



SOCIO-ECONOMIC STUDY
OF THE AREA OF INTEREST



AIR TRITIA

2018

Elaborated within the project „SINGLE APPROACH TO THE AIR POLLUTION MANAGEMENT SYSTEM FOR THE FUNCTIONAL AREAS OF TRITIS” (hereinafter AIR TRITIA) (č. CE1101), which is co-financed by the European Union through the Interreg CENTRAL EUROPE programme.

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Citation pattern: FOLDYNOVÁ, I.; HRUŠKOVÁ, A.; ŠOTKOVSKÝ, I.; KUBÁŇ, D. a kol. (2018) *Socio-ekonomická studie zájmového území*. Ostrava: ACCENDO.

Elaborated by: 31. 5. 2018

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List of Abbreviations

AQMS	Air Quality Management System
avg.	average
CZ	Czech Republic
ČOV	Čistírna odpadních vod (wastewater treatment plant)
CZSO	Czech Statistical Office Český statistický úřad
EPA	Environmental Protection Agency Agentura pro ochranu životního prostředí
ES	Evropské společenství (European Community)
ESÚS	Evropské seskupení pro územní spolupráci (European Community for Territorial Cooperation)
ESA2010	The European System of National and Regional Accounts Evropský systém národních a regionálních účtů
ESÚS TRITIA	Evropské seskupení pro územní spolupráci TRITIA s ručením omezeným (European Territorial Cooperation Task Force TRITIA with limited liability)
EU	European Union
EVVO	Environmentální vzdělávání, výchova a osvěta (Environmental education and public awareness)
FUA	Functional ubranisation area Funkční městská oblast
GUS	Główny Urząd Statystyczny
GDP	Gross domestic product Hrubý domácí produkt
Hmms	Hrubá míra migračního salda (Gross migration rate)
Hmpp	Hrubá míra přirozeného přírůstku (Gross natural increase rate)
IS	Index stáří (Age index)
ITI	Integrovaná územní investice (Integrated territorial investment)
KO	Komunální odpad (Communal waste)
LAU	Local Administrative Units Místní správní jednotky
MČ	Městská část (City district)
MHD	Městská hromadná doprava (Public transport)
MRK	Marginalizovaná romská komunita (Marginalized Roma community)
MSK	Moravskoslezský kraj (Moravian-Silesian Region)
MŠ	Mateřská škola (Kindergarten)
MZV	Ministerstvo zahraničních věcí (Ministry of Foreign Affairs)
NO _x	Oxidy dusíku (Nitrogen Oxides)
NPISH	Non-profit institutions serving households Neziskové organizace sloužící domácnostem
NUTS	Nomenclature of Units for Territorial Statistics Nomenklatura územních statistických jednotek
OECD	Organisation for Economic Co-operation and Development Organizace pro hospodářskou spolupráci a rozvoj
ORP	Obce s rozšířenou působností (Entities with extended competence)
OW	Opolské vojvodství (Opole Voivodeship)
PL	Polsko (Poland)
PM	Polétavý prach (Flight dust)
PPP	Purchasing Power Parity Parita kupní síly
PWS	Systém predikce a varování (Prediction and warning system)
REZZO	Registr emisí a zdrojů znečištění ovzduší (Register of emissions and source of air pollution)
SK	Slovensko (Slovakia)
SO ₂	Oxid siřičitý (Sulphur Dioxide)
SUSR	Štatistický úrad Slovenskej republiky Statistický úřad Slovenské republiky (Statistical Office of the Slovak Republic)
SW	Województwo Śląskie Slezské vojvodství (Silesian Voivodeship)

TSO	Organization providing asset management and its maintenance
UK	United Kingdom of Great Britain and Northern Ireland
	Spojené království Velké Británie a Severního Irsku
ÚP	Územní plán (Territorial plan)
USA	United States of America
	Spojené státy americké
ÚSES	Územní systém ekologické stability (Territorial system of ecologic stability)
VKO	Velikostní kategorie obce (Size category of the municipality)
VKP	Významné krajinné prvky (Significant landscape features)
VOŠ	Vyšší odborná škola (Vocational school)
VÚC	Vyšší územní celky (Higher territorial units)
ZSK	Žilinský samosprávný kraj (Žilinský self-governing region)
ZŠ	Základní škola (Elementary school)
ZVHS	Změna správcovství vodních toků (Changing stream management)
ŽP	Životní prostředí (Natural environment)

Introduction

The socio-economic study is elaborated within the framework of the UNIQUE APPROACH TO THE AIR TRANSPORT AIR POLLUTION SYSTEM FOR THE FUNCTIONAL TOWN AREA OF TRITIA ("AIR TRITIA") (No. CE1101), which is aimed at increasing the capacities and possibilities of public administration for decision-making and pollution control of air quality and thus, its aim is to improve air quality in the TRITIA region with a focus on selected cities which air quality is influenced by sources from neighboring countries. The aim of the socio-economic study is to map population distribution according to socio-economic characteristics, including analysis of long-term changes (population aging, migration trends), thus, creating a basis for strategy development, study focusing on the development of all territorial self-governing units in the AIR TRITIA area of interest and on the development of selected pilot cities or towns. Functional Urban Areas (FUA).

A/Main outputs:

1. The output of the project is to elaborate an air quality management strategy proposal for the TRITIA area. The strategy will include technical, legislative and other proposals with a strong focus on a common approach and international cooperation between the different parts of the TRITIA region in the Czech Republic, Slovakia and Poland.
2. The design of 5 strategies for 5 partner cities, namely Ostrava, Opava, Opole, Rybnik, Žilina. It will also include measures to quantify impacts, including assessing the effectiveness of air pollution relief instruments.

B/Created applications:

1. **AQMS - Air Quality Management System:** AQMS is a professional system including relevant spatial data, results of analyzes, results of air pollution modeling, measures, and impacts of air quality measures. It also includes a single spatial database extended to the proposed measures and the impact of the measures on air quality. Information will be accessed via interactive map interfaces. The system will be calibrated for the city of Ostrava.
2. **PWS - Prediction and Warning System:** PWS will provide model information about air pollution 48 hours in advance. The forecasts will be based on air monitoring and meteorological data in detail for each of the five cities. It will mainly focus on situations with extreme air pollution. The information will be accessible via a web browser and a smartphone application.

C/ Analyses, models and studies:

1. **Socio-economic study:** Population distribution study by socio-economic characteristics, including analysis of long-term changes (population aging, migration trends).
2. **Epidemiological study:** Assessing the condition with regard to the health status of the population, with particular regard to respiratory diseases, circulatory diseases and cancer.
3. **Study on the causes of air pollution:** A summary of the current knowledge of the causes of air pollution in the TRITIA region and 5 selected cities, including the mapping of the applied measures to improve air quality.
4. **Analysis of National Legislation and Policies to Improve Air Quality:** Analysis of National Policies and Legislation, including Immediate Changes, with a particular focus on national and regional pollution control, at national, regional and local levels.
5. **Analysis of current EU-funded projects in the area of air:** Report with summary information on similar projects and their results. Recommendations for the AIR TRITIA territory.
6. **Air Pollution Model:** Distribution model of average concentrations of PM10, PM2,5, NO2, benzo (a) pyrene in the TRITIA region and 5 selected cities.
7. **Health Risks Calculation:** Report on Health Risks Associated with Air Pollution Based on Calculation from Air Pollution Modeling Results, according to EPA methodology.

1. Specification of the Area of Interest

1.1 ESÚS TRITIA

The TRITIA TRITIA European Territorial Cooperation Group (EGTC TRITIA) was established on 25 February 2013 on the basis of a decision of the Ministry of Foreign Affairs of the Republic of Poland (MFA) No. 1/2013 on the registration of EGTC TRITIA in the Register of European Groupings for Territorial Cooperation led by the MFA. The legal basis of EGTC TRITIA is Regulation (EC) No ... of the European Parliament and of the Council. 1082/2006 of 5 July 2006 on the European Grouping of Territorial Cooperation (EGTC), which was transposed into Polish legislation by the Law of 7 November 2008 on the European Grouping of Territorial Cooperation.

