



DEVELOPMENT OF LOGISTICS INFRASTRUCTURE IN THE FUNCTIONAL ZONE OF TRI-CITY AGGLOMERATION IN THE CONTEXT OF DEMOGRAPHIC CHANGES

GRAŻYNA CHABEREK-KARWACKA^a, ALEKSANDRA CICHARSKA^b

^a *WSB University in Torun, Poland*

^b *University of Gdansk, Poland*

ABSTRACT

The aim of this paper is to analyze sufficiency of pace and directions of logistics infrastructure development in the context of demographic changes being observed in the functional zone of Tri-city Agglomeration. Twelve administrative units approved by the Spatial Management Plan of Pomorskie Voivodship which constitute the functional area of Tri-city Agglomeration have been subjected to the analysis over the period 1995-2014. The analysis has shown that the pace of logistics infrastructure development is much slower than the pace of the population growth. However, some positive changes are observed in this matter which influence relatively fast development of communities comprising the functional zone of the agglomeration.

INTRODUCTION

In the time when intense demographic changes, including a rapid urbanization process, are taking place in the areas surrounding the largest cities, logistics infrastructure of these areas has changed as well. It is one of the factors which influence behavioral tendencies in those areas (Kajdanek 2011). However, it is the bi-directional migration that has had the most important role in this process. It is worth mentioning that nowadays the most intense changes can be observed outside city centers and in Tri-city they are taking place in its functional zone. The goal of the article is to analyze how the pace

ARTICLE INFO

Available online 1 January 2016

Keywords:

logistics infrastructure,
demographic changes,
Tri-city Agglomeration,
Tri-city metropolitan area,
Pomorskie Voivodship,
suburbanization.

JEL Classification: R2, R4.

DOI: 10.19197/tbr.v14i1.16

and directions of development of logistics infrastructure, mainly transportation match the demographic change of the functional area of Tri-city.

The analysis was performed on data collected between 1995 and 2014. During this period, many different socio-economic changes took place which influenced demographic profiles of both rural and urban areas. On-going social phenomena are connected with clearly visible changes in the scope of demographic structure. The most fundamental ones are modification of parental patterns and fertility rates, intensification of professional activity and changes in working conditions. Nowadays, it is quite common for people living in rural areas to abandon farming in favor of education. Their demands for socio-economic services provided only in cities have also increased. That is why migration toward cities and urban areas was a common practice in the last decades (Kok 1999). In the 1990's, people living in city centers started to migrate towards suburbs. However, this migration was not associated with the need to make a lifestyle change or willingness to improve living conditions or even with a temporary trend for single-family houses. Obviously, some financial incentives are also of importance, as prices of properties and land are much lower in the suburbs than in agglomeration centers

People moving to rural areas surrounding a metropolis do not typically give up urban lifestyle. The nearest city is still the place to work and the place where they satisfy their other economic and social needs, such as health care, education and culture. Thus, such migration patterns involve the necessity to commute (Grava 2003).

The abovementioned processes require people and goods to be physically moved. This movement is possible thanks to proper tools and techniques and infrastructure which support this movement (Howes, Robinson 2005). The basic element of movement is a broadly understood transportation system in a particular region. Additionally, transportation processes can be supported and replaced by different means of communication. Transportation systems together with other components of communication networks, are parts of a logistics system. That is why this paper asks a question regarding the role that logistics systems play in a suburbanization process and the impact they have on demographic changes.

As the phenomenon of residential migration is especially intense in the areas which directly border the core of agglomeration (Zebik 2011), the authors focused on the demographic and infrastructural changes which take place in the functional zone of Tri-city Agglomeration. The area of the functional zone was delimited in the Spatial Management Plan of Pomorskie Voivodship.¹ The zone was delimited taking spatial, socio-economic, legal, political, ecological, functional and technical conditions under consideration. On this basis, within the the Spatial Management Plan, the following zones were demarcated: the core of agglomeration, the functional zone of agglomeration, the outer zone of agglomeration and the potential zone of agglomeration (Fig. 1). With this delimitation in mind, an analysis has been performed for the cities of Rumia, Reda, Wejherowo and Tczew, an urban-rural community of Żukowo and rural communities of Kosakowo, Wejherowo, Szemud, Kolbudy and Pruszcz Gdański. The analyzed zone is sdirect-

¹ *Plan Zagospodarowania Przestrzennego Województwa Pomorskiego*. Załącznik do uchwały nr 1004/XXXIX/09 Sejmiku Województwa Pomorskiego z dnia 26.10.2009. Gdańsk.

ly and strongly linked to Tri-city and it is characterized by a high rate of everyday relations, common public infrastructure and intense ongoing processes of suburbanization.²

