: population of core cities and LUZs was calculated according to their spatial extent derived from the EU Urban Audit database (Eurostat 2014) or, where this information was missing, from other sources ([(a)] – Urban Atlas (EEA 2014); [(b)] – estimation according administrative boundaries of city and neighbouring suburban municipality). In case of Vilnius, some adjustments for 2014 data were made – population of Grigiškės town was excluded from the city and included into LUZ. *Source*: author's calculations from data of Statistics Estonia (2014a), Statistics Lithuania (2014a) and Central Statistical Bureau of Latvia (2014a).

[2] Larger urban zone is a term adopted in the EU Urban Audit project to approximate extent of functional urban area based on municipal boundaries (ec.europa.eu/eurostat/web/cities/spatial-units).

[3] All Baltic countries after 1990 have implemented some reforms, which eventually affected their administrative subdivision at municipal level (e.g. merging or splitting of municipalities, rearranging municipal boundaries). Therefore, information in Table 1 should be interpreted with some caution.

[4] Urban morphological zone represents spatial extent of closely situated (less than 200 meters apart) urban areas, constructed as a set of CORINE Land Cover classes, such as continuous and discontinuous urban fabric, industrial, commercial and to some extend infrastructural and recreational facilities (EEA 2010).

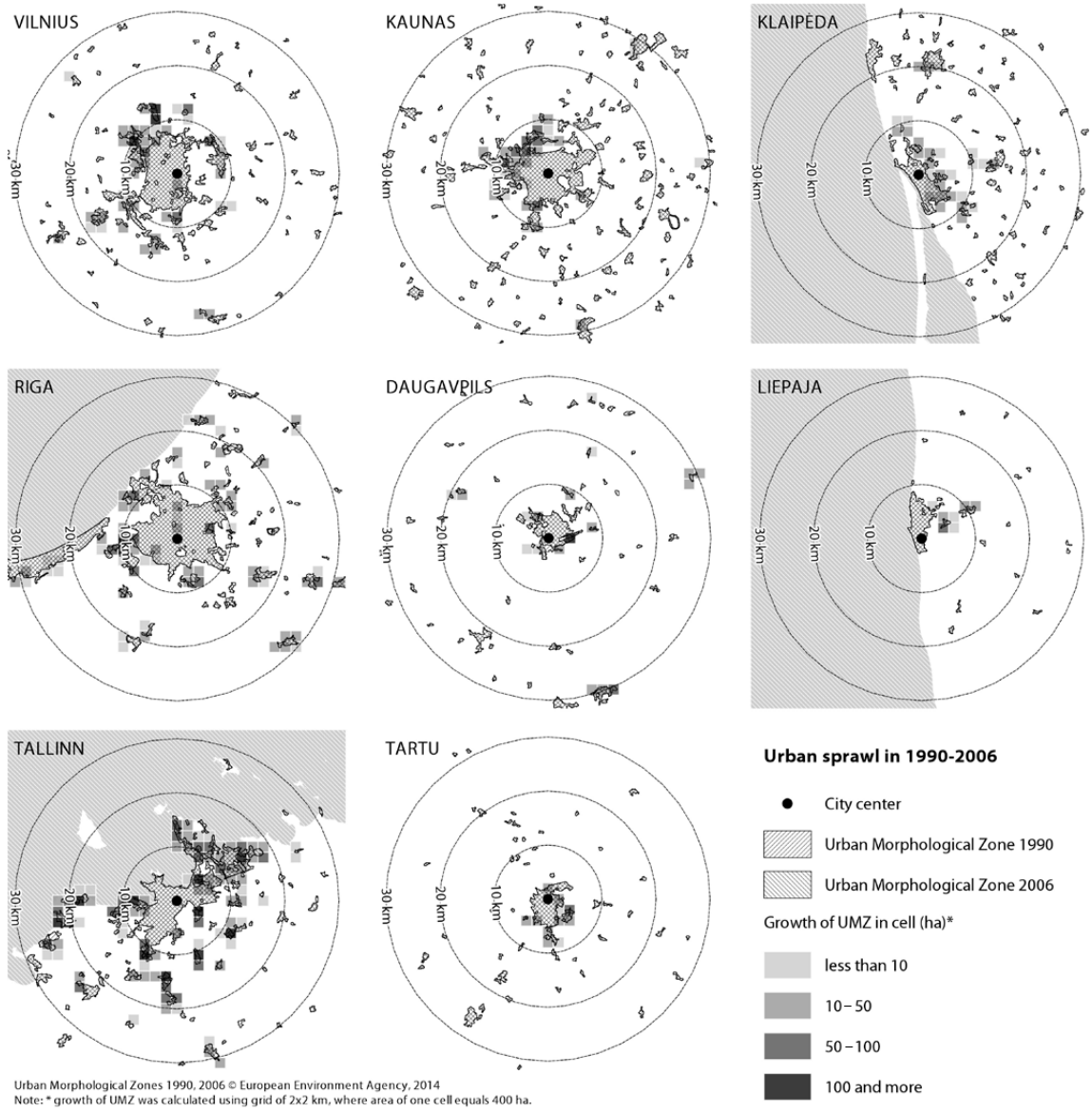

Fig. 2. Spatial pattern of urban sprawl around major cities in the Baltic States

extensive, because monitored spread of built-up areas in later years (2006–2008) was even more significant (Lettmaa 2008; Bardauskienė, Pakalnis 2011) and is slowly regaining its pace after recent economic turmoil, as at least construction rate of single-family housing rose steadily[5].

In general, major cities in the Baltic States resemble the semi-compact cities evolving towards a more dispersed urban form. However, current patterns of demographic change and uncoordinated territorial expansion put great pressure on sustainable future of these cities and their surroundings. Therefore, it is necessary to perform closer investigations of urban development processes in action and analyse their possible outcomes at various scales.

Conditions and consequences of suburban change around Lithuanian cities

Methodology of the research

Referring to the previously presented characteristics of the Baltic cities, the current phase of urban development in the Baltic countries can be partly described as resurrection of the suburbs. Although development of these areas is an antithesis of sustainable urban

[5] Construction of single-family houses moderately declined during economic crisis, but still maintained upward trend in the long-term. In case of Lithuania, the amount of newly constructed dwellings in detached or semi-detached houses in 2013 was already higher than in 2007, in Estonia – exceeded level of 2006, and in Latvia – slightly outnumbered 2005. *Source*: Statistics Estonia (2014b), Statistics Lithuania (2014b) and Central Statistical Bureau of Latvia (2014b).

Table 2. Characteristics of the research

Phase	Development conditions		Development consequences