The decision to set up EGTC TRITIA was adopted in 2009 by representatives of the higher territorial self-governing units from the Moravian-Silesian Region (CZ), the Opole Voivodeship (PL), the Silesian Voivodeship (PL) and the Žilina self-governing region (SVK), and the steps leading to the establishment of the EGTC were started. The decision was based on the positive experience of the regions in cross-border cooperation and on the impacts of this cooperation on improving the life of the border population.

The territory of TRITIA leads the Baltic-Adriatic transport corridor. With a strong economic background, seven public universities, a large number of tertiary education providers, and research and development entities, TRITIA is also an exciting area for research and innovation. Thanks to these relations between the various actors on the Territory of EGTC, as well as the common challenges that this territory faces, the EGTC TRITIA has a huge potential to increase the intensity and systematization of multilateral cooperation.

The EGTC TRITIA was established to facilitate and expand cross-border, transnational and interregional cooperation between its members in order to strengthen economic, social and territorial cohesion, in particular through the implementation of territorial cooperation projects or programs with the following objectives:

1. Facilitating the everyday life of residents of the Group
2. Creating cross-border territorial cohesion
3. Implementation of projects for joint strategic development

To achieve these objectives, the EGTC implements tasks aimed at identifying, promoting and implementing programs, projects and joint decisions in territorial cooperation in four main areas:

1. Transport
2. Economy
3. Tourism
4. Energy with a focus on renewable energy

and in five complementary areas:

1. Culture
2. Environment
3. Human resources, education, including close cooperation with universities
4. Collaboration of public institutions with the implementation of people exchange and experience in international internships
5. Sport

Since 1 January 2018, the Opole Voivodeship has terminated its membership in the EGTC TRITIA, also including the interest in the AIR TRITIA project, this study also includes the territory of all founding members. The area of interest for the AIR TRITIA project consists of 4 higher territorial self-governing units, which we will generally refer to as the regions: Opole Voivodeship (PL), Silesian Voivodeship (PL), Moravian-Silesian Region (CZ) and Žilinský self-governing region (SVK). The territory of the EGTC TRITIA has an area of 34 069 km², with more than 7.4 million inhabitants.

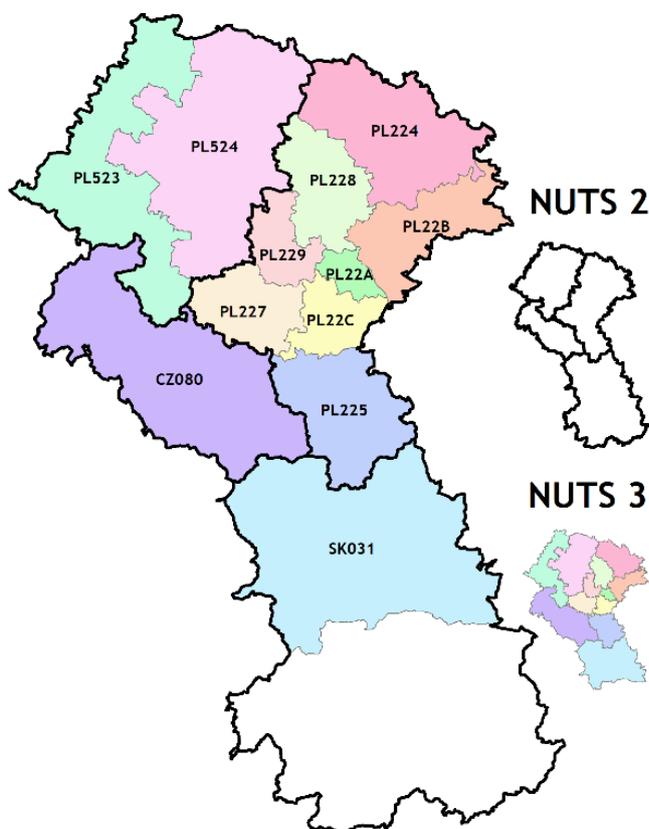
1.2 Basic Classification of Territorial Units

For defining the target area, it is necessary to come out of the Eurostat classification, which includes NUTS and LAU levels. The NUTS (Nomenclature of Units for Territorial Statistics) Territorial Units were created for statistical purposes by Eurostat to compare and analyze economic indicators, to monitor, prepare, implement and evaluate EU member states' regional policy. The NUTS classification was introduced by Eurostat in 1988. The standardized classification of territorial units in the Czech Republic is called CZ-NUTS, PL-NUTS in Poland and SK-NUTS in Slovakia. Most regional statistics of Eurostat are monitored and evaluated at NUTS-2 level. Since 1990, there is also the LAU - Local Administrative Units (Local Administration Units), which include districts and municipalities.

Each state has its unrepeatable model of public administration and its territorial organization. This model is conditioned historically, geographically, but the decisive factor for its organization and functioning are political interests. The same is true in the area of interest in the project, located in three countries. Each country has chosen its model of public administration.

There are four NUTS-2 regions in the area of interest of the AIR TRITIA project: the Opole and Silesian Voivodeship, the Moravian-Silesia Cohesion Region, which is the same with the Moravian-Silesian Region (NUTS-3) and the northern part of the Central Slovakia Region, which includes the Žilina self-governing region together with Banskobystrický region. In the area of interest there are 5 pilot cities (i.e. LAU-2): Ostrava (CZ: 291 634 inhabitants); Rybnik (PL: 139 252 inhabitants); Opole (PL: 118722 inhabitants); Žilina (SK: 81 041 inhabitants) and Opava (CZ: 57 387 inhabitants). Population count is as of 1.1.2017. At the heart of the area of interest is the Katowice-Ostrava cross-border metropolitan area and several functional urban areas according to ESPON (Opole, Bielsko-Biała and Žilina).

Figure 1.1: NUTS-2 and NUTS-3 in the area of interest



Source: ACCENDO, 2018.

Table 1.1: Number of statistical territorial units in the area of interest

	NUTS-2	NUTS-3		LAU-1		LAU-2	
	název	název	počet	název	počet	název	počet
OW	Województwo Opolskie	Podregion <i>Nyski (PL521) a Opolski (PL522),</i>	2	powiat	11	gmina	71
SW	Województwo Śląskie	Podregion Częstochowski (PL224), <i>Bielski (PL225), Rybnicki (PL227), Bytomski (PL228), Gliwicki (PL229), Katowicki (PL22A), Sosnowiecki (PL22B) Tyski (PL22C).</i>	8	powiat	17	gmina	167
MSK	Moravskoslezsko	Moravskoslezský kraj (CZ080)	1	okres	6	obec	300
ZSK	Stredné Slovensko (Žilinský a Banskobytrický kraj)	Žilinský samosprávny kraj (SK031)	1	okres	11	obec	315

Source: Eurostat, 2017

2. Methodology

2.1 Definition of Terms

For the socio-economic development of the area that is based on the development of cities in the area of interest, it is necessary to emerge from urbanistic theories and perspectives of further development.

First, there are criteria that clearly distinguish two main categories of cities:

- Small, medium and large cities, to be studied in Christalle's perspective, provide services and a basic infrastructure framework for the catchment area. However, it is clear that many large or even some medium and small towns can perform important specific functions on a European scale, either as specialized cores within the network or as more or less specialized satellites of large metropolises. This is the subject of this study.
- Major metropolitan areas at European level, which are mostly nodes for integration into a competitive international economy. Categories of major metropolises are irrelevant for our study.