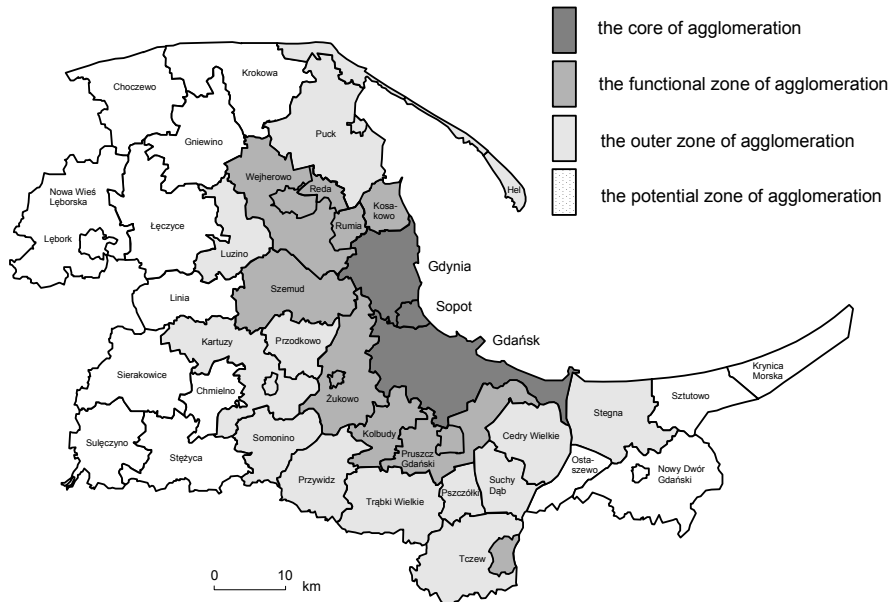


Figure 1. The area of Tri-city Agglomeration

Source: own elaboration on the basis of the *Spatial Management Plan...* 2009.

LOGISTICS INFRASTRUCTURE AND SPATIAL MOBILITY OF POPULATION

The functional zone of Tri-city Agglomeration provides many different services to its citizens and commuters. In order to meet the needs of the above-mentioned groups of people in specific time and place, usability condition shall be fulfilled for all broadly understood resources participating in this process: material ones – devices, tools, products, buildings etc.; human – employees (contractors) and recipients (who report the needs); indicative; financial, etc. It has to be assumed that at any point in a given area which offers the opportunity of meeting a particular human need (satisfying a particular demand), all the necessary resources of proper quality and quantity have been gathered in the proper time and place. Processes which allow providing all these indispensable resources and gathering them in a proper time and place, considering the lowest possible cost of doing so, are called logistics processes (Chaberek 2006). Their effectiveness depends on a broadly understood infrastructure. Logistics processes along with infrastructural tools create a logistics system.

² Stanowisko Zarządu Województwa Pomorskiego w sprawie delimitacji Miejskiego Obszaru Funkcjonalnego Trójmiasta do opracowania „Kryteria delimitacji miejskich obszarów funkcjonalnych ośrodków wojewódzkich”, Ministerstwo Rozwoju Regionalnego (luty 2013 r.). Warszawa.

The main component of logistics infrastructure is the transportation system which makes it possible to physically move people and goods. Processes of population and cargo mobility can be partially replaced by the information flow – and that is why, the next significant component of logistics infrastructure is a broadly understood information system (Taniguchi et al 2001). What is more, logistics infrastructure includes also systems of goods and services distribution and other logistics services available on the market. Still, migration is supported mainly by the information and transport infrastructure (Chaberek-Karwacka., Cicharska 2013). Information systems comprise several elements, such as ICT networks, the Internet, hardware and software, electronic and digital systems of data gathering and transferring, standards for data communication and security. Transportation systems comprise linear and point-to-point transport infrastructure, means of transport and loading devices. Motorized individual transportation is the basic way of movement for commuters living in the functional zone of Tri-city Agglomeration. However, nowadays the meaning and accessibility of public transportation is gradually growing.

Taking the abovementioned facts under consideration, when analysing maps and aerial photographs, it is not surprising that residential settlements tend to develop along main roads and railway lines, especially in Pruszcz Gdański, Żukowo, Kosakowo, Rumia, Reda and Wejherowo. These communities are characterized by a large growth in population which generates an increased level of the people's spatial mobility as the centre of agglomeration is still the main place where they work, study and spend their free time.

LOGISTICS INFRASTRUCTURE ACCESSIBILITY AND DEMOGRAPHIC CHANGES

The last two decades brought intense demographic changes to Poland. In Pomorskie Voivodship as well as in many other regions, a systematic increase in the population growth was observed in areas removed from the center of Tri-city Agglomeration (Cicharska, Karwacka 2012). It is a result of the suburbanization process and because the population living in the above-mentioned areas is more conservative than metropolitan communities that exerts influence over its vital statistics. In this case, matrimonial behavior of people living in Kaszuby is of great importance, but the fact is that the representatives of the 'baby boom' generation have entered reproductive age recently.