Research subject	Urban form at regional level		Urban form at local level
Expected outcome	Zones of development pressure and conditions of their transformations		Types of suburban settlements and features of their physical structure
Research target	Change of socio-demographic and housing structure	Land cover transformation	Evolving physical structure of suburban areas
Data set	Population and Housing Census data	CORINE Land Cover data	GDR10LT – georeferential spatial data ORT10LT – digital raster orthophotographic maps
Time coverage	2001 and 2011	1995, 2000 and 2006	GDR10LT – 2014 ORT10LT – 1995–2001 and 2012–2013
Data provider	Statistics Lithuania	Environmental Protection Agency	National Land Service
Content and accuracy of data set	2001 – 77 indices aggregated for territorial units (settlements, parishes and municipalities) 2011 – 36 indices aggregated for 1×1 km grid	Structural parameters of land cover aggregated for 1×1 km grid [(a)]	Scale 1:10000
Research cases	6 major cities and their suburban municipalities	10 major cities and their suburban municipalities	3 parishes of suburban municipalities

Note: [(a)] – standard technical parameters for CLC mapping include scale of 1:100000, min. mapping unit of 25 hectares and min. width of linear elements (100 metres) (Vaitkus 2005), but for this research, CLC data was recomposed to represents various land cover parameters in cells of 1×1 km grid.

growth, there is a need to find ways and means for evaluating strengths and weaknesses of suburbs and discussing their future development scenarios. In this case, significance of morphological knowledge is evident (Serra, Pinho 2010), as it is obvious that urban environment with well-established social infrastructure and more traditional urban form should be a prior objective while regenerating existing and planning new suburban settlements (Tachieva 2010).

Suburban areas are often analysed indistinguishably from the metropolitan region, to which they belong. However, researchers often face the problem of availability of accurate information when studying urban forms at such great scales (Talen 2003). Since urban sprawl studies examine large areas, it is convenient to split research process according to monitored data and its accuracy. Therefore, the research of the extensive growth of major Lithuanian cities was divided into phases (Table 2).

At first, information of two recent population and housing censuses has been investigated. Despite differences in their content and accuracy, these data sets represent basic conditions of changes in socio-demographic and housing structure after 1990. Additionally, to deepen the understanding of urban form and its transformations at regional (metropolitan) scale, changes of land cover were analysed, including the overall expansion of urbanised areas and alterations of particular land cover types (residential, commercial and infrastructural). These measurements were made by using CORINE land cover data sets, which are widely applied to study urban sprawl around European cities[6] (Vaitkus 2005; Chuman, Romportl 2008). Finally, during the second phase of the research, in order to demonstrate outcomes of ongoing suburban development trends around major Lithuanian cities, physical structure of suburban communities[7] was examined.

