sciendo RIGA TECHNICAL UNIVERSITY
Architecture and Urban Planning
doi: 10.2478/aup-2018-0007
2018 / 14

Changes of Commuting Range in Riga Agglomeration

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***Abstract* – The aim of this paper is to characterise commuting trends in Riga agglomeration, while taking into account proximity to Riga and territorial accessibility. Changes of commuting range are looked at through literature analysis (historical context) and by using descriptive analysis and parametric tests (current situation). Results indicate that while both proximity to Riga and access to state level roads have a significant impact on commuting flows, it is the former which has a more significant impact.**

***Keywords* – Changes, commuting, Riga agglomeration, suburbanization.**

Introduction

Development of typical forms of suburban settlements in the last decades has been particularly noticeable in the post-socialist countries of Central and Eastern Europe. Most of the people move from the core city to suburban areas due to better environment and housing, mostly single family houses, while retaining their jobs there. With that, commuter flows are also on the rise [1]−[3]. Processes taking place in the vicinity of Riga are not an exception [4], [5].

Research of commuting has always been important when it comes to Riga agglomeration (further in text − RA). The first research papers on RA were about commuting characteristics [6], [7]. Due to the changing nature of this process, it still has maintained its place as an important research topic [5], [8], [9]. Commuting has also been an important factor when it comes to defining the area and borders of agglomeration. Latest such research took place in 2017 [10]. Since regaining the independece a total of three more studies have been conducted [11]−[13].

The changes mentioned in the first paragraph (suburbanization and commuting flows on the rise) contribute to the need for applied research for defining and analysis of functional areas of agglomerations [14], [15]. Commuter trends are important when it comes to understanding the extent and dynamics of the agglomeration, so it is important to analyse them.

In this paper changes of commuting range are looked at in two ways. The first way is through literature studies on dynamics of commuting (in a longer period of time; since the 1960s) and territorial development in a shorter timespan (last 20 years). The other way is through descriptive analysis and parametric tests, where commuting flows are analysed. The research question is how commuting flows change depending on the location of the territorial unit and access to transport infrastructure.

I. Data and Research Methods

A. Data

Central Statistical Bureau (CSB; *Centrālās statistikas pārvalde* or CSP in Latvian) data. Numerous datasets were used. Data of CSB labour survey shows the commuting flows of employed people to and from Riga in different years. This data covers commuters from the entire country. The unit of measure for commuter count is people in thousands. Temporal scale of the data varies. From the Soviet times, there is data only about four years (1968, 1978, 1981 and 1991). Starting from the year 2002, the data is available yearly. Data shows commuting flows to and from Riga on a nationwide scale [16]. Still, it was used since the flows from RA areas have always been the most voluminous [8], [9].

Data about the number of employees in territorial units (year 2016). Data on the number of employed by the actual work place was obtained by the CSB through a sample survey and using administrative data sources. It has to be noted, that this is estimated data, because budget institutions, commercial companies with a state or local government share of 50 % and more, and all private sector enterprises with a number of employees of 50 and more or with a defined turnover threshold were fully surveyed, the remaining enterprises were surveyed using a simple stratified sample as well as adding information from administrative data sources [16]. Data on population from regular database and 2011 census and on the number of working people (for this study these are people between the ages of 15−74, according to law it is 15−62) were used. However, recent studies, such as *Rīgas aglomerācijas robežu precizēšana* [10], have already used the extended version, since a lot of people aged 63 and older continue to work [17]. Georeferenced data [18] and additional information from the Department of Human Geography (LU ĢZZF Cilvēka ģeogrāfijas katedra) was used as the base for maps [10].

State Revenue Service (*Valsts ieņēmumu dienests*) data containing information about the number of employees in each administrative territory in 2016 was used [19].

Data from Lursoft is used to interpret commuting flows from Riga. This dataset shows businesses with the highest annual turnover in territorial (further in text − TU) and administrative units. Only the first 20 companies are shown, thus there are some limitations [20].

B. Methods

Descriptive analysis. RA commuting flows to Riga and from Riga were calculated differently. Flows to Riga were calculated as a proportion of work commuters compared to the total amount of working age people in TU multiplied by 100. Flows from Riga were also calculated as a proportion; however, here it is a proportion of work commuters compared to the total amount of people working in TU multiplied by 100. The reason for this difference is as follows: if commuting flows to Riga were compared to the total amount of people working in the core city, then the percentages would be really small and it would be impossible to deduce any characteristics of commuting flows.