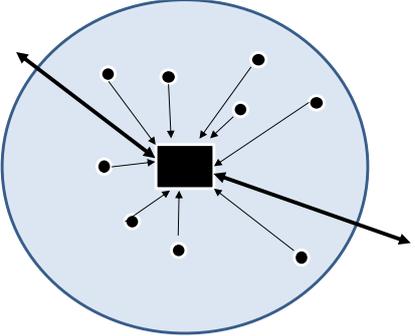
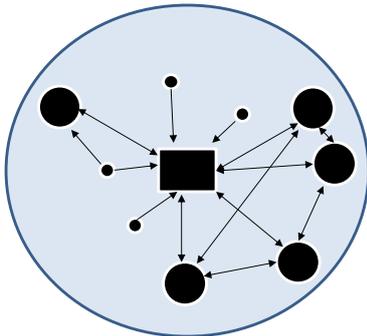
Functional Urban Area (FUA)

It is a territory defined on the basis of common geographical features and strong internal links. An example of a functional area can be a large city and surrounding communities. Residents in the community commute to the city to work, study, go to theater, etc. This means that this area has common potential and obstacles to development, independent of administrative boundaries. Spatial planning of these borders will enable you to achieve better results.

The definition of urban areas is based on the population density used to identify urban cores, and the flow of daily work paths serves to identify backgrounds which labor market is highly integrated with the urban centers. According to the OECD methodology, the classification of functional urban areas is proposed into four types according to population size¹:

1. Small city areas with the population of under 200 000 residents;
2. Medium size city areas with the population between 200 000 and 500 000 residents;
3. Metropolis areas with population between 500 000 and 1,5 mil. residents;
4. Large metropolis areas with population of more than 1.5 mil. residents.

Types of FUA

Type A Mono-centric FUA arrangement	Type B Polycentric FUA arrangement
 <p>e.g. Opole, Žilina</p>	 <p>e.g. Hornoslezská aglomerace nebo Ostravská aglomerace</p>

¹OECD (2013) *Definice funkčních městských oblastí (FUA) pro OECD - metropolitní databáze*. Available at: <https://www.oecd.org/cfe/regional-policy/Definition-of-Functional-Urban-Areas-for-the-OECD-metropolitan-database.pdf>

The diagrams summarize two different situations in a high density area, but are quite different in terms of functions, economy, mobility management and spatial planning, development strategies, including air quality improvement planning. Models are a certain theoretical simplification, depending on how many significant centers are located in the FUA and whether these centers cooperate within the FUA or whether they specialize in certain activities such as university education and whether the FUA secondary outlying centers have more decisional autonomy. Monocentric urban areas are basically a city and its surrounding with an urban landscape around it, which is arranged around a densely populated knot, mostly of the historical core.

The ESPON 1.1.1 project "Urban areas as nodes in polycentric development" divides selected elements of European settlement into the MEGA (Metropolitan European Growth Area) and FUA (Functional Urban Area) areas) of transnational to regional significance. FUA features are registered for countries with more than 10 million inhabitants for cities with a core area of at least 15 thousand inhabitants and more than 50 thousand inhabitants in the urbanized background (over 1959 FUAs with more than 20 000 inhabitants identified in Europe). Elements of MEGA correspond to those FUAs that have the greatest effects on population, transport, manufacturing, education, administrative functions, etc. (76 excellent MEGAs in Europe). City of Ostrava is rated as a candidate for promotion to MEGA category 4 (weak MEGA) based on the specification (MRD 2008) of the above project for the Czech Republic. Within the defined area of the European Grouping for Territorial Cooperation TRITA, there are Katowice (MEGA 4), Opole, Bielsko-Biala and Žilina (National FUA).

3. Economic and Social Aspects of Regions

The character of regions, its status and behavior can be labeled as a result of the interaction of three elementary environments. We can generally consider the social environment, the economic environment and the natural environment. The settlement structure of the area of interest is currently undergoing a major transformation process, which is caused by several influences. There is a decline in traditional areas of the economy and traditional professions that are closely linked to the space, especially in the industrial regions. At the same time, there is an increase in the differences in the territory, which are also reflected in the spatial structure of settlements. Regional development actors are not, as before, closely linked to the territory because the headquarters of their companies are outside the region. Globalization processes reduce the possibilities for public administration to regulate the processes in the area, which increases the pressure on city/town management when planning future development of the territory and its sustainability. There is a change in the distribution of economic activities in space and their structure. On the one hand, new peripherals and socially excluded areas are emerging, and on the other, an unregulated area is growing in the process of suburbanization around towns. Suburbanisation due to lack of effective regulatory instruments is characterized by high demands on land use and the cost of building transport and technical infrastructure. Compared to a compact building, localized objects are the cause of much higher energy, water, and water losses in power grids. The people living here are much more dependent on the use of individual car transport. The total area of partially natural ecosystems, biocenters and bio-corridors and soils suitable for maintaining a sustainable degree of agricultural, forestry and recreational land use are decreasing. The current processes of economic concentration and population deconcentration "blur" the boundaries of cities. The development of transport influences the polycentric model of settlement of Ostrava agglomeration and Upper Silesian conurbation.

3.1 Settlement Structure

There are two cities with nearly 300 000 inhabitants in *the area of interest of the AIR TRITIA project* - Katowice (PL) and Ostrava (CZ). The largest city is Katowice, which is the core of the Upper Silesian conurbation, comprising a total of 19 cities with 2.1 million inhabitants and 5 million Katowice agglomerations (including Rybnik). In the agglomeration of the second largest city in the region, Ostrava lives almost 1 million inhabitants (including Opava). These urban agglomerations and other two major settlement centers, Opole (PL) and Žilina (SK), combine intensive socio-economic relations. The Katowice, respectively the Upper and the Ostrava agglomerations create a cross-border metropolitan area. The Czech Republic is characterized by very small villages, the average size of which is 1 640 inhabitants, the similar size of the municipalities is in Slovakia (1 850 inhabitants), in Poland municipalities are usually bigger, with an average of 15 530 inhabitants. The proportion of inhabitants living in individual size categories of municipalities corresponds to the abovementioned. The cross-border polycentric Ostrava-Katowice agglomeration affects the distribution of the population to such an extent that in cities with over 100 inhabitants there is 49 % of the population living in the SW (also 5 % of the Voivodship is affected by Częstochov); in MSK or Ostrava alone, this share accounts for 24 % of the population of the whole region. In ZSK, the most important centers of settlement are Zilina and Martin, where 20 % of the inhabitants of the region live. In OW, the city of Opole (12 % of the population) and Nysa with Kędzierzyn-Koźle (6 % of the region's population)

Figure 3.1: Cities with more than 50 thousand inhabitants in the area of interest



Source: ACCENDO, 2018.