Although the study included examination of different data sources at various scales (regional and local), basic findings of the research in subsequent chapters of this article are presented by describing situation

[6] This is done by rendering extend and change of urban morphological zone (UMZ). However in this research, the procedure of UMZ identification (EEA 2010) has been slightly adjusted (rasterisation and exclusion of patches smaller than 25 ha were not performed), in order to keep more precise limits of final UMZ built.

[7] From now on, the broader term "suburban community" or just "community" will be used instead of "eldership" or "parish" when having in mind the territorial units, examined in the research.

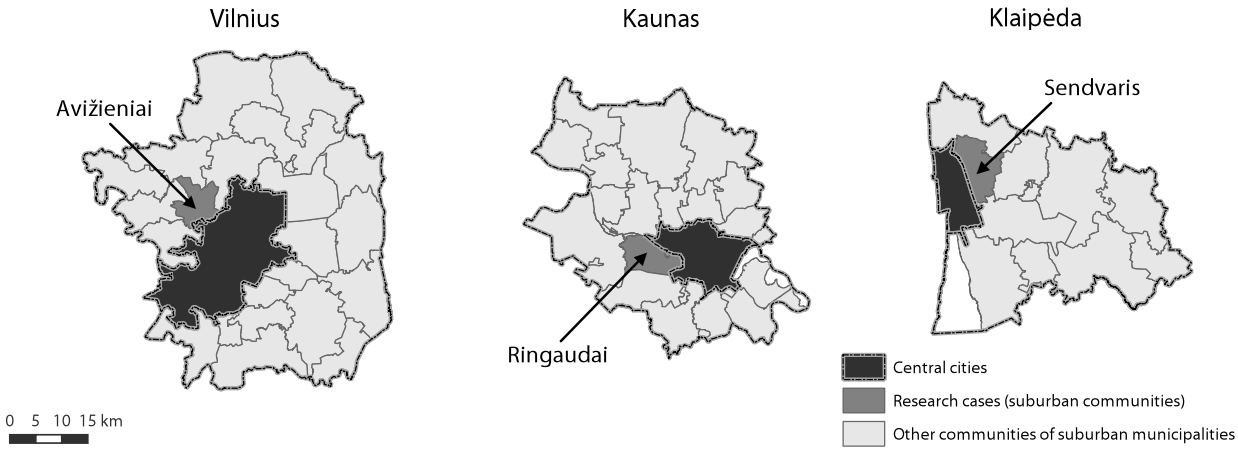

Fig. 3. Location of the analysed suburban communities

in three preselected suburban communities (Fig. 3). Consequences of suburban sprawl led by Vilnius city were examined in the community of Avižieniai. Changes around Kaunas were analysed in the community of Ringaudai. The community of Sendvaris illustrates uncoordinated urban expansion near the city of Klaipėda. These localities were chosen based on their performance in the first phase of the study (high rate of population growth and expansion of urbanised areas). Furthermore, they are entitled as zones for perspective suburban development in master plans of suburban municipalities and show high activity of the real estate market (Laukaitytė-Malžinskienė 2012).

Trends of demographic change (population size and density)

The suburban communities, which were examined in the research, belong to areas with highest residential growth in their municipalities. In 2011, Ringaudai and Sendvaris had up to 5000 residents, and Avižieniai – about 7500. Over the last decade, the population in these areas increased from 40 to 90 per cent (Table 3), and this constituted from 30 to almost 50 per cent of the total population growth in suburban municipalities. During the last decade, structure of settlements has remained quite diverse with just few localities reaching more than 500 residents (Fig. 4). Nevertheless, changes mainly occurred in less populated places – the overall increase in the number of settlements with population over 200 residents has been noticed[8].

Table 3. Population change during 2001–2011

Case	Population		
	2001	2011	Change (%)
Vilnius			
City municipality	553904	535631	–3.3
Suburban municipality	88586	95348	+7.6
Avižieniai	4276	7509	+75.6
Kaunas			
City municipality	378943	315993	–16.6
Suburban municipality	81615	85998	+5.4
Ringaudai	3550	5010	+41.1
Klaipėda			
City municipality	192954	162360	–15.9
Suburban municipality	46220	51308	+11.0
Sendvaris	2636	5033	+90.9

Source: Statistics Lithuania (2003, 2013), author's calculations.

Population density in the suburban communities also increased, but remained relatively low – in 2011, in places outside larger and few newly emerging settlements, it was less than two persons per hectare. Although the population density in built-up areas was higher and showed mixed patterns, it still rarely reached ten or more persons per hectare. During the period of 2001–2011, in some parts of analysed communities, it even declined, whereas in case of Sendvaris, it became more uniform, matching 2–5 persons per hectare of built-up area. The latter suggests existence of some standard commodities in the real estate market, which predetermine features of new residential properties (e.g. plot size) and cause unification of built environment in suburban localities.