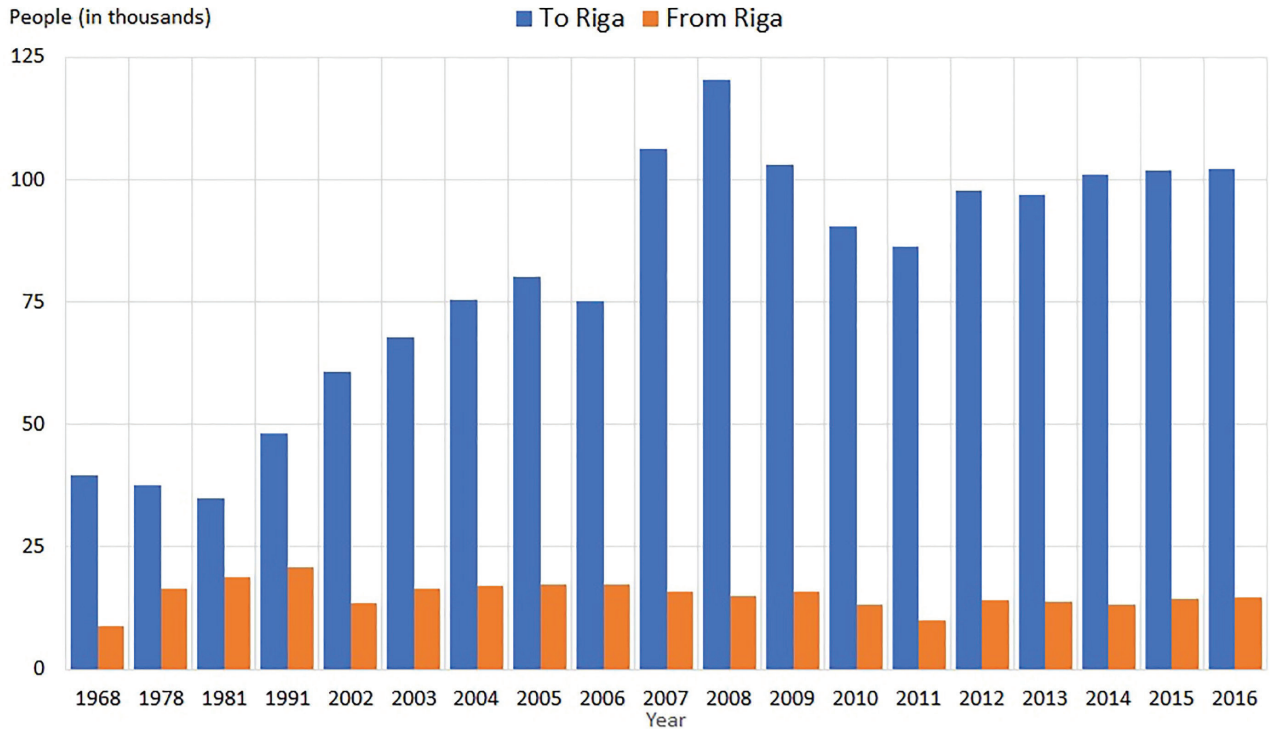

Fig. 1. Commuting flows of employed people to and from Riga in different years [Developed by T.Skadiņš, based on CSP data].

The flows were looked at territorial unit level, because this level of aggregation gave a more detailed look into commuting flows. At the administrative level there are several municipalities (e.g. *Amata* and *Bauska*), which are quite heterogenic in regard to commuting flows.

Another part of the descriptive analysis was the creation of TU group typology based on commuting flows. TU were divided into groups based on commuting proportion. Based on commuting flows to Riga, they were divided into six groups, ranging from very high (over 60 %) to low (less than 40 %). Based on commuting flows from Riga they were divided into five groups, ranging from high (over 40 %) to low (below 10 %).

They were further grouped based on the commuting flow group pairings (to and from; ones that were described in the previous paragraph) e.g. very high flows to Riga and high flows from Riga or low flows in both directions. That was deduced from the matrix table (which shows how many TUs belong to each of the group pairings). Since the number of groups created was rather high, 17 to be exact, it was eventually reduced to four – High, Average, Asymmetrical and Low. These groups gave a clearer view of commuting flows and patterns.

Microsoft Excel F test and t-test were used to determine the statistical significance between average commuting flows for different variables, based on whether the particular TU borders Riga or not, and on the accessibility of territory (meaning the presence of state and regional level roads. The F test was used to determine whether the variances are equal (F smaller than F critical) or unequal (F bigger than F critical). t-test: Two-Sample Assuming Equal Variances (if standard deviations are similar), or t-Test: Two-Sample Assuming Unequal Variances (if standard deviations are different), were selected based on the results of the F test. Significance was determined by comparing t stat and t critical indicators. It then determined whether the difference between the average values was significant (t stat has a bigger value than t critical or t stat has a smaller value than negative t critical) or not (t stat has a smaller value than t critical). Commuter proportion data was used for F and t-tests since commuter count can differ between TUs.

II. Commuting Patterns

In Soviet times, especially since the 1970s (Fig. 1) commuter count from Riga was on the rise (increase of close to 20 000 commuters, bringing the total number to just under 25 000). Back then, several industries were located in suburban areas, and agglomeration was more polycentric economically [6]. This is an example of efforts to limit the excessive growth and importance of Riga. However, the development of new economic sectors (e.g. science and technologies) only increased its growth and influence from the labour market perspective [21].

Since 1991, with the changes in political system and socio-economic situation, there has been a continued increase in commuting to capital city, while the flows from Riga have been way less prevalent.

At the beginning of the 1990s, daily mobility flows to suburban areas from Riga decreased. Number of jobs in the suburbs