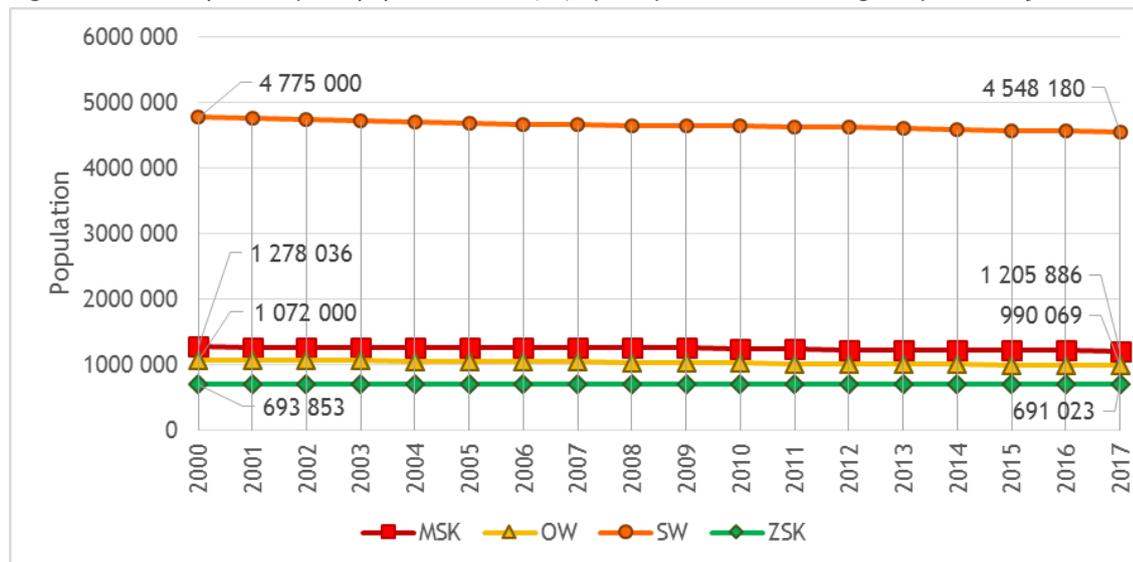
3.2 Demographic Development in the Area of Interest

3.2.1 Population Size

The study of population development in the territory is based on the knowledge of the size of the population, its structure, its location and its transformation. On the basis of the available data, the ten-year period has been chosen for analysis since 2007, the distribution of the **population size** has been extended to the year 2000. While the three regions (Moravian-Silesian, Opole and Zilina regions) are close enough, Silesian Voivodeship is much more populous. For the first group of the three regions, their population size ranges from 0.7 to 1.2 million. They are very close in size. However in Silesian Voivodeship, there is a completely different situation. More than 4.5 million people live in this region.

The smallest region is the Zilina Region, where lives about 300 thousand less than in the Opole Voivodeship and 500 thousand less than in the Moravian-Silesian Region.

Figure 3.1: Development of the population size (KS) of the four researched regions from the year 2000



Source: CZSO, SÚSR, Eurostat, own elaboration

In evaluating the population change over the last ten years (2007 to 2016), the overall findings are as follows:

- The total common population loss of all regions reached over 180 000 inhabitants.
- In the last ten years the population has only slightly decreased in the region of Žilina (less than 5 000). This region also contributed to the relative decrease in the population by the smallest value (2.7 %) and also by measuring the relative population weight of the region by 9.3 % of the total population of all four regions.
- The population decline in the Moravian-Silesian Region and the Opole Voivodeship reached 40 000 and 44 000, which represented 22 % and 24 % of the total decline of all regions. Given that the population of Opole is approximately 13 % of the population of the whole area surveyed, the population was virtually the largest.
- The largest decrease in population was recorded in the Silesian Voivodeship, where the population decreased by almost 95 thousand, which represented its share in the total decline of the regions over 51 %.

For all pilot cities, the population has declined not only over the last 10 years but also over the last 20 years. Given the size differences, it is clear that the largest absolute decline occurred in Ostrava. In the last ten years, however, Opole and Ostrava have had the highest rate of losses, with an annual decline of at least one percent (0.9 %). The highest rate of annual loss was recorded by Žilina (0.7 %), Opava (0.5 %) and Rybnik (0.3 %). The long-term absolute annual loss of Ostrava reaches almost 1 800 inhabitants, Opole 900 inhabitants, Zilina over 400, Rybnik over 200 and at Opava less than 200 inhabitants. For the prognosis of population growth in selected cities, it is clear that by 2030 there will be a decrease in the population of at least three cities: Ostrava, Opole and Žilina. For the remaining two cities, we may expect the stagnation of population size, or only a slight decrease in population, over the next 10 years.

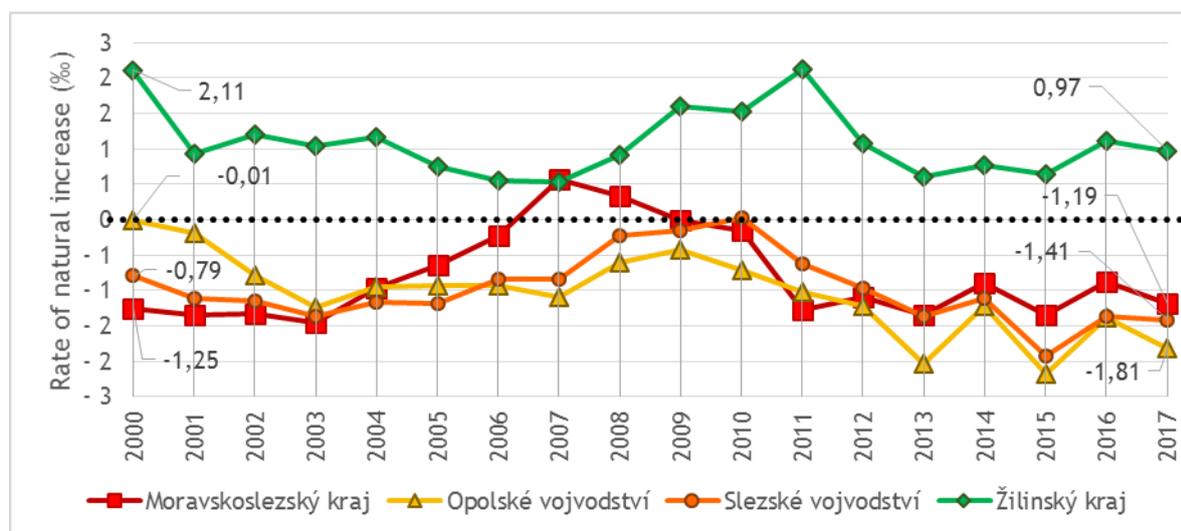
Population changes, including population growth in the southern direction from the Upper Silesian agglomeration, are more massive in the south than in the Ostrava agglomeration, where similar lower intensity trends can be identified. Apart from the southern direction, the surrounding of Ostrava is developing suburbanisation process in western, northern and eastern direction. On a more detailed analysis, it is possible to identify that people from Ostrava with a higher socioeconomic status move to a better environment in the north, west and south direction, while on the contrary, the people with

lower incomes are moving to the eastern area, where the estates are significantly cheaper, (lower land prices due to degraded environment, especially air).²

3.2.2 Natural Currency

Population size analysis is a basic framework for population development considerations. We will now attempt to document the specific causes of population change in the regions. In the first step, we will focus on the natural currency, that is to state the differences in the number of live births and deaths for the same period of time (natural increase/decrease).

Figure 3.2: Development of natural currency of four researched regions from the year 2000