[8] There are 77 settlements in analysed communities. During 2001–2011, number of settlements with population over 200 residents increased from 10 to 25. Source: Statistics Lithuania (2003, 2013).

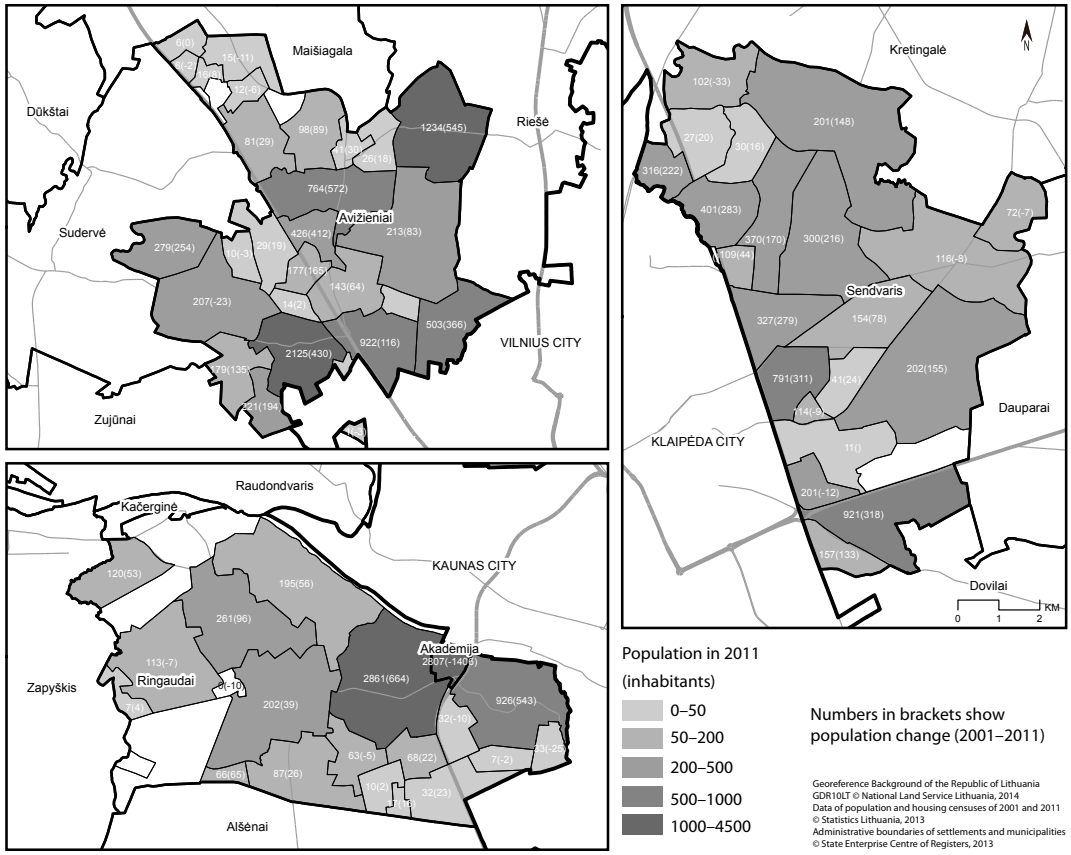

Fig. 4. Population in the suburban communities in 2011

Changes of housing structure (single-family housing)

According to the traditional suburban image, it should be dominated by single-family houses (Bruegmann 2005). Already in 2001 the communities in question showed high share of low density housing, which accounted for 50 or more per cent of all dwellings. One-fourth of these were built after 1990. During the Soviet period low density housing was forbidden in large cities; therefore in 2001, this type of dwellings accounted just about 10 per cent in Vilnius and Klaipėda, and only in Kaunas this ratio was higher (10 to 30 per cent). However, according to census data of 2001, significant part of single-family housing in the major cities was constructed during the first decade of independence, with higher numbers registered in Klaipėda (up to 50 per cent). This trend could be influenced by incorporation of rural areas into the cities. On the other hand, new quarters of detached houses have been built on the undeveloped land inside cities as well, as an outcome of the restitution of property to former owners.

In 2001, detached and semi-detached houses dominated in major parts of Avižieniai and Ringaudai (Fig. 5). Only in larger settlements and areas near the cities, the share of these buildings was lower than 70 per cent. A smaller amount of individual housing could be attributed to a higher ratio of dwellings in low-rise multi-family buildings. Apparently, this reason could influence features of housing structure in Sendvaris, where dwellings in single-family houses dominated only in several settlements. However, data from 2011 show that individual dwellings dominated in almost all parts of analysed communities. This shows that construction of single-family housing is one of the leading agents behind suburban expansion of major Lithuanian cities.

