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TRANSPORT CONNECTIVITY AS A FACTOR IN OVERCOMING CHALLENGES OF THE PERIPHERY: THE CASE OF RURAL AREAS IN THE KALININGRAD REGION

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Quality of life in rural areas is increasingly dependent on transport links to nearest towns and regional centres. In this article, we examine transport connectivity between villages and towns in the Kaliningrad region. We use the travel time access parameter to investigate the influence of transport connectivity on the population size and the prospects of socio-economic development in rural areas with different transport and geographical situations. Although the overall transport connectivity is high in the region, up to 10 per cent of villages score low on this parameter. We conclude that the demographic saturation of the Kaliningrad agglomeration has not been completed. Moreover, the smallness of the local consumer market impedes the formation of subregional centres in the eastern part of the region. The most alarming trend is the incipient concentration of population in peripheral border areas.

Keywords:

transport connectivity, settlement system, rural areas, Kaliningrad agglomeration, local centres, periphery

Introduction

The literature on settlement systems and population geography focuses primarily on the development of cities. This research emphasis results from the objective process of cities growing as centres for socio-economic development, which also aggregate human, economic, financial and political resources. This process could not but spark a surge of academic interest. Moreover, the influence of cities extends far beyond their geographical borders. Although rural areas and populations have received much less research attention, the economic and social

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transformation is changing the functions of villages. Many rural localities are no longer part of the modern production system, as they have lost their function of primary processors of agricultural produce. Now they are just places of permanent residence. Functioning enterprises or an agricultural specialisation are not determining factors in rural development any more. In the new socio-economic conditions, Russia cannot support the equal development of all its settlements by building infrastructure and opening enterprises where necessary on a top-down initiative, as was the case during the planned economy period. The decisive factor now is the economic-geographical position, remoteness from the city and the transport-geographical situation.

Suburbanisation and reurbanisation are transforming rural localities situated in catchment areas of large cities into suburban zones whose residents live a spatially dispersed lifestyle [1]. Rural areas lying farther from cities no longer participate in the economy and suffer from locational socio-economic space compression [2; 3]. All the above trends are visible in the small Kaliningrad region, where transport penetration levels are well above the national average. Rural localities in the regional periphery, lying far from cities, require a new development incentive. And better transport accessibility may provide this much-needed stimulus.

State of knowledge

Various aspects of rural transformations in Russia have been considered by Aleksandr Alekseev [4; 5], Tatyana Nefedova [6; 7], Andrey Treyvish [8; 9] and Nikita Mkrtychyan [10]. Other studies have looked at individual Russian regions (for example, Tver [11] and Volgograd [12]) or federal districts [13–15]. There are also investigations at a local level, considering in detail the relationship between cities and rural settlements [1; 16]. Rural areas of the Kaliningrad region have also been examined in the literature [17–21].

Most Russian publications analyse transport accessibility at the national or interregional levels. Amongst the most recent works are studies exploring transport accessibility as an indicator of regional development [22] and investigating transport connectivity in the eastern regions of Russia [23].

International studies consider both theoretical [24; 25] and practical [26; 27] aspects of transport connectivity. Geographically relevant to our research are investigations of transport connectivity across the Baltic region¹ and in some of its countries (for instance, Finland [28] and Poland [29]).

¹ *Accessibility of the Baltic Sea Region Past and future dynamics. Final Report, November 2018* URL: https://vasab.org/wp-content/uploads/2019/07/VASAB_Accessibility_Report_2018.pdf (accessed 11.09.2021).

An interesting insight into transport connectivity, particularly accessibility to various social services, is the publication by Mert Kompil et al. [30]. They summarise earlier findings on maximum admissible distances and travel times between settlements and cities as central places providing various services, i.e. measure accessibility to basic services, such as schools, hospitals, public libraries, railway stations etc. Moreover, the authors justify their criterion-based approach to identifying maximum accessible distances to central places (Table 1).

Table 1

Typology of service centres and relevant population and distance criteria

Service centers	Optimal population of a catchment area, people	Ideal distance to a central place, km	Minimum population of a catchment area, people	Maximum admissible distance to a central place, km
Local central places providing access to primary schools, small medical practices, childcare and sports facilities, small markets etc	10,000	2.5	5,000	5
Subregional (municipal) central places providing access to secondary schools, hospitals, theatres, cultural organisations, supermarkets, specialised markets etc	100,000	10	50,000	25
Regional central places providing access to specialised educational and healthcare institutions, large sports and cultural institutions, public organisations, high-tech services etc	1,000,000	50	500,000	100

Source: [30].