In the analyzed period, population of the functional zone of Tri-city Agglomeration grew by 34.0%. At the beginning, in 1995, it was 252.4 thousand, then, by the year 2000, it had increased to 267.0 thousand. Ten years later the population was over 318.4 thousand and in the end of the analyzed period it was 338.4 thousand. In the second half of the analyzed period, the abovementioned trend became more intense, so it can be assumed that the compensation process took place within the agglomeration borders (fig. 2).

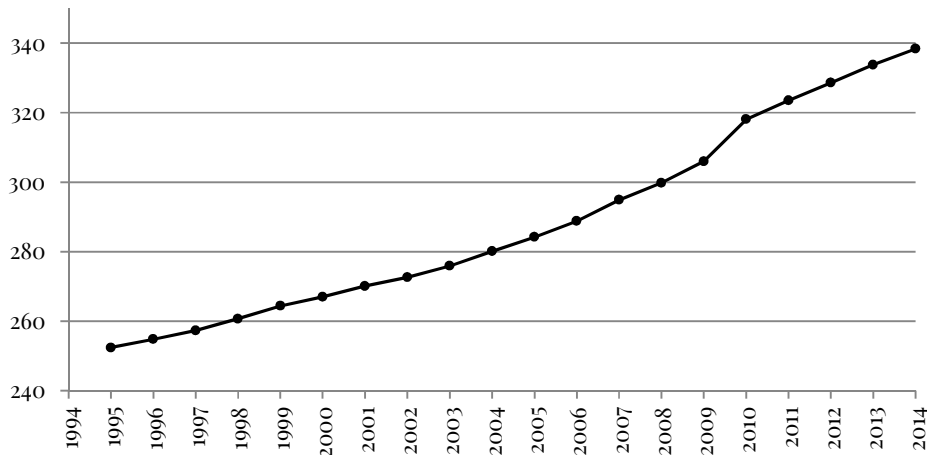


Figure 2. Population of the functional zone of Tri-city Agglomeration [in thousands]
 Source: own elaboration on the basis of the General Statistic Office data; *Bank Danych Lokalnych* [online]. 2015 [Access 20 June 2015]. Główny Urząd Statystyczny: http://stat.gov.pl/bdl/app/strona.html?p_name=indeks.

Analysis of the population growth dynamics for the selected communities showed that the largest growth was recorded in Kosakowo (155.3% in comparison to 1995), Pruszcz Gdański (100.1%), Kolbudy (96.6%) and Żukowo (95.2%). This growth is mainly connected with the development of housing and public infrastructure and with the fact that flats and houses located in the suburbs were relatively cheap. It was also the time when it was trendy to move to the suburbs. As the quality of services provided in the rural areas and transportation accessibility were improving, the suburbs became a place of permanent residence for an increasing number of young adults. However, the nearest large cities and the agglomeration core still remained areas where they work, study and spend their spare time. An average level of population growth was recorded for the cities of Wejherowo and Żukowo, while Tczew is the only unit of the functional zone where a slight decrease was found in the number of residents with permanent place of abode. It should also be noted that in most cases (Pruszcz Gdański in particular) the growth was larger during the second half of the analyzed period. Yet, in the municipalities of Wejherowo and Kolbudy as well as in the city of Żukowo, a noticeable decline was recorded in comparison to the period of 1994–2005 (tab. 1).

Table 1. Population growth dynamics in the functional zone of Tri-city Agglomeration [in %]

Community	2005 (1995=100%)	2014 (2005=100%)	2014 (1995=100%)
Kosakowo	163.4	156.2	255.3
Rumia	110.4	107.1	118.3
Reda	121.3	128.3	155.7
Wejherowo	141.1	128.5	181.2
Wejherowo t.	94.5	111.8	105.7
Szemud	127.0	130.3	165.6
Żukowo	136.0	143.5	195.2
Żukowo t.	121.2	103.8	125.8
Kolbudy	148.6	132.3	196.6
Pruszcz Gdański	129.6	154.3	200.1
Pruszcz Gdański t.	111.6	122.8	137.1
Tczew t.	99.4	100.5	99.9

Source: own elaboration on the basis of the General Statistic Office data; *Bank Danych Lokalnych* [online]. 2015 [Access 20 June 2015]. Główny Urząd Statystyczny: http://stat.gov.pl/bdl/app/strona.html?p_name=indeks.

In the functional zone of Tri-city Agglomeration the rate of natural increase (RNI) is mainly shaped by the fertility rate, as mortality rates remains relatively stable. Although a substantial part the analyzed zone has rural character, in this case it has transformed into a transitional area – typical for suburbs. It substantially influences the rate of natural growth which, on the one hand, is determined by dominant childbearing decisions of young residents, and on the other, by a gradual disappearance of the problem of a usually higher mortality rate among the farmer population (Michalski 2002).