Structural analysis of residential buildings by their age suggests that in the period of 1991–2000, activity of residential construction in the suburban communities was relatively low. Despite the fact that structure of buildings became more diverse during the first decade of independence, it was still dominated by buildings of the Soviet period in 2001. Only in larger settlements and some localities closer to the city limits, higher numbers of buildings of later period have been noticed. However, it is likely that a considerable part of construction works in the suburban areas has consisted of upgrading the existing building stock in order to meet the changing needs of individual households of both,

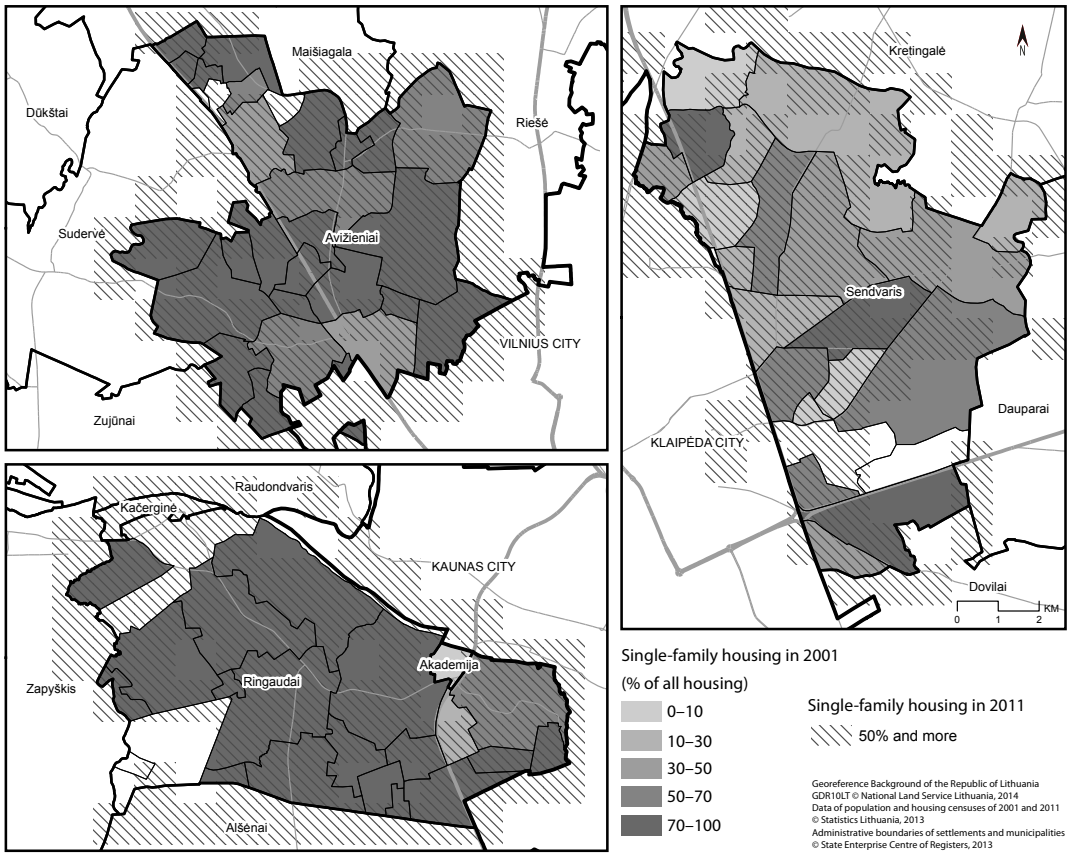

Fig. 5. Single-family housing in the suburban communities in 2001 and 2011

former residents and newcomers. However, census data sets do not posses this information. Therefore, these processes can be observed only on a very detailed level.

Trends of land cover change (residential and commercial sprawl)

Analysis of the expansion of urban morphological zones around major Lithuanian cities during 1995–2006 showed that at first growth of built-up areas progressed inside the cities or in places located near their administrative boundaries, but later outer expansion embraced larger portions of the suburban areas (Fig. 6). For instance, the community of Avižieniai with adjoining territories became part of the north-west development axis of Vilnius city, whereas Sendvaris started to represent the eastern sector of suburban expansion in Klaipėda region. These areas were gradually affected by processes of urban sprawl. Despite lesser extend of sprawl in the community of Ringaudai, Kaunas city still experienced a high degree of outer growth.