This approach succeeds in measuring the quality of life in the catchment areas of central places of different levels, as well as in identifying the potential of central places themselves. The overpopulation of a catchment area will adversely affect the quality and accessibility of services for all. Yet, the underpopulation of a catchment area will render its facilities inefficiently and impede the socio-economic development of central places. Different parameters can be used to assess transport accessibility. The most frequently used criteria are distance (between a settlement and the central place), time (time of travel between a settlement and the central place), fare (the average cost of travel between a settlement and the central place), quality (satisfaction with the quality of public transport services and infrastructure), and organisation and infrastructure (frequency of bus services between a settlement and the central place). The criteria are usually chosen according to the research objectives or the specialisation of the researcher. Most economic geographical studies use the criteria of distance and time.

Methods

Our study used the time interval as the basic criterion for assessing transport accessibility. It measures the total travel time from a settlement to a city via a public road, with speed limitations taken into account. The distance was assumed as covered by a private car rather than a public bus. The travel time was computed without considering traffic congestion, which is a variable. Including the traffic situations into a calculation requires a series of experimental measurements at different times of the day and on many days. Doing so would have been problematic within this study. The time criterion was chosen over distance because the latter is a quantitative parameter of transport accessibility, whilst time is a qualitative one, allowing for the standard condition of the road infrastructure. GIS tools were used to prepare maps showing isochronous lines for towns of the Kaliningrad region. Drawing on earlier research and the working papers of the European Commission,² we selected optimal time intervals for towns of different hierarchical levels. For Kaliningrad, the regional centre, the access time interval was 60 minutes. For all the other towns, almost all of which³ are centres of municipalities offering a variety of services, this interval was 30 minutes. All the calculations were performed from the centres of the towns.

² Dijkstra, L., Poelman, H. A harmonised definition of cities and rural areas: The new degree of urbanization. *Regional Working Papers* WP 01/2014. URL: http://ec.europa.eu/regional_policy/sources/docgener/work/2014_01_new_urban.pdf (accessed 19.08.2021).

³ Exceptions are the town of Primorsk, which does not have the status of a municipality, and the village of Yantarny, which is the centre of a municipality but not a town. Isochrones, however, were calculated for Yantarny as well.

The study used statistical data on population change from 2010 (census results) to 2020 (population statistics as of 1 January 2020) for 1068 settlements of the Kaliningrad region (excluding the towns and the village of Yantarny).⁴

Although settlement population statistics are often imperfect (they record registrations in a settlement, whilst the registered people may live elsewhere), we have to use these data because of their availability and extensive coverage. A more informative source could be mobile phone data [31] or survey results. The former, however, are not in open access, whilst the latter require significant time to be collected, analysed and interpreted.

The distance and time of travel using public roads to the municipal centre and Kaliningrad were calculated for each settlement. The GIS calculations were calibrated using the Yandex.Maps and Google Maps web mapping platforms.

Results

According to the statistics as of 1 January 2021, the 1,018,624⁵ strong population of the Kaliningrad region was distributed across settlements of different types as follows: 493,256 people (49 per cent of the total number) lived in Kaliningrad, the administrative centre; 298,814 (29 per cent), in the 22 towns of the region; 226,554 (22 per cent), in its rural areas.

As of 1 January 2020, there were 1,068 settlements in the Kaliningrad region, of which 467 (43.7 per cent) had fewer than 50 residents. The 2010 census recorded just 444 settlements with such a small population (41 per cent). Over half the regional settlements (559) were losing population in 2010–2020. There were only 36 settlements (3.3 per cent) with a population of over 1,000 and 112 (10.5 per cent) over 500. The most populous settlements were Vasilkovo (4,257 people), Maloe Isakovo (3,266) and Bolshoe Isakovo (3,262). All three border the administrative centre, Kaliningrad, and attract a substantial number of people. In 2020, 19 villages did not have any popu-

⁴ Official statistics on the number of settlements are different from the official data provided by the authorities (Appendix No. 1 to the Order of 5 February 2020 No 12—3p On Compiling a List of Rural Settlements of the Kaliningrad Region and a List of Rural Agglomerations of the Kaliningrad Region, signed by Governor of the Kaliningrad region Anton Alikhanov. The regulation lists 1042 rural settlements. This discrepancy is most probably explained by differences in methodological approaches to cataloguing settlements. Since we used population statistics in our study, we opted for the qualitative assessment from the official statistics services.

⁵ Rosstat. Population estimate as of 1 January 2021 and the 2020 average. URL: https://web.archive.org/web/20210319185917/https://rosstat.gov.ru/storage/mediabank/wJkrbrPg/Population2021_Site.xls (accessed 27.09.2021).

lation; most were located in the periphery — the Krasnoznamensk, Ozersk, Pravdinsk and Chernyakhovsk municipalities. Along with deserted villages, whose official population is zero, there are settlements with fewer than ten people as of 1 January 2020. Thus, ghost villages may account soon for as much as 10 per cent of all settlements.