The rate of natural increase in the functional zone of Tri-city Agglomeration was the highest in 2008–2009 when it exceeded 7.0%. It was related to the fact that numerous representatives of the 1980's "baby boom" generation entered parental age. A substantial percentage of them moved to the Tri-city suburbs during that period. We should also add that it was the largest increase of the RNI since 1995 (6.5%) which, in a way, recompensed a moderately worse situation of the matter recorded for 2002–2003. At the end of the period analyzed, the rate fell below 6.0% and in the nearest decade it may remain at the same level (Fig. 3). When analysing the communities of the functional zone of Tri-city Agglomeration, Szemud (12.0‰ in 1995; 8.9‰ in 2014) and Wejherowo (11.6‰ in 1995; 8.4‰ in 2014) merit particular attention as these are regions where the RNI remained on a high level during the whole period. However, in the city of Żukowo, a significant rate decrease was recorded as the RNI was 10.4‰ in 1995; 9.0‰ in 2004 and 4.1‰ in 2014. The city of Tczew, which is not directly influenced by the centre of agglomeration, is in the worst situation. An average rate of natural increase in Tczew was 2.1‰ in 1995–2014 and it has shown a downward trend. It may be explained by an unfavorable structure of population and broadly understood life conditions which influence parental and migration decisions and a demographic profile of Tczew. It is worth mentioning that none of the analyzed communities recorded a natural population drop during that period.

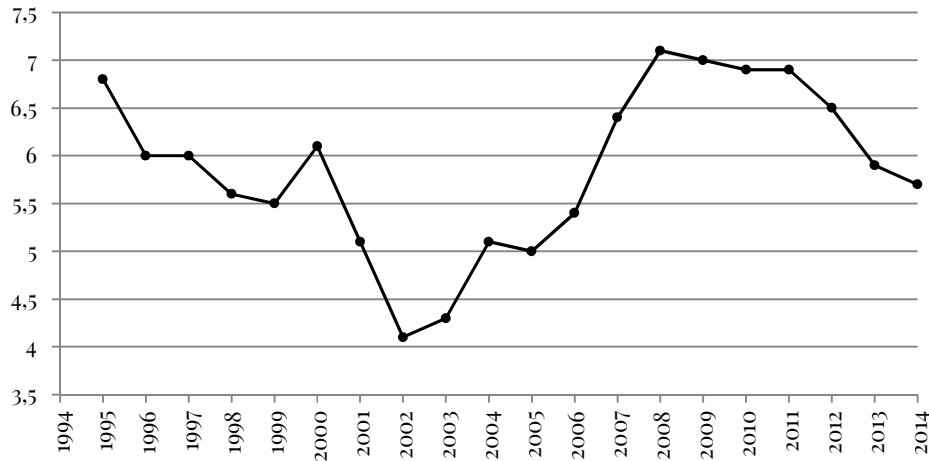


Figure 3. Changes in the rate of natural increase in the functional zone of Tri-city Agglomeration [in %]

Source: own elaboration on the basis of the General Statistic Office data, *Bank Danych Lokalnych* [online]. 2015 [Access 20 June 2015]. Główny Urząd Statystyczny: http://stat.gov.pl/bdl/app/strona.html?p_name=indeks.

Migration towards the functional zone of Tri-city Agglomeration has accelerated and it is mainly connected with an expanding offer of the property market. However, this trend may stagnate in the nearest future. Probably, the current trends may continue in the northern (Kosakowo, Wejherowo) and southern (Pruszcz Gdański) parts of the zone which attract the largest number of newcomers from Gdańsk and Gdynia. In the last decade, which played a key role in shaping the net migration rate, the highest rates were recorded for the community of Kosakowo (2003 – 29.3‰; 2013 – 51.1‰) and Pruszcz Gdański (2003 – 19.9‰; 2013 – 44.8‰). A marked deceleration in the newcomers' inflow was observed in the communities of Kolbudy and Szemud, while in Rumia and Wejherowo a net migration loss was recorded at the end of the period analyzed. Yet, the situation can be considered alarming only in Tczew (2003 – -2.3‰; 2013 3.6‰) – the only city of the functional zone which may depopulate in the future.

It is also worth mentioning that the ones who are more mobile and more flexible to move are the residents of large cities – Gdańsk and Gdynia in this case (Cicharska 2011). It is more difficult to make such a decision for people living in rural areas (that is, in the potential zone of agglomeration) and for those who have never considered migration before, but they are in a difficult socio-economic situation. That is why support programs aimed at increasing entrepreneurship and social integration are becoming more and more popular, especially those concerning people threatened by social exclusion (Czapiewska 2010). Such programs may improve their quality of life, defer migration decisions, increase attractiveness of the areas being under these programs, influence their social and economic development and attract more residents what will make the functional zone of Tri-city Agglomeration much larger.