Urban sprawl is a heterogeneous phenomenon and consists of growth in residential, commercial and infrastructural areas (Chuman, Romportl 2008). Although these processes represent distinct functional domains of the urban landscape and usually operate simultaneously, their spatial patterns can diverge. The comparison of different processes of land cover changes revealed that the majority of alterations can be attributed to residential sprawl (Fig. 7). The case of Avižieniai is exceptional. Here, the growth of residential areas was quite intensive and affected settlements adjacent to Vilnius city and also in some remote locations. In Ringaudai, residential sprawl was observed in several locations around larger rural settlements. In case of Sendvaris, this type of urban sprawl dominated in localities neighbouring Klaipėda city. During 1995–2006, territorial expansion of commercial and industrial areas also progressed; however, it was less visible. In most cases, this type of land cover transformation occurred near highways leading to the cities or appeared in the vicinity of major transport nodes.

Generally, land cover transformations around major Lithuanian cities can be characterised by both, nuclear and dispersed patterns. These are highly dependent on spatial structure of urban region at metropolitan (road network, natural constraints, etc.) and local (land-use, land ownership, etc.) scale. However, residential and commercial sprawl usually progresses as a greenfield development and drastically changes the suburban landscape. Therefore, it is necessary to examine physical features of emerging suburban settlements.

Fig. 6. Urban sprawl in the suburban communities during 1995–2006

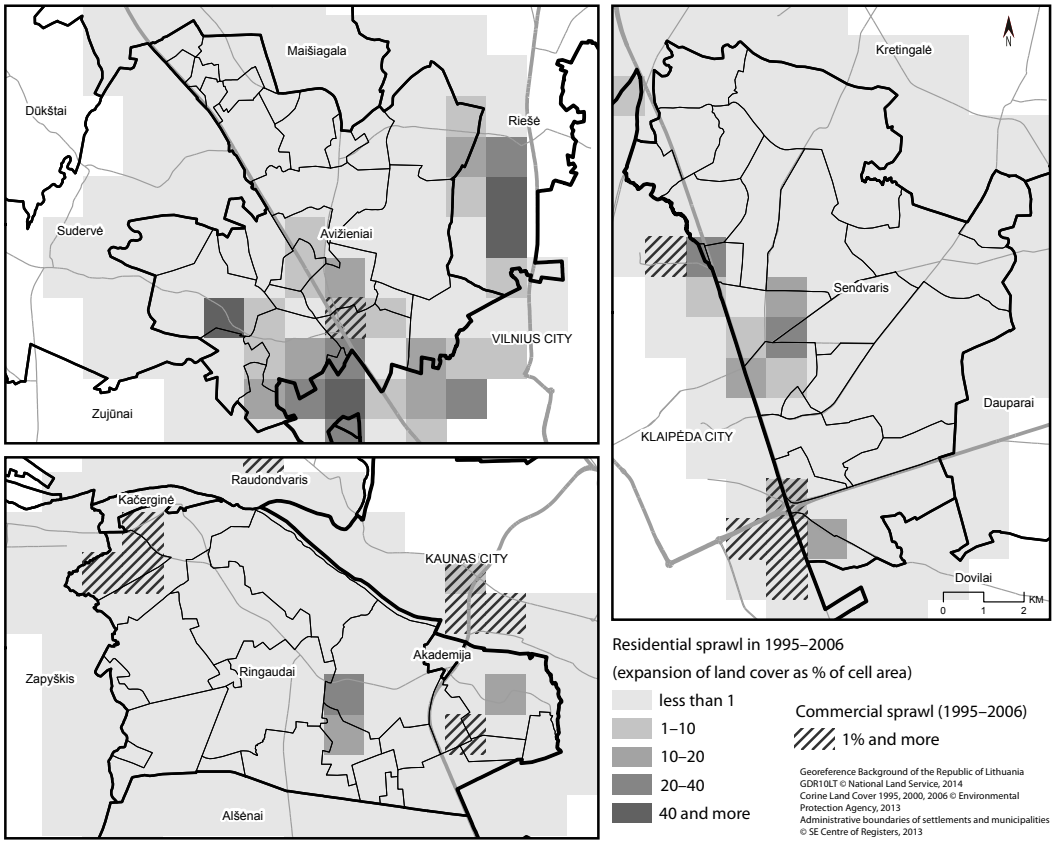

Fig. 7. Residential and commercial sprawl in the suburban communities during 1995–2006

Physical transformations of suburban settlements

As the review of development conditions in the suburban communities has shown, external growth of urbanised areas is quite noticeable, especially after 2000. Therefore, we can observe formation of the peri-urban landscape, which is characterised as a mosaic of urban, agricultural and natural areas (Sieverts 2003).