Source: CZSO, SÚSR, GUS, Eurostat, own elaboration

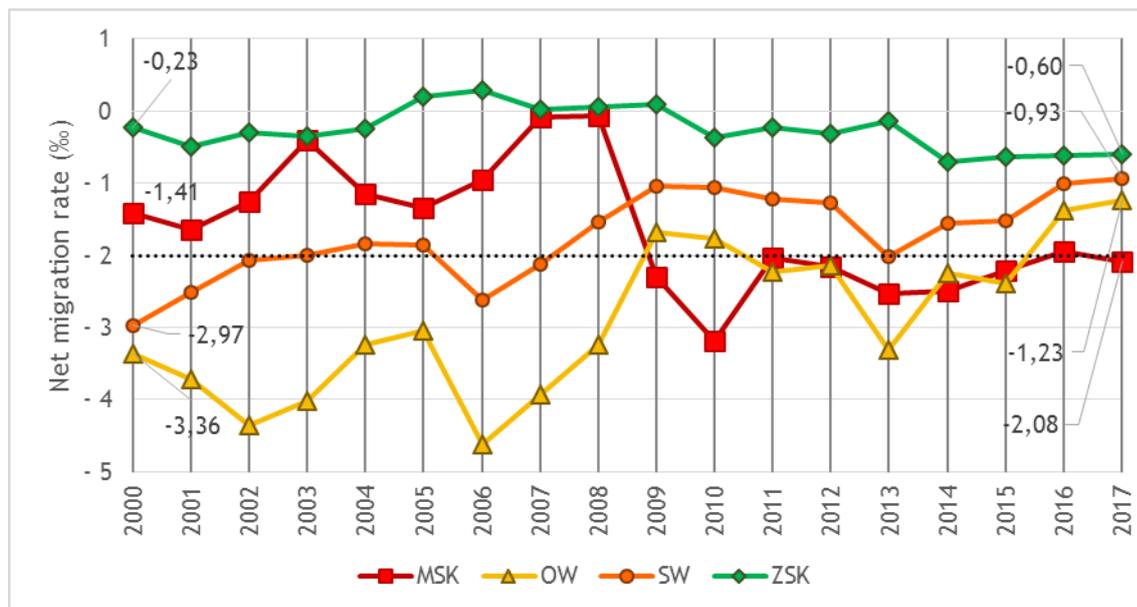
The Žilina Region, as the only one, shows the long-term natural increase of 0.6 % to 2.2 %. The other group consists of the other three regions, where the *hmpp* indicator has long been in negative values. Thus, the annual population decline is a natural currency at the level of -1 % over the past ten years. In this group of three, the natural currency of the dying regions, the longest-running Opole and Silesian Voivodeship have been the worst. The Opole Voivodeship, represents an annual average decrease of 1 200 inhabitants over the last 10 years, with the Silesian Voivodeship accounting for annual decreases of 4 300 inhabitants. A bit better is the Moravian-Silesian region with an average *hmpp* value of -0.6 % over the past ten years, which represents an annual population loss of about 800 inhabitants. In the long run, only two cities have grown i.e. Rybnik and Zilina, but their long-term average *hmpp* of around 1.5 % represents only a very small growth of both cities by the natural currency. The largest natural loss of the population in the long-term in the natural currency from all the evaluated five cities is in Ostrava.

3.2.3 Development of Resident's Migration Behavior

Spatial movement of the population is, besides the natural currency, the second item with a direct impact on population size. Even in this case, we have the option to work with an indicator for calculating the absolute (migration balance, MS) or relative migration values - the gross migration rate (hmms). In relation to the resulting population size of the region, we prefer analyzes focused on the difference between the number of immigrants in the region and the emigrants from the region. We are focusing on the migration balance (MS, absolute population growth in the migratory currency) or the gross migration rate (hmms, relative increase of population by the migration currency).

² Podrobněji viz HRUŠKA a kol. Socioekonomický atlas Moravskoslezského kraje. Ostrava: ACCENDO, 2012.

Figure 3.3: Development of migration currency of the four researched regions from the year 2000



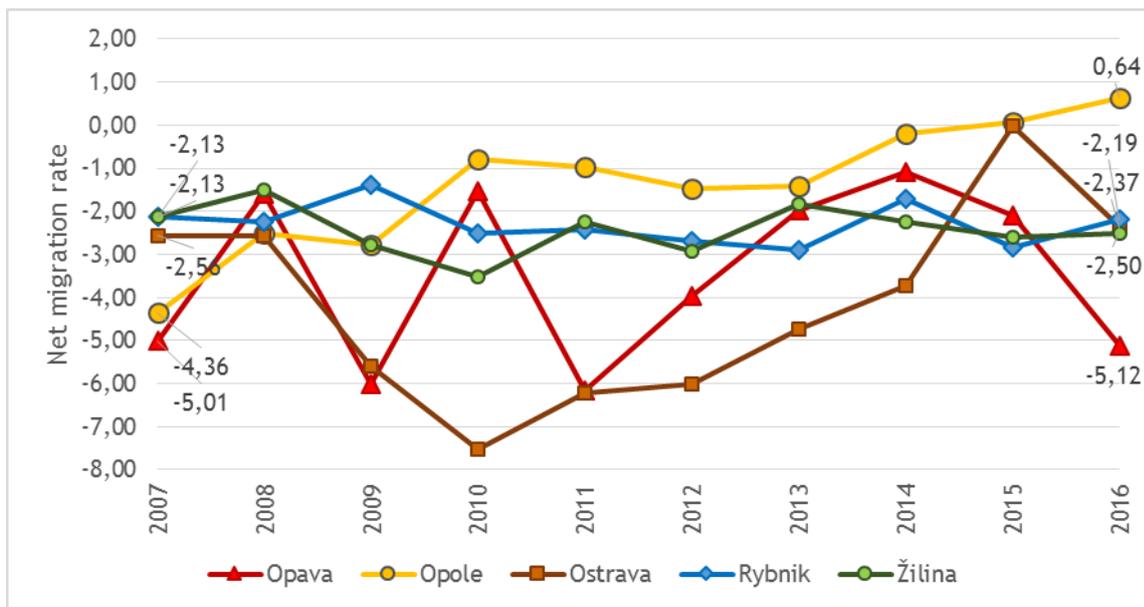
Source: CZSO, SÚSR, GUS, Eurostat, own elaboration

It is clear that the longest population loss is due to the region of Žilina, where the long-term average of *hmms* is around -0.2 to -0.4 per milles (annual average migration decreases of 170 inhabitants). The second group with a higher loss of their own population by migratory behavior consists of two regions: the Silesian Voivodeship (annual average migration decreases of 8 000 inhabitants) and the Moravian-Silesian Region (annual average decrease of migration of 3 200 inhabitants). Here the values of *hmms* are in the long run at -1.5 to -1.9 per milles. In the long run, the largest relative loss was reported by the Opole Voivodeship with a value of *hmms* -2.5 to -3.0 per mille (annual average migration decreases of 3 000 inhabitants). When assessing changes in the trend of migratory behavior, the following can be highlighted:

- Decrease in the negative values of the migration currency is evident in both Polish regions.
- A slight deterioration in the values of the migration currency is evident in the Moravian-Silesian and the Žilinský regions.
- Over the last 20 years, all regions have reduced the population in the currency of migration, which is the predominant trend of emigration from the regions above to immigration to the regions.

In assessing the migratory behavior of five pilot cities, it is clear that they all record longer-term losses of their own population due to the prevailing number of emigrants over immigrants. Only in the city of Opole is it possible to assume that in the coming decades the city would no longer have to lose its own population with a migratory currency.

Figure 3.4: Development of migration currency of five selected cities in the last ten years



Source: CZSO, SÚSR, Eurostat, own elaboration

3.2.4 Population Development Forecast

The prognosis of the population development of the Moravian-Silesian Region shows that the last variant of the CZSO in 2013 predicts the population of the region at the end of 2030 at the level of 1 125 000. The modified version based on the last years, however, slightly shows more favorable development of the total fertility, natural currency and migration in the region shows that we can expect the population of the region to be between 1 150 000 and 1 160 000.

The latest forecast of the Polish Statistical Office predicts a population decline in the Opole Voivodship by 2030 by one hundred thousand to around 900 000. Our forecast assumes that the population of the Opole Voivodship will fall by 60 thousand by 2030. We assume annual losses of around 3.5 thousand inhabitants (*hmcpp* at -3.5 to -3.8 ‰).

The latest forecast of the Polish Statistical Office predicts a decrease of 320 000 inhabitants in the population of the Silesian Voivodship by 2030 to approximately 4.245 million. Our forecast assumes a decrease in the population of the Silesian Voivodship by 230 thousand by 2030. We assume annual losses of about 12-14 thousand inhabitants (*hmcpp* at -2.5 to -3.0 ‰). For all three population-long-term loss regions, the population decline is likely to decrease further by at least 2030. The Silesian Voivodship will have the lowest rate of population decline, followed by the Moravian-Silesian Region and the Opole Voivodship. Nevertheless, the differences in their rate of annual decline in population are not significant (min. -2.5 ‰ and maximum - 3.8 ‰).