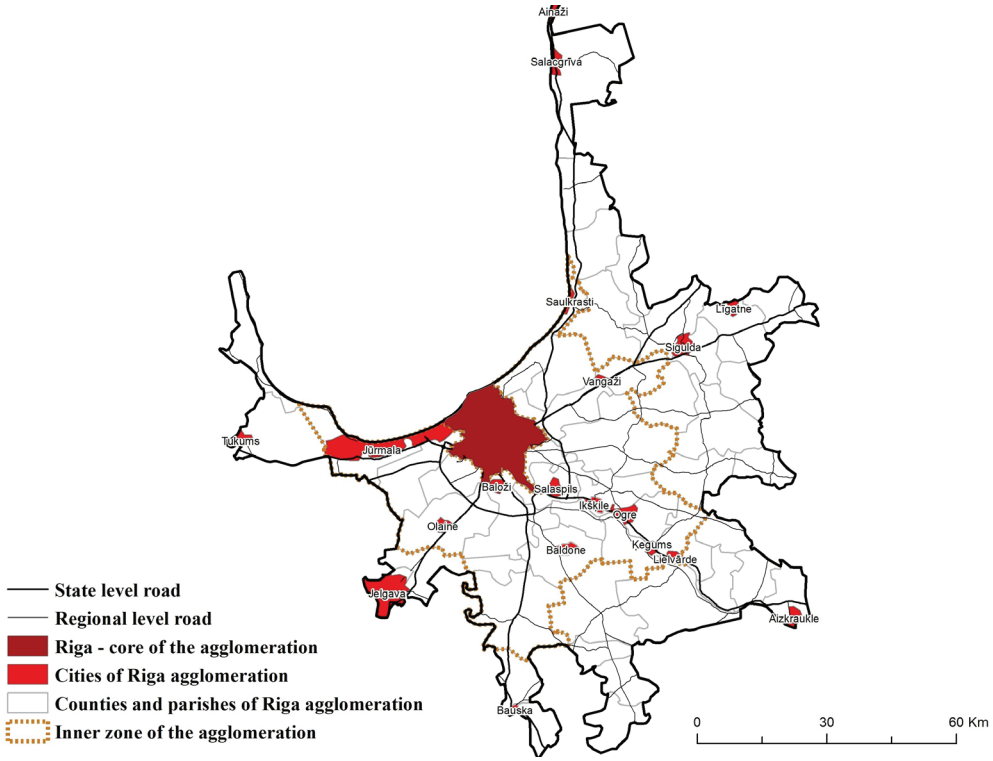

Fig. 2. Riga agglomeration territorial structure [Developed by T.Skadiņš, based on the data of CSP and LU ĢZZF Cilvēka ģeogrāfijas katedra].

shrank due to collective farms and industrial enterprises being liquidated. Flows between municipalities outside Riga also became less voluminous because part of the population found jobs in municipalities where they resided. With these developments, Riga clearly dominated the commuting structure [8], [9]. In the early 2000s, a new commuter group began to emerge – weekly commuters. Part of commuters who lived in the periphery of RA spent their entire work week in the capital, returning to their homes only for the weekend [9]. As the second decade of new millennium approached, a development of another trend took place – shortage of job opportunities and bad economic situation forced many inhabitants of small towns and rural areas to move closer to Riga, which still had plenty of job opportunities, though to a lesser extent than before. As a result, there was an increase in commuter flows from all agglomeration areas. Most of the increase, however, was from areas further away from Riga. There housing was cheaper than in Riga or in municipalities bordering Riga, while transport infrastructure still provided good enough connectivity with the capital [5].

In the second decade of 2000s, commuter flows from Riga to other TUs were on the rise due to commercial suburbanization [13]. Rather high number of commuters worked in Marupe and Stopini counties, as well as in Babite and Kekava parishes. In the following years, this trend continued [10], [13], [16].

Due to territorial expansion of the agglomeration in the last 15 years, when the agglomeration has spread significantly towards the northern and southern direction, commuting patterns have significantly diversified.

III. Territorial Development

Boundaries of RA were first defined in the 1960s. At that time, it was considered that all TUs within 60–70 km radius should be included in the agglomeration. Population growth was quite limited due to rather strict planning. Nevertheless, agglomeration and its population continued to grow in the 1980s. At the end of the decade it had reached an all-time high number of inhabitants – 1 226 814, with most of them living in Riga. Settlements around Riga also grew and were mostly populated by people from other parts of the country who worked in the industrial sector [4], [14].

Transitional period occurred during the first decade after socialism collapsed. Suburbanization process was still different from the one in western countries. Most people moving to suburbs were of low socioeconomic status and were seeking cheaper housing. Share of agricultural land decreased in most parts of agglomeration and consequently the available land area was used for construction of residential buildings [22].

Land reform of the 1990s was also significant. As a result, part of the urban population gained the opportunity to move elsewhere, including suburban areas. Others returned to their homes that they had once left to find jobs in towns. These were the main factors behind suburbanization during the transitional period. At that time, as multiple systems (e.g. political, economical) changed, planning policy also changed, and uncontrolled development was characteristic. Building pattern was quite chaotic. This problem exists in many other post-socialist countries [22].

In 2017, RA consisted of 70 TUs (Fig. 2), that occupied 11.4 % of the area and was home to 55.2 % of the population of Latvia.

TABLE I
AREA AND POPULATION CHANGES OF RIGA AGGLOMERATION [DEVELOPED BY AUTHOR, BASED ON CSP DATA]

Area	Year			
	1996	2004	2012	2017
TU	5701.2	6676.6	6994.6	7292.8
Riga	307.2	307.2	303	303.8
Total	6008.4	6983.8	7297.6	7596.6
Population				
TU	321412	408771	437956*	428778
Riga	810172	739232	658640*	641423
Total	1131584	1148003	1096596*	1070201
*2011 Census data				

In addition to Riga, there are 16 other cities, of whom two are republican cities and 11 county centres.

In the years after regaining independence, agglomeration has grown rapidly sizewise, while the population has declined in the new millennium (Table I). Such developments occur because of suburbanization characteristics (population growth in areas near Riga; further away growth takes place only in certain areas of TUs) and factors impacting commuting patterns that were mentioned in the previous chapter.

Starting from the 1990s, the agglomeration has maintained its radial shape, and throughout its entire history has been rather mono-centric [10]–[13].