Actually, the higher or lower pressure for urban development can be noticed in various places of the wider space of suburbia. According to their distance from the central city, three types of transforming suburban settlements can be identified: 1) residential areas on the periphery of city, 2) residential areas located immediately outside the administrative boundary of city, and 3) self-sufficient suburban settlements. However, development pressure can also be visible at more distant locations of metropolitan region (e.g. periphery of the remote towns and large villages). Similarly, there are other specific types of semi-residential environment, which can be affected or even created in the course of urban sprawl (e.g. garden communities, areas of seasonal or second housing). Respectively, the analysed communities are dominated by the second and third type of suburban settlements, which represent expanding former villages and newly emerging areas of low density housing.

Comparing patterns of built-up areas in the suburban communities near major Lithuanian cities in 2001 and 2013, high increase of new constructions is visible (Fig. 8). New developments usually appeared near the older settlements or occupied former agricultural fields. In some cases, residential structures were built across the border of neighbouring city, eventually causing merging of nearby urban and suburban fabric (e.g. Avižieniai). Overall, it is evident that new suburban structures favour locations in the vicinity of cities and major transport corridors, as well as natural features (Table 4). Although new developments also tended to appear near pre-existing structures, urbanised areas expanded in a very chaotic way, frequently leaving large fragments of undeveloped land in between. New settlements could acquire more regular urban form, but as long as these speculative voids prevail, suburban areas will remain incomplete and fragmented.

In general, emerging residential formations can be divided into several morphological types. According to their relationship with the pre-existing suburban fabric, they represent infill, extending and outlying structures (Fig. 9). Infill structures are mostly small

Fig. 8. Physical structure of the suburban communities in 2013

in size and appear on previously undeveloped land, which is fully or partly surrounded by built-up areas; whereas extending structures usually border and expand older residential areas. The latter type of suburban tissue can be subdivided into regular and linear formations. Regular structures are formed mostly by extending pre-existing street grid of settlement, while linear structures form around separate cul-de-sacs. Sometimes small enclosed residential structures create leapfrogging patterns, which incorporate former rural homesteads. Such extensive and complex formations could be considered as additional subtype of extending suburban structures.

When new residential formations appear in locations, which are relatively distant from current settlements (e.g. more than 200 meters), they can be considered as outlying structures. These greenfield developments can acquire various spatial configurations and greatly differ in size (from separate house on large agricultural plot to complete residential neighbourhood), because usually they are separately planned and relatively instantly built on any undeveloped land.

Table 4. Newly built-up areas in suburban communities by location

Case	Previously built-up areas (ha)	Newly built-up areas (2001–2013, ha)	Structure of newly built-up areas by location (%)			
			Near borders of cities [a]	Near previously built-up areas [b]	Near major roads [c]	Near natural features [d]
Avižieniai	532.71	315.42	32.4	76.4	27.4	53.0
Ringaudai	491.21	179.75	18.2	88.1	30.2	40.8
Sendvaris	420.73	570.09	39.0	43.9	32.2	28.1
Total	1444.65	1065.26	33.6	61.0	30.4	37.6

Notes: [a] – 500 m buffer zone outside administrative border of city; [b] – 200 m buffer zone around previously built-up areas; [c] – 200 m buffer zone around highways and major roads; [d] – 200 m buffer zone around forests and other densely vegetated areas larger than 5 ha, lakes and ponds larger than 10 ha, rivers and some water streams. *Source*: author's calculations.

Fig. 9. Emerging suburban fabric: A – extending, B – infill, C and D – outlying structures

Table 5. Newly built-up areas in suburban communities by type

Case	Structure of newly built-up areas by type					
	Infill structures		Extending structures		Outlying structures	
	Area (ha)	Percentage of total area (%)	Area (ha)	Percentage of total area (%)	Area (ha)	Percentage of total area (%)
Avižieniai	11.7	3.7	253.1	80.3	50.6	16.1
Ringaudai	12.7	7.1	125.9	70.1	41.4	22.9
Sendvaris	9.2	1.6	289.9	50.8	271.1	47.5
Total	33.6	3.2	668.9	62.8	362.8	34.1

Source: author's calculations.

All previously described morphological types of new developments can be found in analysed communities. However their spatial extent greatly varies (Table 5). For instance, infill structures constituted only three per cent, whereas extending structures dominated, amounting for almost 63 per cent of all newly built-up areas. The highest share of outlying formations was noticed in Sendvaris; whereas in other communities, it was lesser, averaging for 34 per cent of all new developments.