Of the four evaluated regions where we are focusing on population projections by 2030, it is very likely that the annual rate of population decline will continue to be at between -2.5 ‰ and -4.0 ‰ for the three regions. It is certainly not an alarming value, but the number of inhabitants of the Opole and Silesian Voivodship and the Moravian-Silesian Region still needs to be counted. We did not have a projection of the Slovak Statistical Office for the forecast of the Žilina Region. That's why we made our own prognosis in two variants. Here the greatest probability of estimating further population development is concentrated on the state of long-term stagnation of the population of the region at a level of about 690 thousand inhabitants with a minimum of 687 thousand and a maximum of 694 thousand.

3.2.5 The Aging Process

The age structure as a result of basic demographic events is often very beneficial for any demographic analysis. Almost all demographic components and events (including wider conditionalities) show statistically significant deviations depending on the age structure changes.

The weight of children is declining in all the regions evaluated after 2000, most of them in the Opole Voivodship and the Žilinský Region. Here the relative frequency of children decreased by 5 % (64 thousand and 35 thousand). The smallest decrease occurred in the Moravian-Silesian Region (decrease of 2 %, 37 thousand) and Silesian Voivodship (decrease by 3 %, 174 thousand). Altogether, there has been a decrease of more than 310 000 in the area of 4 regions.

The opposite trend of the last twenty years is evident in the relative frequency of the aging component (citizens aged 65 and over). The largest increase in relative representation of seniors can be registered in the Moravian-Silesian Region (almost 7 %, 74 thousand), Silesian Voivodship (6 %, almost 268 thousand), Opole Voivodship (5 %, 42 thousand) and Žilinský region (4 %, 26 000). Altogether there was an increase of 410 000 seniors in the four regions.

The continuation of the process of population aging of economically more developed regions is no longer a matter of dispute. Of course, remote forecasts are always less accurate to perform.

If we expect a percentage change over the next twelve years for the child component to be around 1.0-1.5 %, then a much more significant change should occur with the aging component. We are reasonably expecting much more significant changes in age composition in seniors aged 65 and over. If, in the next 12 years, we estimate a decrease in the relative representation of children in the population by 1 to 1.5 percent, then we estimate the increase of the seniors by more than 5 percent over the same period.

In assessing the aging process, we can start from the rule that bigger cities are aging a little faster than the whole region where the city lies. The biggest decrease in children, in absolute terms, will, of course, be recorded in Ostrava, where we expect a decrease in children by 2030 by less than 6 thousand, Rybník by 2 thousand, Opole and Opava about a thousand and the least loss we expect in Žilina (200 children). Overall, we expect a total decline of all five cities by more than 10 000 children. A bigger change will be the age composition of the five rated cities in the age group of 65 and older. Unlike the children's component, this group will significantly strengthen. In all five cities, the number of seniors will increase by more than 35 000. The biggest increase will be recorded in Ostrava, where we expect to increase the number of seniors by almost 15 thousand. For other cities, we expect these increases in the number of the oldest citizens: Rybník by less than 8 thousand, Žilina by 6,5 thousand, Opole by 5 thousand and Opava by almost 2,5 thousand.

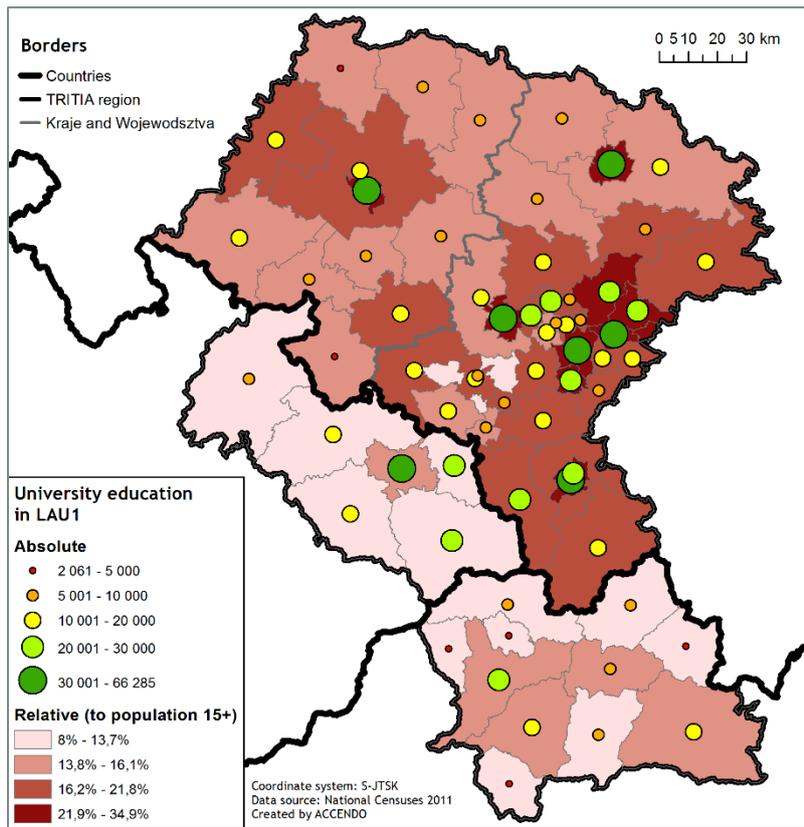
3.3 Socio-economic Aspects of the Residents in the Area of Interest

3.3.1 Development of Education

Over the last sixty years, since the end of the Second World War, there have been very significant changes in the educational composition of the population. The educational structure affects the lifestyle of the population and has a clear influence on the life expectancy.

At the last census in 2011 it was found that university students over the age of 15 are represented in the Czech population by 12.5 %. Comparing the Moravian-Silesian Region and the Czech Republic from the point of view of education and the last two censuses, we can emphasize that the Moravian-Silesian Region continues to show a lower level of education of the population in the Czech Republic. Both Polish regions have a significantly better educational level, while the number of persons with higher education (ISCED 5-6) is 20.2 % in the Silesian Voivodship and 19.0 % in the Opole Voivodship. In the Moravian-Silesian Region it is only 11.7 %, on the other hand, the highest share is the population with the lowest level of education. The highest share of these people is in both Polish regions. In general, people with university degree are concentrated in large cities.

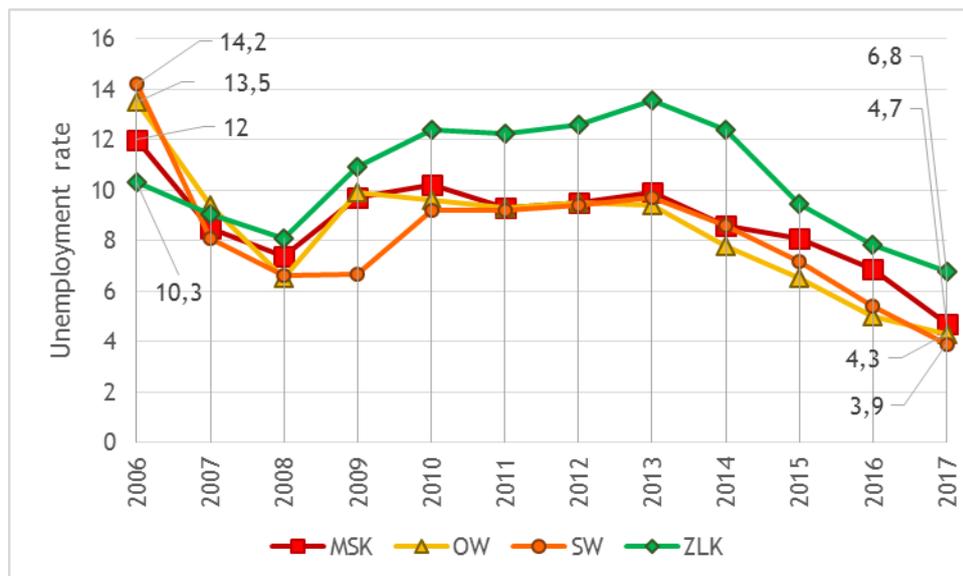
Figure 3.5: The number and proportion of inhabitants with a tertiary education in the area of interest