The structure of agglomeration is determined directly by the intensity of commuting. Based on that the agglomeration is divided into two zones – inner and outer (31 and 39 TU, respectively) [10]. Inner and outer zone of agglomeration was defined in 2004 [12]. Structure of the inner zone has remained unchanged, while outer zone has experienced significant changes.

In 1996, the agglomeration experienced very little territorial changes. Only Suntazi parish in the eastern part was included and no TUs were excluded [11].

In 2004, the agglomeration began expanding in southern direction due to increasing commuting flows, made possible by A7 highway (southern part of Via Baltica). Five parishes, which bordered the city of Jelgava or were in the vicinity, were also included. Another parish that was included in the south was Vecumnieki parish. Due to these change the agglomeration was extended in northwest and southeast direction [12].

The town of Ligatne and Suntazi parish were no longer part of agglomeration due to low commuting flows. Compared to 2012 and 2017 the territorial changes were not as large numbers wise, however there were certainly way more changes than in 1996 [12].

In 2012, due to development that took place along state level roads, the agglomeration was extended further to north and south of the country. Most of it occurred in close proximity to Via Baltica (A1 in northern part) highway. As a result of the newly constructed Saulkrasti ring road, an increase of traffic intensity and accessibility was observed in northern part of the agglomeration. In southern part, there was a similar situation. Furthermore, the town of Ligatne returned to agglomeration after being excluded in 2004 [13].

Commuting flows had decreased in several parishes in the vicinity of Jelgava city. Only two parishes in western and southwestern part remained in the agglomeration. This indicated the increase of job opportunities in Jelgava. In southeast, the town of Jaunjelgava was no longer part of it [13].

In 2017, although the area of agglomeration had grown (by 299 km^2 compared to 2012), the number of people had decreased (by 2.4 % or 26 395 inhabitants), since only 14 out of 70 TUs experienced population growth during the six year period from 2011 to 2017. Most of them either border Riga or are in a very close proximity [10], [13].

A total of four parishes were excluded from the agglomeration in north, east and southwest. [10]. TUs that are now a part of the agglomeration outnumber the excluded ones. In southern part, three parishes were included for the first time. In east, three parishes were included. The agglomeration was also extended further northwest [10].

Importance of the regional level roads has become more prevalent (to an extent), since the biggest changes have occurred along regional level roads P80 and P89. Their reconstruction has improved accessibility in the southern and southeastern part of the agglomeration [10].

IV. COMMUTING PATTERNS OF THE AGGLOMERATION

Work commuting flows are the most common ones and it is one of the most important variables that is used to determine which TUs are to be included in agglomeration [10], [16], [23].

In 2016 (data from this year was used to define agglomeration borders in the 2017 research, see Fig. 3), largest commuting flows (volumes) were characteristic to TUs bordering Riga. These were, for instance, Carnikava county with 72.4 % or 2995 of working age population working (commuting to) in Riga, Garkalne county

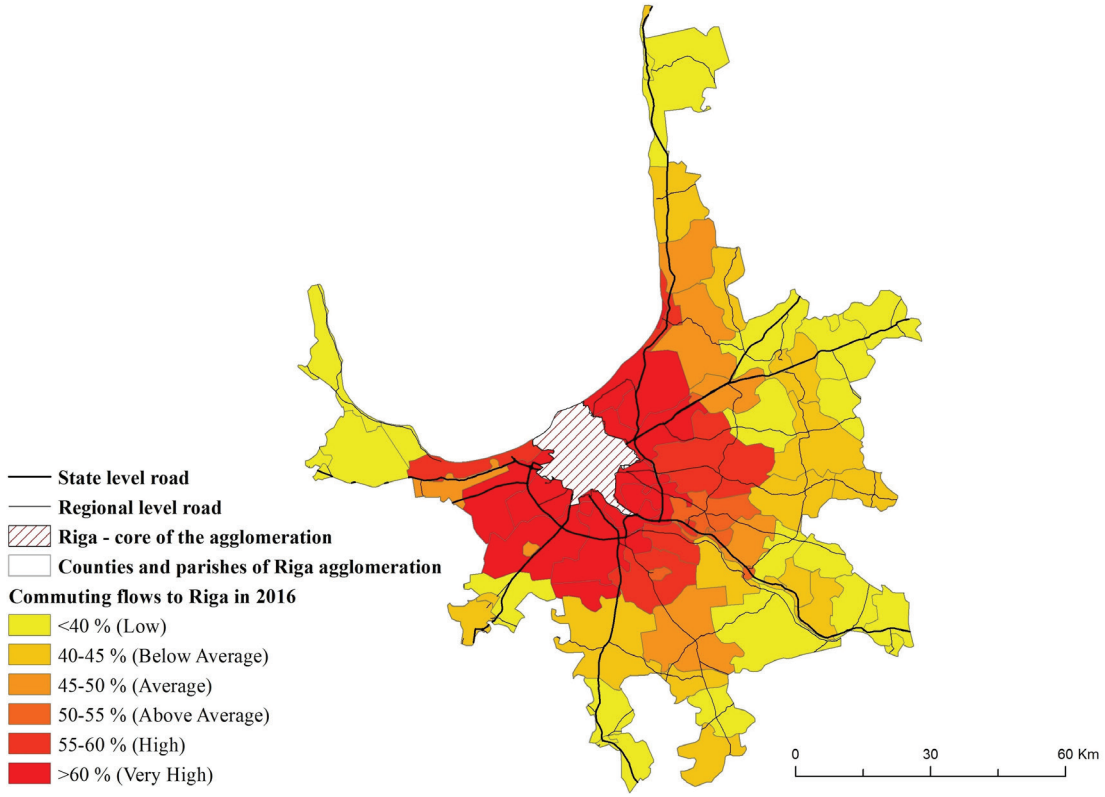

Fig. 3. Riga agglomeration commuting flows to Riga [Developed by T.Skadiņš, based on the data of CSP, LU ĢZZF Cilvēka ģeogrāfijas katedra and Valsts ieņēmumu dienests].

with 71.3 % or 5108, and Stopini county with 69.5 % or 4481. In nearly all TUs where the Riga ring road is located (state level roads A4 and A5) commuting flows were above 60 %. The only exception was Ropazi county, where 56.4 % of working age people were commuters to Riga. It has to be said that the ring road only briefly crosses its territory and is rather far from its major populated areas [19].