Particular attention shall also be paid to the fact that with the assumption that people migrate because they have difficulties with finding employment, the main direc-

tion of migration are the largest cities of the region. However, technological progress and development of the road networks which are supported by some large local companies (also in the rural communities) enhances the prospects of better life quality and it delays the migration perspective at the same time. Better quality of logistics infrastructure makes it possible for people living in the peripheries not to change their professional profiles and to work in places which are far away from the place of their permanent residence. Thus, when considering the commuting balance (Fig. 4), in comparison to 2006, of Tri-city Agglomeration, it becomes obvious that it is positive for area within the boundaries of the largest urban organisms (type A). In this matter, the situation of the communities incorporated with the functional zone of Tri-city Agglomeration is varied. Outside the two cities – Żukowo and Pruszcz Gdański, where a relatively high percentage of working residents are employed in their place of residence, a majority of people living in the other communities have to commute – mainly to Tri-city. In concerns both type B (Kosakowo, Wejherowo, Żukowo, Pruszcz Gdański) and type C (Reda, Rumia, Szemud, Kolbudy) units where it is very difficult to find a job. Nonetheless, the toughest situation can be observed in the area which was marked in the Spatial Management Plan of Pomorskie Voivodship as the potential agglomeration zone. This zone mainly consists of rural communities. Type D units usually face socio-economic difficulties and that is why it is so important to provide them with proper support. Their development demands a higher level of public spending.

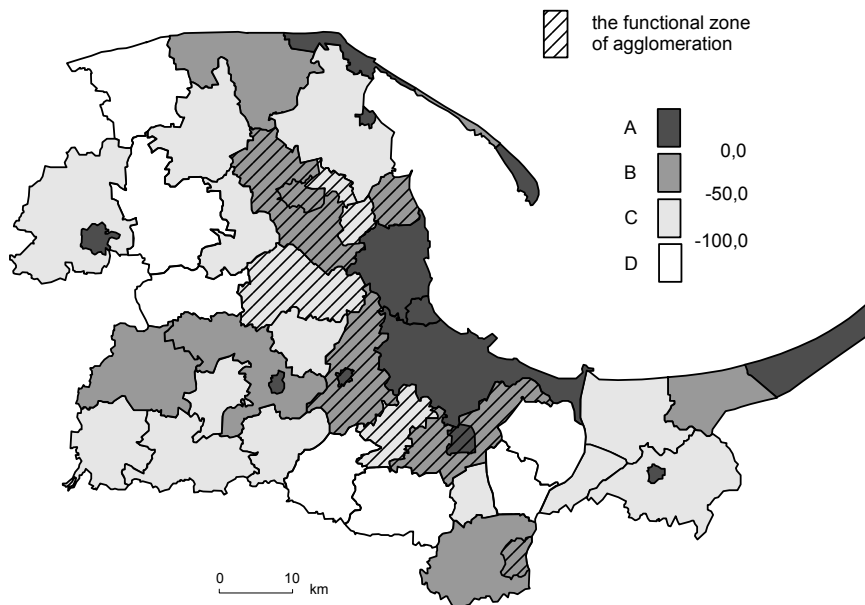


Figure 4. Commuting balance of Tri-city Agglomeration [per 100 employed]

Source: own elaboration on the basis of the General Statistic Office data, *Bank Danych Lokalnych* [online]. 2015 [Access 20 June 2015]. Główny Urząd Statystyczny: http://stat.gov.pl/bdl/app/strona.html?p_name=indeks

The demographic analysis presented above makes it possible to distinguish three communities with the highest demographic potential, namely, Kosakowo, Pruszcz Gdański and Żukowo. They are characterised by the highest dynamics of population inflow, a noticeable rate of natural increase and a positive net migration rate. The logistics of infrastructure quality in these communities, namely, technical condition and accessibility of its components gives their residents a possibility to successfully pursue the logistics processes although they live in remote areas. Analysis of maps depicting particular regions of the functional zone has shown that new housing developments emerge not only along the main roads linking the suburbs and the centre of agglomeration, but also in some remote rural areas where logistics infrastructure is not well developed yet.



Figure 5. Localization of Kosakowo community in relation to the elements of logistics infrastructure

Source: Kosakowo – OpenStreetMap; *Kosakowo* [online]. 2015 [Access 20 June 2015]. OpenStreetMap: <https://www.openstreetmap.org/relation/1555427>.