To sum up, the infill and extending structures can be considered as more traditional than outlying formations, which were typical for intensive suburban expansion in the Western countries during the 20th century (Bruegmann 2005). In reality, these morphological types are not so easy to distinguish. The main reason is the dynamic nature of suburban development, which is characterised by the time lag between planning and construction works. As additional analysis of land-ownership structure showed, the amount of pre-planned plots for residential construction in the suburban municipalities is impressive. For example, in the community of Sendvaris, supply of residential plots in 2013 was high enough to house nearly ten times more new residents than this community had received during the period of 2001–2011. Therefore, it can be said that suburbanisation is the prior course of urban development in Lithuania, or at least in major urban regions. However, spatial and functional structure of emerging suburban settlements still does not meet the standards of high quality residential environment.

Conclusions and discussion

Recent decades of urban development in the Baltic States are marked with rapid social and economic changes, inducing various transformations of physical and functional structure of the cities and their surroundings. As a role of private and commercial interest consequently strengthens, major cities in the Baltic countries experience intense alterations of their peripheries. Therefore, the latest evolutionary phase of the Baltic cities can be perceived as resurrection of the suburbs.

However, as stated in the article, intensive development of suburban areas around major cities in the Baltic countries is a problematic phenomenon. First of all, the process is politically uncoordinated (especially, at municipal level), and secondly – it is not based on any demographic presumptions. Therefore, current patterns of urban sprawl put great pressure on sustainable future of the Baltic cities and their surroundings and already cause negative effects to occur (e.g. demographic decline of central cities, inefficient use of suburban areas, etc.).

From a morphological point of view, suburban growth is complicated as well. The main problem is that resulting semi-urban structures acquire a chaotic and fragmented shape. As the analysis of suburban communities near major Lithuanian cities showed, the present periphery of the Baltic cities is dominated by large patches of greenery and semi-natural spaces, former rural settlements and newly constructed low density commercial and residential areas, scattered throughout the peri-urban landscape in form of extending and outlying formations. And all of this is superimposed by the networks of major and local roads. Nevertheless, tools of morphological research can be adopted to study contemporary suburban fabric around the Baltic cities, as it has been done elsewhere (Serra, Pinho 2010). This allows identifying regional characteristics of suburban form, which can be particularly useful while considering possible development scenarios for territories adjacent to major urban centres.

In general, major cities in the Baltic countries represent examples of semi-compact cities evolving towards a more dispersed urban form. Regarding this, three scenarios for their future development can be discussed (Fig. 10). The first scenario – the further expansion and urban dispersal – represents continuation of urban sprawl with all possible negative consequences. The second scenario – fragmented

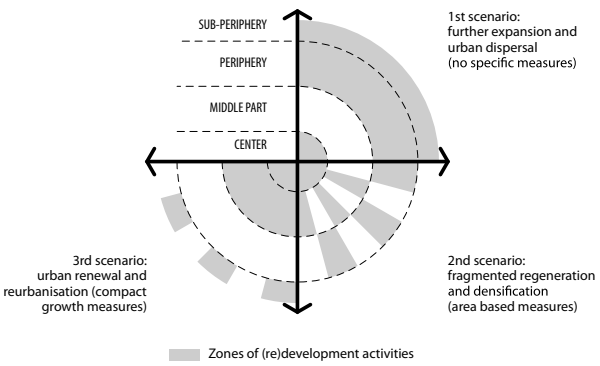

Fig. 10. Possible future development scenarios for a Baltic city

regeneration and densification – stresses the possibility to apply area based measures for renewal and regeneration of pre-selected inner city zones, as well as densification of progressive settlements on the periphery in order to concentrate capacity and resources of national and local governments to deal with problems in these areas. Finally, the third scenario – urban renewal and reurbanisation – enables the application of compact growth measures to strengthen the existing urban cores of metropolitan regions, but it can only proceed as agreement between representatives of urban and adjoining suburban municipalities, because it requires political means to restrict or at least discourage processes of uncoordinated outer growth.

Overall, it is necessary to continue promoting public concern about negative consequences of urban sprawl and discuss possible measures to sustain a more compact form of cities in the Baltic States. Therefore, findings of the presented study could be adapted to further examination on the current trends of urban growth and decline in the Baltic countries in order to create models, designated to coordinate development of major cities and their suburban regions. Additionally, insights on characteristics of emerging suburban fabric highlights a great demand for closer morphological analysis of these formations, on purpose to distinguish origins, physical characteristics and transformation possibilities for different types of settlements.

Note

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MATAS CIRTAUTAS

Master of Architecture, younger researcher at Research Laboratory of Urban Analysis, Department of Urban Design, Faculty of Architecture, Vilnius Gediminas Technical University, Pylimo g. 26/1 LT-01132, Vilnius, Lithuania.
E-mail: archimatas@yahoo.com.

Research interests: urban/suburban sprawl, post-Soviet cities, measurement of urban form, urban design and planning.