The lowest commuting flows were characteristic to peripheral TUs, e.g. More (32.9 %), Salacgriva (33.4 %), Ligatne (33.5 %) parishes. Allazi parish was the only non-peripheral parish with low commuting flows (37 %). Most of its population is located far from transport infrastructure.

In nearly all TUs that border Riga more than 40 % of all people employed there were commuters from Riga. The three exceptions were the city of Jurmala, Carnikava county and Salaspils parish. In most cases, the volume of these commuting flows still did not come close to the ones in other direction. Kekava parish and Marupe county were the only exceptions [19].

89.2 % (8744 out of 9807) of all jobs in Kekava parish were held by commuters from Riga. High percentages (above 50 %) were also characteristic for Marupe and Garkalne counties – 63.2 % (11 867 out of 18 804) and 57.2 % (1542 out of 2695), respectively. However, these percentages should be taken with a pinch of salt since several logistics companies (which are at least partly based in Riga, e.g. Kreiss) and Latvian Post are registered in Marupe while Maxima Latvia and Sanitex (wholesale trade company) are registered in Kekava parish and JYSK is registered in Garkalne [19], [20].

First 9 TUs with the highest percentages border Riga. Exception is Carnikava county. The average percentage of commuters from Riga is 19.1 % [19].

Commuting flows from Riga did not necessarily decrease if a TU is further from Riga (Fig. 4), as indicated by rather high percentages in Ceraukste (23.5 %), Birzgale (32 %), and More (34.5 %) parishes. Upon further inspection, however, it becomes apparent that these flows were this high due to some specific characteristics. Most people in Ceraukste parish work in agriculture and there was a small amount of jobs (376). The amount of jobs was even smaller in Birzgale parish (108 out of 338) and "Lats" food store chain, which has a total of 15 stores in Riga, is registered there. The situation in More parish can be explained by the small amount of workplaces (67 out of 194). One TU located further away from Riga where commuting flows were quite high both percentage and numbers wise is the town of Sigulda, where 1048 (20.7 %) of jobs were held by people from Riga. All in all TUs with the smallest percentages were in the periphery of agglomeration, for example, Barbele (2.5 %), Smarde (3.1 %) and Vidrizi (3.1 %) parishes [19], [20].

While a clear pattern of commuting flows (in both directions) emerged when looking at the data of TUs, such patterns were not that apparent for state and regional level roads. Flows were quite high in TUs, where Riga ring road is located but that can also be explained by proximity to Riga.