The community of Kosakowo is the most interesting case (fig. 5). It is a rural region directly bordering Gdynia which has the highest population growth not only among the communities comprising the functional zone of Tri-city Agglomeration, but also in the whole Pomorskie Voivodship. It is also a community where transportation accessibility has been improving in the recent years giving its residents an opportunity to get to the city centre of Gdynia more easily. A distinctive feature of this region is the domination of housing developments accumulated along the main road directly linking the community and the city of Gdynia. In the last few years we could observe that even villages of lower transport accessibility which are located in Kosakowo community were becoming more and more popular places to live, such as Suchy Dwór, Mechelinki and Dębogórze. Notwithstanding, we must emphasize that although the main road has been modernized, new bike lanes have been constructed and the components of informatic system have definitely improved, fast pace of the suburbanization process exceeded the pace of logistics infrastructure development a long time ago. It resulted in many communication problems which can be observed also in other communities of the functional zone – especially in areas lacking access to the railway network. The best possible solution to this problem will be to enlarge the network of the Pomeranian Metropolitan Railway which may contribute to improvement in quality of life of their residents (less pollution from road traffic, faster commuting) and visitors – after opening Airport Gdynia-Kosakowo.

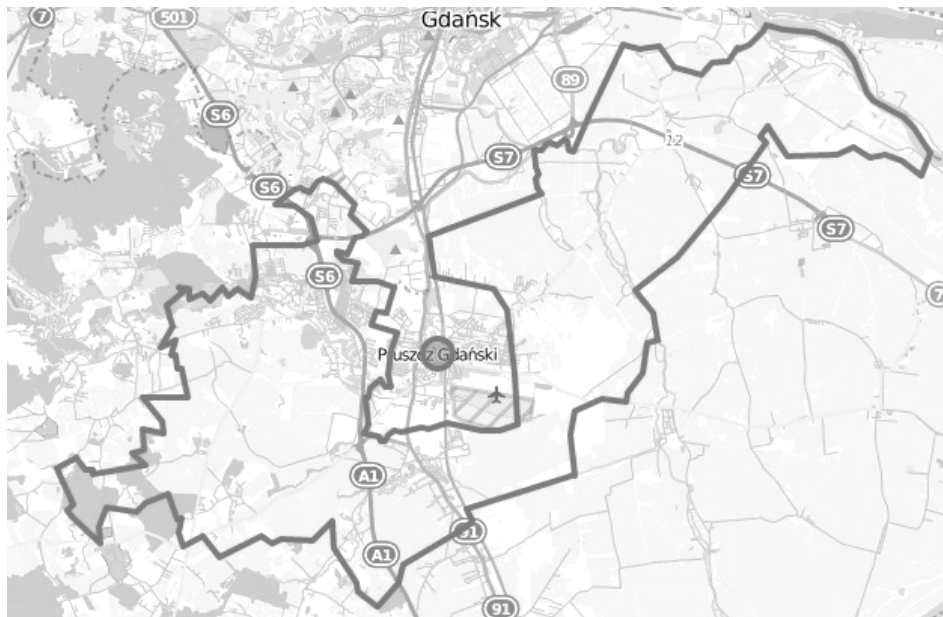


Figure 6. Localization of Pruszcz Gdański community in relation to the elements of logistics infrastructure

Source: Pruszcz Gdański – OpenStreetMap; *Pruszcz Gdański* [online]. 2015 [Access 20 June 2015]. OpenStreetMap: <https://www.openstreetmap.org/relation/1561927>.

Although the dynamics of population growth in the rural community of Pruszcz Gdański is not as high as in Kosakowo, it is also considered significant from administrative point of view in the context of demographic changes and logistics infrastructure development. Villages comprising this community are quite dispersed, yet housing developments, both single-family and large housing estates, are concentrated mainly in the south-east part of the area (Fig. 6) where Borkowo (neighbouring the city of Gdansk), Straszyn and Rotmanka (near Pruszcz Gdański) are located. The abovementioned area has a direct bus connection with the capital city of Pomorskie Voivodship what makes it an attractive place to live. A similar situation can be found in Cieplewo where public transportation system is train-based. If nothing else, it is the accessibility factor that seems to be one of the most important reasons why the number of people who moved to Pruszcz Gdański has increased – although its transportation system still needs some improvements, especially in terms of trains frequency. Access to S6 and S7 express roads and to Highway A1 (Amber Highway) is another factor conditioning its development. During the last twenty years many local and provincial roads were modernised as well, what highly enhanced safety and comfort of driving.