The largest city in the region, Kaliningrad, provides access to services and facilities befitting a regional central place. The time interval used in the diagram map was 60 minutes. This is the optimal time people are ready to spend commuting to Kaliningrad or travelling to the city to get regional-level specialised services. The 60-minute zone includes 11 towns, one urban-type settlement (Yantarny) and 510 villages (almost half of all regional settlements) (Fig. 1). The total population of the latter was 131,500 people as of 1 January 2020. In 2010–2020, their official population increased by 13,500 people (unofficial estimates put the figure as high as 50,000). The population of the 60-minute zone, including that of the regional centre, is almost 700,000 people. The typology of central places proposed by Kompil et al. (Table) views Kaliningrad as a regional centre with potential for further population increase. Such growth is usually accounted for by intraregional migration from the periphery to central municipalities bordering the agglomeration and extra-regional migration to the same districts [32].

The 60-minute travel time is also a viable criterion to identify the boundaries of the Kaliningrad agglomeration, whose development has received attention from many Russian researchers [33; 34].

If the transport accessibility of all settlements in the Kaliningrad region to municipal central place is considered, the optimal time interval is 30 minutes of travel via a public road. Most transport flows from any settlement are directed towards the municipal centre, which provides various public and municipal services. Yet, there are emerging but steady flows towards the nearest town offering services that do not require an administrative status (those of sports and recreation clubs, specialised stores and markets, cultural organisations etc.).

To visualise the transport accessibility of municipal central places, we drew a diagram map (Fig. 2) of 30-minute accessibility to each town, including Kaliningrad and Yantarny, the administrative centre of its municipality, albeit without an urban status. The 30-minute zone encompasses 940 out of the 1068 regional settlements and has a total population of 208,000 people (92 per cent of all regional rural residents).

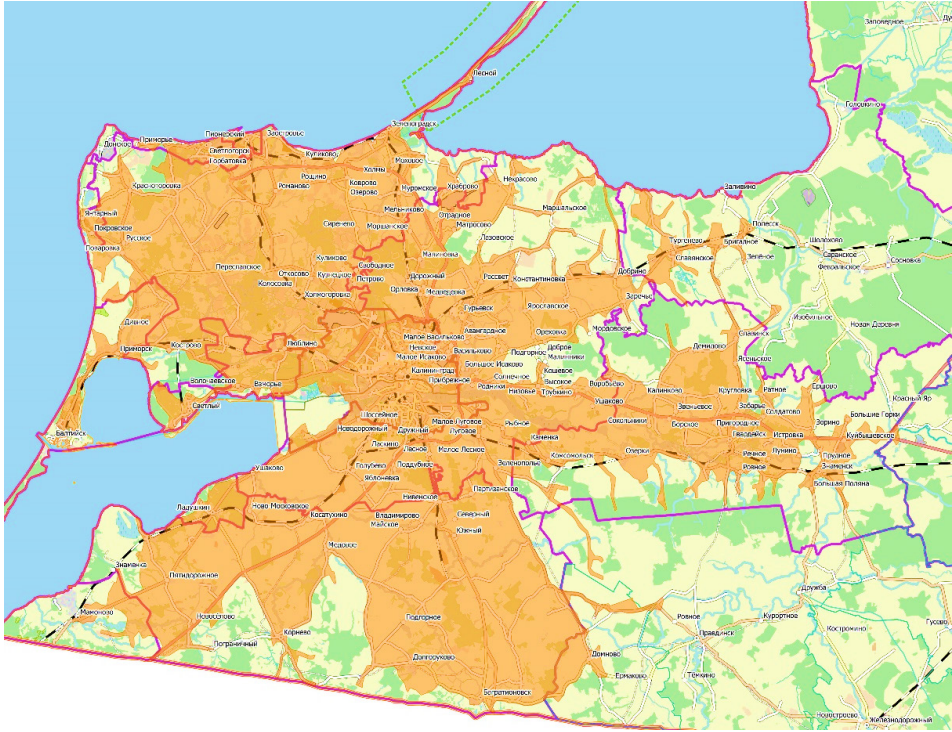


Fig.1. Transport accessibility to Kaliningrad, the administrative centre (60-minute accessibility via public roads)

On the one hand, these results point to good connectivity across the region: almost all regional residents can reach the nearest town in 30 minutes to get municipal services and visit various organisations. On the other hand, if the sustainability of the region's municipal centres is viewed from the perspective of the catchment area population, there is a risk that these centres will decay because of their sparse populations. For example, the second-most populous town in the region, Sovetsk, has a catchment area of 50,000 people, including its own residents (38,500 people) and those of the nearby towns of Slavsk and Neman. Since 50,000 is the minimum threshold for a subregional centre, Sovetsk does not have the resources needed to function as one — its consumer market is rudimentary. The situation in the towns of Chernyakhovsk and Gusev is even worse: none of them has a sufficient population within the 30-minute catchment area (it does not exceed 40,000 people). Another problem is that the two towns are just 28 minutes away from each other, and their functions of municipal central places overlap. As a result, neither has a large enough customer market to generate demand commensurate with a subregional status.