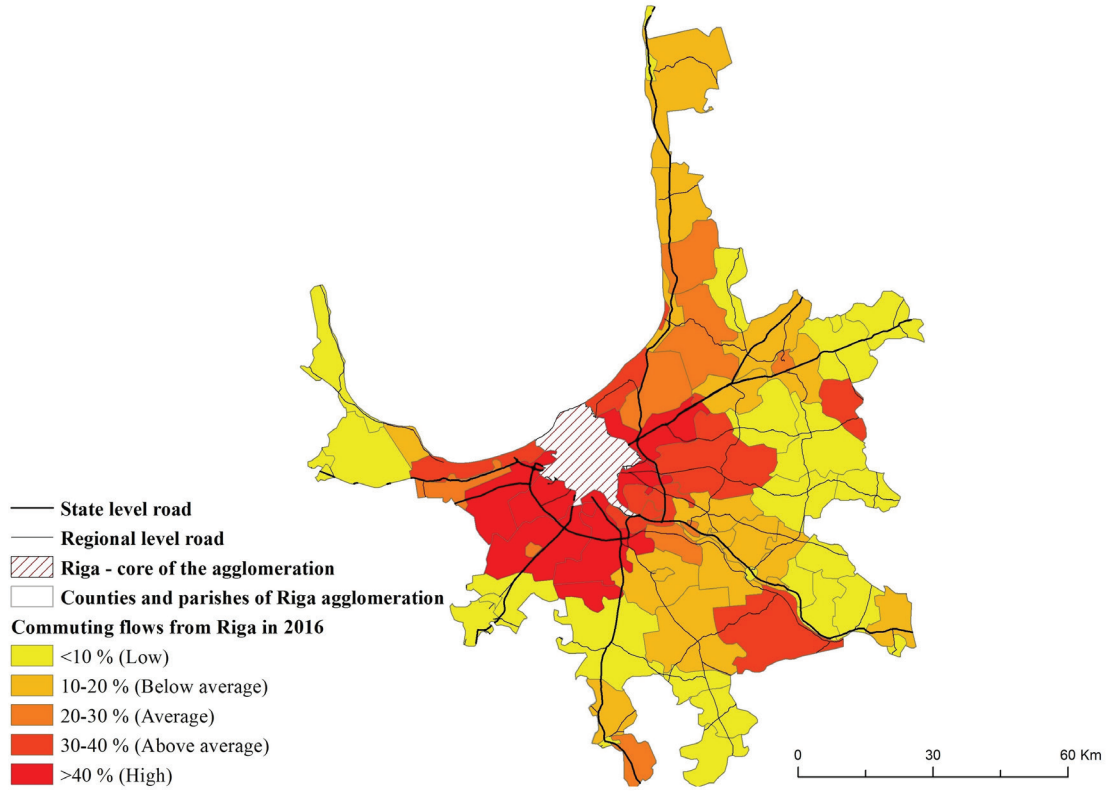

Fig. 4. Riga agglomeration commuting flows from Riga [Developed by T.Skadiņš, based on the data of CSP, LU ĢZZF Cilvēka ģeogrāfijas katedra and Valsts ieņēmumu dienests].

Authors of both western and post-socialist studies of mobility and its forms emphasize aspects of proximity to central city and presence of transportation infrastructure [24], [25]. Studies about Riga agglomeration have led to similar conclusions [5], [9]. Due to that, it was important to determine their influence on commuting flows.

In TUs that have a border with Riga, 66 % of working age population worked in Riga. For the rest of the agglomeration this figure was 43.8 %. F test results show that these two variables have unequal variances. The results of t-test show that t stat has a smaller value than negative t critical (–11.9 < –1.7), meaning that that the TUs bordering Riga had a significantly higher commuter proportion.

The difference between TUs with or without state level roads was not as notable (49.1 % to 41.9 %), nevertheless the difference is significant (unequal variance t-test shows that t stat > t critical; 3 to 1.7).

Unlike in the two previous instances, not only is there no significant difference between TUs with or without regional level roads (equal variance t-test shows that t stat < t critical; –0.4 and 1.7) but TUs with regional level roads had a smaller commuter proportion in 2016 – 46.2 % to 48.3 %.

As for commuting flows from Riga, TUs which border Riga also had a significantly higher proportion of commuters than the rest of the agglomeration – 49.5 % to 14% (unequal variance t-test shows that t stat > t critical; 6.6 and 1.8).

Difference between TUs with or without state level roads also was not as notable (22 % and 13.6 %). Nevertheless, the difference was significant, too (unequal variance t-test shows that t stat > t critical; 2.3 and 1.7).

TUs with access to regional level roads had a slightly higher proportion of commuters than the rest of the agglomeration (20.4 % and 18.5 %). Still, the difference between the two means is not significant enough (equal variance t-test shows that t stat < t critical; –0.4 and 1.7).

Table II

Commuting Flow Groups of Riga Agglomeration [Developed by Author Based on Data of CSP and Valsts Ieņēmumu Dienests]

Flows	From Riga					
To Riga	High	Above Average	Average	Below average	Low	Sum
Vey high	7	4	1	0	0	12
High	0	2	2	2	0	6
Above Average	0	1	0	3	1	5
Average	0	0	4	3	0	7
Below average	0	0	1	4	13	18
Low	0	2	1	6	13	22
Sum	7	9	9	18	27	70

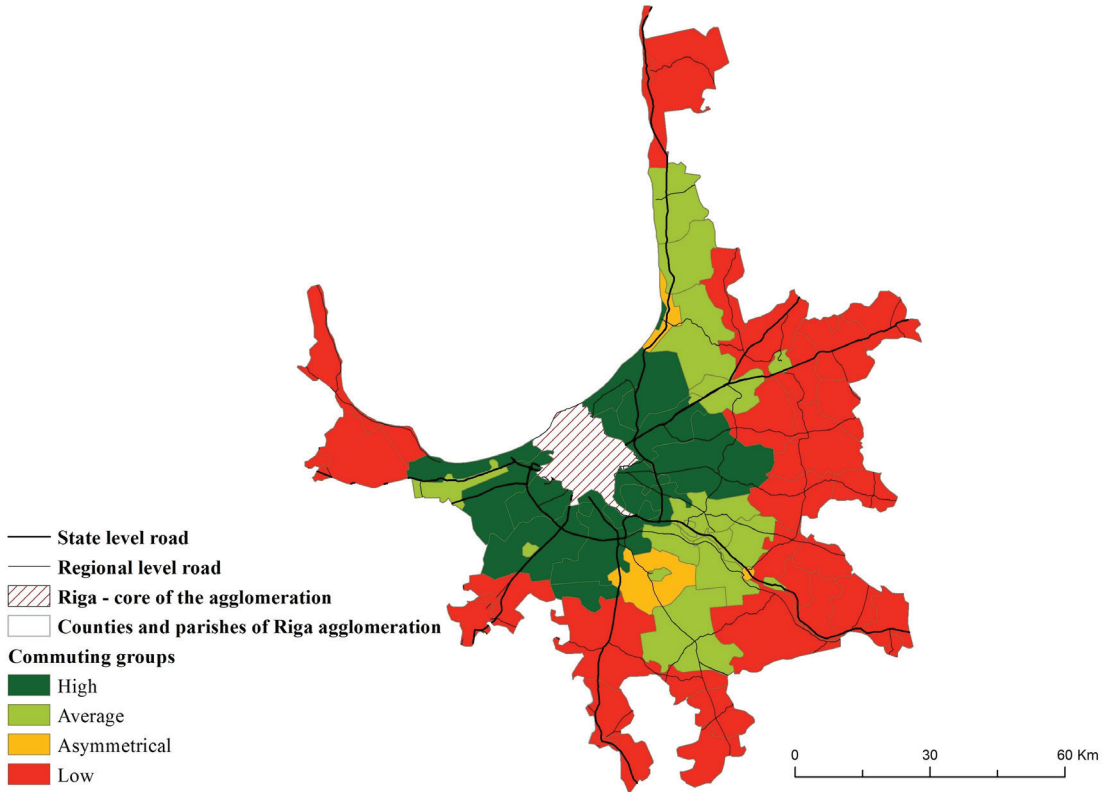

Fig. 5. Riga agglomeration territorial units divided in groups based on commuting flows [Developed by T.Skadiņš, based on the data of CSP, LU ĢZZF Cilvēka ģeogrāfijas katedra and Valsts ieņēmumu dienests].