Żukowo community is another administrative unit of the functional zone of Tri-city Agglomeration with a great demographic potential. The inflow of people, moving mainly from the agglomeration centre, started at the beginning of the 1990's and the primary motivation behind these migrations were low prices of properties and land. The urban-rural community of Żukowo is well connected with Gdańsk – via national road No. 6 and with Gdynia – via national road No. 20 (Fig. 7). Commuters may also use public transportation; however, the system seems to be insufficient. Daily traffic jams are the largest problem as there aren't enough access roads linking the city of Żukowo and the surrounding villages. The community is situated near Gdańsk Airport, but as Żukowo is not perceived an attractive place for tourists, this vicinity does not matter in the context of its development. It is also worth mentioning that a metropolitan bypass³ which is to be constructed in the future will probably have a negative impact on demographic situation of Żukowo community. Although its transportation accessibility will undoubtedly increase, its residents who appreciate the rural lifestyle may not be satisfied with the decreasing quality of life. For instance, in Chwaszczyno, several houses will be demolished, some farms and companies will be closed down despite the fact that they are the main source of income for many local people.

It can therefore be concluded that transportation infrastructure influences migration behavior. At the same time, it seems that information infrastructure does not. Access to telephone lines and to the Internet is still limited in many rural areas. The problems are connected with wireless network coverage and sometimes it is impossible to connect new users to wired networks, either. IT communication system still cannot compete with or complement transportation systems as the solutions they offer (such as telecommuting) (Vescoukis, Stratigea, Giaoutzi 2012) are not popular enough. Yet, it should be remembered that successive development of logistics infrastructure depends on population changes and it should meet the needs and requirements of people.

³ *Obwodnica Metropolitalna* [online]. 2015 [Access 20 June 2015]. Chwaszczyno: <http://www.chwaszczyno.pl/wiadomosci-wszystkie/obwodnica-metropolitalna.html>.

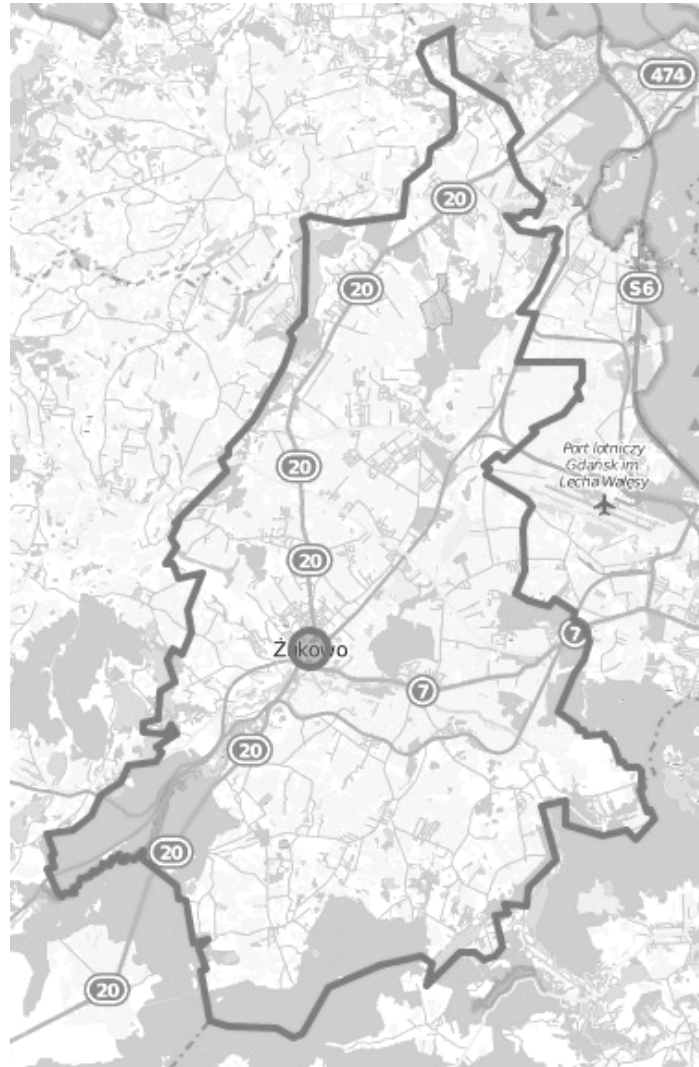


Figure 7. Localization of Żukowo community in relation to the elements of logistics infrastructure

Source: Żukowo – OpenStreetMap; *Żukowo* [online]. 2015 [Access 20 June 2015]. OpenStreetMap: <https://www.openstreetmap.org/relation/1584925>.

SUMMARY

As proven by the analysis, the logistics infrastructure connecting the functional zone of Tri-city Agglomeration with its core develops slower than required by the intense demographic changes taking place in the region. As a result, it does not influence migration behavior of people living in Gdańsk, Gdynia and Sopot and it does not affect migration in the outer communities, either. In fact, migration movements are triggered main-

ly by constant demographic changes visible in the analysis of vital statistics and population structure. However, there is no data clearly confirming that people moving to the analyzed communities do not take the transportation possibilities under consideration when making decisions on changing their place of residence – this issue shall be researched in more details in the future. Although the quality of the existing logistics infrastructure strongly affects the quality and time of the commuting process, it seems that the main migration motivation is still the availability and price of land and dwellings. Daily commuting becomes a problem after moving and it can be assumed that it was not taken under consideration by most people who move.