The other towns in the regional periphery, albeit enjoying the status of municipal centres, perform the functions of local central places. For instance, the 10-minute catchment area of Ozersk, the town included, has a population of about 5,000 people, which is the minimum threshold for local central places. In Krasnoznamensk, this figure is 4,200 people; in Nesterov, 7,500. Thus, a small consumer market limits the opportunities for development in these towns, whose urban status is nominal, divorced from the functions they perform.

The prospects are the bleakest in settlements lying beyond the 30-minute catchment area of any town. There are almost 188 of them in the region (about 10 per cent). Approximately 18,000 people are registered there, although much fewer people live in these villages. Twenty-two have below ten residents, which renders them ghost villages. The most populous rural localities in the category are Korenevo in the Bagrationovsk district (1956 people) and Komsomolsk in the Gvardeysk district (1352 people). All these villages can be divided into two subcategories. The first comprises those located in central municipalities (the Cherenyakhovsk, Gvardeysk, Guryevsk and Zelenogradsk districts) but away from principal regional transport corridors. Despite their location in the vicinity of the main centres, their transport connectivity is poor because of the inferior quality of the regional transport infrastructure. Komsomolsk, lying at a distance of 26 km from both Kaliningrad and the municipal centre, makes an interesting case. Despite this proximity, the village is situated far from the motorway linking Kaliningrad and Gvardeysk, and the travel time to either centre is 35 minutes. Overall, there are 31 such villages; 14 of them have a population of over 100 people. Their prospects will brighten if their transport connectivity to the nearest towns improves. This condition can be met by modernising the transport infrastructure (reaching higher design speeds).

The second subcategory includes villages in the border periphery of the region, remote from central places and suffering from poor transport connectivity (the few roads they have are of inferior quality). These are villages of the Polesk, Slavsk, Krasnoznamensk, Nesterov, Ozersk, Pravdinsk and Bagrationovsk districts. They are home to 11,000 people living in substandard conditions. The settlements were losing residents (in 2010–2020, their total population decreased by 500 people according to the official data), becoming invisible in the socio-economic space of the region. This state of affairs is further aggravated by the border position of most of these settlements. The local compression of the socio-economic space along the national border of the Kaliningrad region complicates control over the boundary (this problem, however, is becoming less acute as remote monitoring methods are improving and border services are

growing more mobile). At the same time, local compression contributes to illegal activities across the border (locals violate the border). Precluding locational compression of the socio-economic space along the state border requires prompt measures to improve transport connectivity between settlements and nearby towns, such as launching road infrastructure projects and increasing the frequency of public transport services. Until these actions have been taken, comprehensive projects giving these areas new functions (for example, turning an agricultural municipality into a tourist destination) cannot be run.

Conclusion

The small Kaliningrad region, most of whose territory is involved in economic activities, has transport connectivity above the national average. Still, trends towards population concentration in the Kaliningrad agglomeration, towns incapable of normal functioning as municipal centres, the decay of the rural settlement system and the compression of regional socio-economic space are present in the region, albeit at a smaller scale than throughout the country.

The Kaliningrad has not exhausted its potential for growth as a regional centre. Its 60-minute catchment area, whose optimal population size is 1,000,000 people, has now 700,000 residents.

Regional towns, which should perform the functions of subregional central places in the periphery and semi-periphery, lack necessary human resources. The most successful town is Sovetsk, whose 30-minute catchment area is home to 50,000 people — the minimum threshold for a subregional centre. Yet, the demographic trends of the past ten years show that the area's population tends to decline, and a decreasing population is a threat to Sovetsk as a subregional centre. Nor do the other two large towns in the east of the region, Chernyakhovsk and Gusev, do not have a sufficient consumer market. Moreover, their geographical proximity makes them compete for the same market and impede each other's development. Smaller towns in the periphery, although having a status of municipal centres, perform local functions and have bleak prospects.

The 30-minute catchment area of regional towns encompasses 940 of the 1068 settlements; they have a total population of 208,000 people or 92 per cent of the region's rural residents. Thus, transport connectivity is high in the region. Still, about 18,000 people live in 118 villages located beyond the 30-minute catchment area. On the one hand, these figures are not critical for the Kaliningrad regional settlement system. On the other, the current situation contributes to socio-economic compression in the periphery, i.e. the border zone along the national border

of Russia. The socio-economic decay of the border area impedes cross-border cooperation, such as running joint transboundary projects supported by Russia and the EU.

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