The matrix table (Table II) indicates two distinct pairings. TUs with very high flows to Riga were highly likely to have high flows from the capital. Meanwhile, ones with below average and low flows to Riga were highly likely to have low flows from the core of agglomeration. Other pairings were smaller numbers wise and, consequently, not as distinct. All TUs were grouped into four distinct groups, since they were less fragmented (Fig. 5).

Commuting flow group membership is further emphasized by the t-test results about the significance of location. All of TUs bordering Riga indeed belong to the highest group. High flow areas actually extend even further, including Adazi and Ropazi county and the towns of Salaspils and Saulkrasti. A total of 14 make up this group. Only TUs where commuting flows in both directions were very high or high are included.

17 TUs belong to the "average" group. This group had a wider range of commuting flow groups. Two TUs with high flows to Riga were included, since in the opposite direction their flows were average, so it was more reasonable to include them in the "average" group. For other TUs the commuting flows range from "above average" to "below average". It must be noted that in every case at least one of the flows belonged to either "average" or "above average" group.

Asymmetrical group is a unique one. Baldone and Saulkrasti parishes, the town of Kegums make up this group. "High" and "above average" commuting flows to Riga were characteristic to this group, indicating that suburbanization processes were quite prevalent there, while "below average" and "low" commuting flows from Riga indicated the lack of commercial suburbanization [9], [10].

36 of the 70 TUs belong to the "low" group. Some of these TUs even belong to inner zone of agglomeration (e.g. Lapmezciems parish and Iecava county). Several could have possibly been included into "average" group (because of relatively high flows from Riga), but due to situation with the low amount of jobs causing these high percentages, they were included into "low" group. Most TUs belonging to this group share a border with agglomeration. Apart from the few aforementioned exceptions all TUs in this group had "low" and/or "below average" flows.

Location of "high" and "low" group TUs conjures with theory that location in the agglomeration is an important aspect when it comes to commuting.

Conclusion

It was concluded that spatial functional structure of RA commuting range mainly changes due to the suburbanization process.

Proximity to Riga and access to state level roads determines the intensity of commuting. Proximity to Riga has a bigger impact on commuting flows, as indicated by the results of descriptive analysis and parametric tests. That is because these TUs share labour market with the capital and are the most functionally linked ones.

Importance of state level roads is not that apparent in the results of descriptive analysis. The results of t-test, however indicate that

the presence of this type of infrastructure does have a significant impact on accessibility. Historical development also indicates their importance – both on the increase of flows and expansion of agglomeration.

Regional level roads do not have as significant impact on commuting flows. It can be argued that they are important only where recent reconstruction has taken place, for instance, the two examples mentioned in the historical development chapter.

Comparison of commuting patterns of TUs for various years was not possible due to lack of data. This information on TUs was made available rather recently. Only the total number of commuters is available. Despite the limitations, this dataset gives some insight into historical changes. Characteristics of commuting flows from Riga point to a small scale employment decentralisation during 2003–2006, but it is evident that financial crisis certainly impacted these developments and the job market still has not fully recovered. The impact of crisis on flows to Riga was even more severe, and they have yet to reach the level of 2008. Despite that, Riga has maintained its importance as a major employment centre. Based on this data it can be concluded that over the years RA has remained mono-centric. The results of this study further emphasize that rather high numbers and proportions of commuters from Riga are characteristic only for the TUs bordering Riga and the ones in close proximity.

The results, mainly about the four commuting flow groups, also highlight the necessity for further research concerning commuting flows, especially concerning the two commuting zones, since more than half of the TUs belong to the "low" group.

Acknowlegdement

This study was carried out with the support of the University of Latvia Effective Collaboration project "Redefining the borders of Riga agglomeration."