3.3.2 Unemployment

The unemployment or unemployment rate is one of the key socio-economic indicators in the area that identifies the untapped potential of the workforce. Also, the long-term unemployment has a significant negative impact on the economic situation of unemployed people, as well as on their family, and there are also changes in the psyche of the unemployed. In 2017, the area of interest belonged to regions with lower unemployment rates, MSK, OW and SW were the number of unemployed was between 3.9 % and 5.7 %, in the Central Slovakia it was slightly higher (5.8 % to 9.5 %). If we focus on the development of unemployment in the area of interest, it is possible to identify a rate of unemployment lower than 5 % for all regions, except in the Zilina region (although the comparison with the whole NUTS-2 region of Central Slovakia is significantly lower). Unemployment rates below 5 % are usually considered to be very low in economic theories.

Figure 3.6: Development of unemployment rate in the area of interest



Source: EUROSTAT, LFS 2006 – 2017.

Note.: The values for the ZSK were estimated on the basis of the values of Central Slovakia, the weight was determined on the basis of Labor Office statistics in this territory.

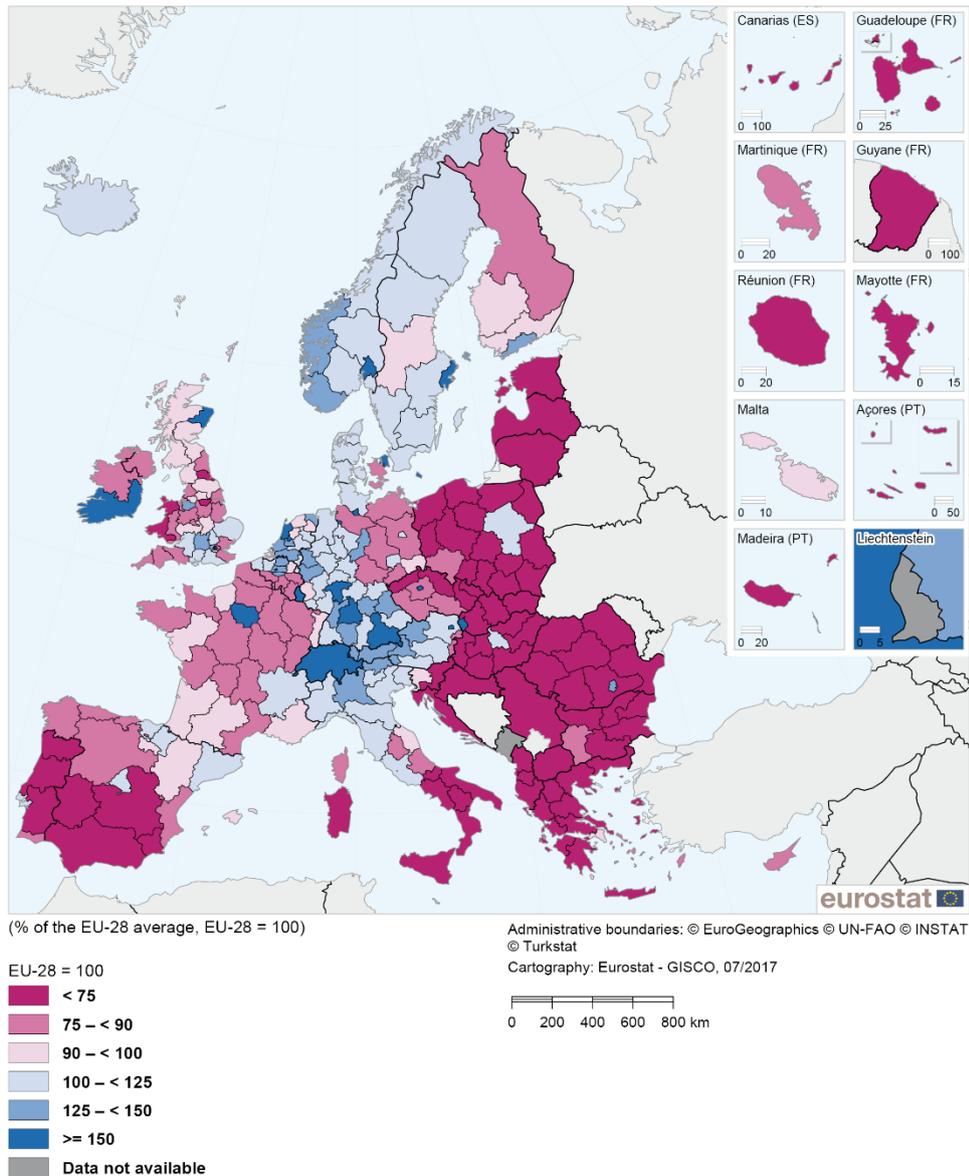
3.4 Economics in the Area of Interest

3.4.1 Economic Performance of the Regions

A key economic indicator mapping the performance of the regional economy is the Gross Domestic Product (GDP) per capita in Purchasing Power Parity. It should be noted that the whole area of interest belongs to the regions that did not reach 75 % of the EU-28 average GDP, only the regions where the capitals of the analyzed countries are located (see Figure 3.38) surpassed this level. Low GDP values are due to low labor productivity. If we measure the change in Gross Domestic Product per capita, expressed as purchasing power parity from 2007 to 2015, it is clear that there is growth throughout the area of interest. The weakest growth is in the Moravian-Silesian Region, the most significant in the Silesian Voivodeship, where it reaches values above 15 %. The growth in the share of services in gross value added in the Silesian Voivodeship and also in the Moravian-Silesian Region can be positively evaluated, which can be considered as a positive transformation effect.

Figure 3.7: GDP per inhabitant in purchasing power standards in 2015

Gross domestic product (GDP) per inhabitant in purchasing power standards (PPS) in relation to the EU-28 average, by NUTS 2 regions, 2015
 (% of the EU-28 average, EU-28 = 100)



Note. Ireland, Norway and Albania: 2014. Switzerland and Serbia: national data. Switzerland: provisional.
 Source: Eurostat (online data codes: [nama_10r_2gdp](#) and [nama_10_pc](#))

3.4.2 Science and Research in the Regions

Total R & D expenditure is statistically monitored using Gross Domestic Expenditure on R & D (GERD). In the R & D intensity, the Czech Republic represents a European average compared to other countries, which was approximately 2 % in 2014. The Moravian-Silesian Region showed the second lowest spending on research and development in the Czech Republic in 2014, with 1.23 % of GDP. On the other hand, compared to the Opole and Silesian Voivodeship and Central Slovakia, Moravia belongs to the regions with the highest R & D intensity. The second highest value of this indicator is achieved by Central Slovakia, with the most intensive expenditure in Slovakia accounting for approximately 0.78 % of GDP in Slovakia, to support research and development regions in the region of Bratislava. Poland and the Polish regions, on the other hand, show the lowest spending on R & D compared to other EU countries. Opole Voivodes with R & D spending of approximately 0.34 % of GDP and the Silesian Voivods

with R & D expenditure of around 0.57 % of GDP do not exceed the national average, which amounted to approximately 0.94 % of GDP in 2014. For Opole and Silesian Voivods, regions such as Mazowieckie, Malopolskie and Podkarpackie, which exceed the national average and spend more than 1 % of GDP on R & D, could be inspiring.