Despite the fact that the pace of logistics infrastructure is not as intense as the pace of population growth, lots of positive changes can be observed in this matter. In the next ten years the inflow of people shall remain at the same level – especially in the communities of Kosakowo and Pruszcz Gdański. Most probably, the city of Tczew will depopulate as its citizens will move to the communities situated nearer Tri-city. Governing bodies in the communities comprising the functional zone of Tri-city Agglomeration should remember that it is necessary to continuously develop the network of roads, make the public transportation system more accessible and enhance the information system as well. Failing to do so or delaying new investments in this respect may stop or slow down the migration process which, in turn, may lead to a slowdown in development of the suburbs and to their disconnection with Tri-city.

REFERENCES

- Bank Danych Lokalnych. (2015). Retrieved from http://stat.gov.pl/bdl/app/strona.html?p_name=indeks.
- Chaberek, M. (2006). Funkcje logistyki w stymulacji porządku systemów gospodarczych. *Zeszyty Naukowe Uniwersytetu Gdańskiego. Ekonomika Transportu i Logistyka. Modelowanie procesów i systemów logistycznych*. V.
- Chaberek-Karwacka, G. & Cicharska A. (2013). Wpływ rozwoju infrastruktury logistycznej na zmiany ludnościowe obszarów wiejskich otoczenia aglomeracji gdańskiej. *Zeszyty Naukowe Uniwersytetu Gdańskiego. Ekonomika Transportu i Logistyka nr 46. Modelowanie procesów i systemów logistycznych*. XII.
- Cicharska, A. (2011). Demographic transformations of polish metropolises (Tri-City case study). *Analele Universității din Oradea - Seria Geografie*. 1.
- Cicharska, A. & Karwacka G. (2012). The aspects of the peripheral areas development in the Pomeranian Region. In T. Michalski. & A. Radchenko (Eds.). *Global, Continental, National and Regional Conditions of Local Development*. Gdańsk-Kharkiv: ADNDU.
- Czapiewska, G. (2010). Aktywność i integracja społeczna mieszkańców wsi województwa pomorskiego. In: E. Kacprzak, A. Kołodziejczak (Eds.). *Rola środków Unii Europejskiej w rozwoju obszarów wiejskich*. Warszawa: IGiPZ PAN.
- Grava, S. (2003). *Urban transportation Systems. Choices for communities*. New York: McGraw-Hill.
- Howes, R. & Robinson H. (2005). *Infrastructure for the Built Environment. Global Procurement Strategies*. Oxford: Elsevier.
- Kajdanek, K. (2011). Suburbanization in Poland - a socio-spatial landscape. *Przegląd Socjologiczny*. 60(2/3).

- Kok, H. (1999). Migration from the city to the countryside in Hungary and Poland. *GeoJournal*. 49(1).
- Kosakowo. (2015) Retrieved from OpenStreetMap: <https://www.openstreetmap.org/relation/1555427>.
- Michalski, T. (2002). Uwarunkowania sytuacji zdrowotnej ludności wiejskiej w Polsce. In: J. Bański & E. Rydz (Eds.). *Społeczne problemy wsi*. Warszawa: IGIPZ PAN.
- Obwodnica Metropolitalna. (2015). Retrieved from Chwaszczyno: <http://www.chwaszczyno.pl/wiadomosci-wszystkie/obwodnica-metro-politalna.html>.
- Plan Zagospodarowania Przestrzennego Województwa Pomorskiego. Załącznik do uchwały nr 1004/XXXIX/09 Sejmiku Województwa Pomorskiego z dnia 26.10.2009. Gdańsk.
- Stanowisko Zarządu Województwa Pomorskiego w sprawie delimitacji Miejskiego Obszaru Funkcjonalnego Trójmiasta do opracowania „Kryteria delimitacji miejskich obszarów funkcjonalnych ośrodków wojewódzkich”. (2013). Ministerstwo Rozwoju Regionalnego. Warszawa.
- Taniguchi, E., Tompson, R. G., Yamada, T. & Von Duin, R. (2001). *City Logistics. Network Modelling and Intelligent Transport Systems*. Bingley: Emerald.
- Vescoukis, V., Stratigea, A. & Giaoutzi, M. (2012). Teleworking: From a technology potential to a social evolution. *Regional Science Inquiry*. 3-4.
- Zebik, G. (2011). Typology of suburban communities in Poland. *Bulletin of Geography. Socio-economic Series*. 16.
- Żukowo. (2015). Retrieved from OpenStreetMap: <https://www.openstreetmap.org/relation/1584925>.