References

1. Sykora, L., Stanilov, K. (eds.) *Confronting Suburbanization: Urban Decentralization in Postsocialist Central and Eastern Europe*. Oxford: Wiley-Blackwell, 2014. 360 p.
2. **Novotny, L.** Urban Development and Migration Processes in The Urban Region of Bratislava from The Post-Socialist Transformation until The Global Economic Crisis. *Urban Geography*, Vol. 37, Issue 7, 2016, pp. 1009–1029. https://doi.org/10.1080/02723638.2016.1139413
3. **Sroda-Murawska, S., Dymitrow. M.** *Bulletin of Geography. Socio-economic Series*. Torun: Nicolaus Copernicus University Press, 2016, pp. 131– 143.
4. **Krišjāne, Z., Bērziņš, M.** Post-Socialist Urban Trends: New Patterns and Motivations for Migration in The Suburban Areas of Riga, Latvia. *Urban Studies*, Vol. 49, Issue 2, 2012, pp. 289–306. https://doi.org/10.1177/0042098011402232
5. **Krišjāne, Z., Bērziņš, M., Ivlevs, A., Bauls, A.** Who are The Typical Commuters in The Postsocialist Metropolis? The Case of Riga, Latvia. *Cities,* Vol. 29, Issue 5, 2012, pp. 334–340. https://doi.org/10.1016/j.cities.2012.05.006
6. **Bauls, A.** Commuting in the Suburban Zones of Some Cities of the Latvian SSR. *Soviet Geography*, Vol. 19, Issue 6, 1978, pp. 406–415. https://doi.org/10.1080/00385417.1978.10640238
7. **Bauls, A., Koziols, V.** *Osobennosti majatnikovoj migracii selskogo naselenija v Rižskoj aglomeracii. Rajonnaja planirovka i gradostroitelstvo.* Riga: Riga Polytechnic Institute (*Особенности маятниковой миграции сельского населения в Рижской агломерации. Районная планировка и градостроительство*. Рига: Рижский Политехнический Институт), 1989, pp. 103–108.
8. **Bauls, A., Krišjāne, Z.** Latvian Population Mobility in The Transition Period. *Folia Geographica*, Vol. 10, 2000, pp. 24–35.
9. **Krišjāne, Z., Bērziņš, M.** Commuting and The Deconcentration of The Post-Socialist Urban Population: The Case of The Rīga Agglomeration. *Folia Geographica*, Vol. 14, 2009, pp. 56–74
10. LU ĢZZF Cilvēka ģeogrāfijas katedra. Rīgas aglomerācijas robežu precizēšana 2017. gadā [tiešsaistē]. *Rīgas domes Pilsētas attīstības departaments* [Skatīts 06.08.2018]. http://www.sus.lv/sites/default/files/rigas_aglomeracija_2017.pdf
11. **Bauls, A., Melbārde, Z., Sķinķis, P.** Rīgas aglomerācijas robežu noteikšana nepilnīgas informācijas apstākļos. *Folia Geographica*, Vol. 8, 1999. 86–94. lpp.
12. SIA CTB. Rīgas aglomerācijas robežu precizēšana 2004. gadā [tiešsaiste]. *Rīgas domes Pilsētas attīstības departaments* [Skatīts 06.08.2018]. http://www.sus.lv/sites/default/files/media/faili/rigas_aglom_robezu_noteiksana_31_08_2004.pdf
13. LU ĢZZF Cilvēka ģeogrāfijas katedra. Rīgas aglomerācijas robežu precizēšana 2012. gadā [tiešsaiste]. *Rīgas domes Pilsētas attīstības departaments* [Skatīts 06.08.2018]. http://www.sus.lv/sites/default/files/media/faili/2012_rigas_aglomeracijas_robezu_precizesana.pdf
14. **Melo, P.C., Graham, D.J., Noland, R.B.** A Meta-Analysis of Estimates of Urban Agglomeration Economies. *Regional Science and Urban Economics*, Vol. 39, Issue 3, 2009, pp. 332–342. http://www.sciencedirect.com/science/article/pii/S0166-0462(08)00126-9
15. **Fang, C., Yu, D.** Urban Agglomeration: An Evolving Concept of an Emerging Phenomenon. *Landscape and Urban Planning*, Vol. 162, 2017, pp. 126– 136. https://doi.org/10.1016/j.landurbplan.2017.02.014
16. LR Centrālās statistikas pārvalde (CSP). Nepublicētie materiāli.
17. CSP datu bāze. Statistikas datubāzes [tiešsaiste]. *Centrālās statistikas pārvalde* [Skatīts 06.08.2018]. https://www.csb.gov.lv/lv/statistika/db
18. CSP datu bāze. Kartes un telpiskie dati [tiešsaiste]. *Centrālās statistikas pārvalde* [Skatīts 06.08.2018]. https://www.csb.gov.lv/lv/statistika/kartes-un-telpiskie-dati
19. Valsts ieņēmumu dienests. Informācija par darba ņēmēju skaitu katrā administratīvajā teritorijā 2016. gadā.
20. Lursoft. Statistika Latvijas novadu/pilsētu griezumā [tiešsaiste]. *Lursoft* [Skatīts 06.08.2018]. https://www.lursoft.lv/lursoft-statistika/Statistika-Latvijas-novadu-pilsetu-griezuma&id=515
21. **Filimonenko, L.** Problemy razvitija Rižskoj aglomeracii. Latvijskij naučno-issledovatelskij institut stroitelstva. Unpublished questionnaire. Riga: Latvijskij NII stroitelstva (Проблемы развития Рижской агломерации. Латвийский научно-исследовательский институт строительства. Неопубликованный опрос. Рига: Латвийский НИИ строительства). 1991.
22. **Sķinķis, P., Pužulis, A.** Suburban Settlements in the Context of Urban Policy: Latvian Example. *European Integration Studies*, Vol. 4, 2010, pp. 153–158.
23. Krišjāne, Z., (project curator). *Darbaspēka ģeogrāfiskā mobilitāte*. Rīga: Latvijas Universitāte, 2007. 240 lpp.
24. **Schwanen, T., Dijst, M., Dieleman, F.M.** A microlevel analysis of residental context and travel time. *Environment and planning*, Vol. 34A, 2002, pp. 1487–1507. https://doi.org/10.1068/a34159
25. **Novak, J., Sykora, L.** A city in motion: Time-space activity and mobility patterns of suburban inhabitants and the structuration of the spatial organization of Prague metropolitan area. *Geografiska Annaler*, Vol. 89B, Issue 2, 2007, pp. 147–167. https://doi.org/10.1111/j.1468-0467.2007.00245.x

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