3.4.3 Employment in the Industry

The impact of the global financial and economic crisis has been very noticeable in European industry and has affected the relative weight of the manufacturing sector that has fallen during the recession. However, industrial activities remain a major part of the EU exports, research and innovation and also provide a number of highly qualified jobs. In 2014, industry accounted for almost a quarter of the EU labor force (non-financial business). In general, industry records a higher share of employment in the EU's eastern regions. None of the regions with high employment in industry was the capital. The highest employment rate in industry is concentrated in countries such as Bulgaria, Romania, Hungary, including the Czech Republic, Slovakia and Poland. In these countries and regions, employment in industry is at least 35 %. In the regions concerned, the employment rate in the industry is over 35 %, while in Central Slovakia it was 37.8 % in 2014, 41.7 % in Opole, and 42.1 % in Silesian Voivodeship. In the Moravian-Silesian region it is around 35 %. A relatively high degree of industrial specialization in the EU's eastern regions may reflect, to a certain extent, relatively low labor costs, outsourcing and foreign direct investment strategies as well as subsidies for natural resources.

4. Socio-economic Structure of the Area of Interest

4.1 Regions in the Area of Interest

4.1.1 Opole Voivodeship

The province is located in south-west Poland, mostly in the Silesian Lowlands (Nizina Śląska). To the east, the region touches the Silesian Plain (Silesian Highlands, Wyżyna Śląska) with Mount Anne, the Opawskie Mountains lie in the southwest. The Odra River flows through the middle of the Voivodship. The northern part of the province, along the Mała Panew River, is densely wooded, while the southern part forms arable land. There are 3 large lakes in the territory: Turawskie, Nyskie and Otmuchów. The region has the warmest climate in the country.

Approximately 15 % of one million inhabitants of the province are ethnic Germans, i.e. that 90 % of all Germans live in Poland. In Opole, many areas are officially bilingual, and German language and culture play an important role in the area of education in the region.

Opole Voivodeship is an industrial and agricultural area. With regard to mineral resources, the importance of the raw material deposits for construction: limestone (Strzelce Opolskie), marl (near Opole), marble and basalt. Favorable climate, fertile soil and high agricultural crops contribute to the development of agriculture, which is one of the most productive in the country.

In total, nineteen sectors are represented in the province. The most important are the production of cement and lime, furniture, food, automobiles and the chemical industry. In 1997, it achieved the largest growth in the production of wood and wood products, electrical equipment, machinery and equipment, as well as pulp and paper products. In 1997, Zakłady Azotowe SA was the largest enterprise in Kędzierzyn-Koźle, the income of which exceeded PLN 860 million. The Voivodship economy consists of over 53 000 enterprises, mostly small and medium-sized, employing more than 332 000 people. Manufacturing companies employ more than 89 000 people; 95.7 % of all businesses in the region operate in the private sector.

At the regional level of the Opole Voivodship, the following strategic and conceptual documents are relevant to the area of economic development and the environment:

- Development Strategy of the Opole Province until 2020: The main strategic document of the Opole Voivodeship. As part of the strategic objectives, emphasis is placed on the high quality of the environment on the territory of the province.
- The Opolskia air protection program as a result of exceeding the PM10 and PM2.5 and benzo (a) pyrene targets, together with the short-term Opole 2013 Action Plan: A program summarizing a number of specific measures for the Opole Voivods in the air quality issue.

4.1.2 Silesian Voivodeship

The Silesian Voivodeship (In Polish Województwo Śląskie) is the upper territorial self-governing unit of Poland, one of 16 Voivodeships. Although its name is Silesian, this province extends beyond the eastern part of the Polish part of Silesia also in the west of Malopolska. It was founded in 1999 on the territory of the former Voivodships: Białski, Czestochowski and Katowice. The province is located in the south of Poland. Within Poland, it neighbors the Opole, Malopolska, Swietokrzyskie and Lodz Voivodships; followed by Slovakia (Žilinský region) and Czech (Moravian-Silesian region). The capital of the province is Katowice.

There are 71 cities in the Silesian Voivodeship including 19 cities with Powiat status. In this province, most of the cities have over 100 000 inhabitants. It is the only Voivodship in Poland, where there are fewer Powiatas (17) than the Powiat states (19). Most of the strands are heavily urbanized - they do not have agricultural functions and often fulfill only a residential and recreational function for the inhabitants of large cities.

The region is characterized by a significant share of national minorities. There are 20 000 Germans living in the province (representing 0.43 % of the total population in the region - especially in the Ratiboř, Gliwice and larger cities). The number of other nationalities, such as Bohemian and Moravian, is less numerous. In the Silesian Voivodeship, most people report Silesian nationality.

Silesian Voivodeship has the largest share of people working in the industry. Most of them in the central part of the province, in the Katowice agglomeration, which is the most developed region in Poland. In addition to Katowice, there are several smaller industrial districts in other major cities - Częstochowa (Częstochowa Industrial Area), Bielsko-Biała (Bielsko Industrial Area) and Jaworzno (Jaworznicko-Chrzanowski District). In the province, coal mines, steelworks and power stations are in industrial plants. The light industry is located mainly in Częstochowa and Lubliniec.

At the regional level of the Silesian Voivodeship, the following strategic and conceptual documents are relevant to the area of economic development and the environment:

- Environmental Protection Program for the Silesian Voivodeship until 2019, taking into account the perspective by 2024: A program containing long-term goals aimed at the introduction of modern technologies and the related improvement of air quality and the environment in general.
- Air Pollution Program for the Silesian Voivodes with the aim of reaching permissible concentrations of substances in the air: Document aimed at protecting the health of the Silesian Voivodeship.

4.1.3 *Žilinský Region*

The Žilinský Region is located at the intersection of two European transport corridors as well as in a significant cross-border development area defined by the triangle of Žilina, Ostrava (CZ), and Katowice (PL). The whole of this mountainous area falls into the Western Carpathians from a geomorphological point of view. The Váh River is distinctly divided into the north-west Slovakia-Moravian Carpathians (Javorníky, White Carpathians) and the southeastern Fatra-Tatra region (Mala Fatra, Strážovské vrchy). In this locality mountain massifs have been formed relatively recently, in the Paleogene. Thanks to the movement of the plateaus, the original sediments of the sea, which gradually formed impressive gorges and valleys, were highlighted.

In 2016, 690 449 inhabitants lived in the Žilina Region. Until 2010, the population grew steadily along with the trend of population growth in the whole Slovak Republic, but then the growth stopped and there were alternate slight year-on-year decreases and increments. An unfavorable trend can be observed in the age structure of the population, where the population aged over 65 is growing, while the number of working-age population is decreasing. This trend is copying the changes across Slovakia.

Opening up to the global market, economic reforms, and entry into the eurozone mean that Slovakia, including the Žilina region, is receiving foreign investment. Their common phenomenon is the arrival of new technologies and processes, which has a direct impact on the increase in labor productivity and the competitiveness of the Slovak economy. This trend is also related to the development of unemployment. Slovakia's accession to the EU in 2004 began with the trend of falling unemployment in Slovakia, including the Žilina Region, which lasted until 2008. The arrival of foreign investors, structural reforms and ambitions to enter the Euro zone, as soon as possible, encouraged this trend. However, the economic crisis in 2008 was severely affected by unemployment, when a long-term trend of gradually rising unemployment started, which did not stop until 2013. The Žilina Region itself has been copying national trends all along. In 2017, 20 351 jobseekers were registered in the Žilina Region, representing a registered unemployment rate of 5.08 %. As the unemployment rate was 12.51 % in 2013, a significant decline in the number of unemployed people has been observed in recent years.

The most powerful companies in the region are operating in automotive, metallurgy, engineering, wood, pulp, paper and related products. Compared with other regions, the construction industry in Žilina has a strong position, accounting for an annual turnover of 13 %. There is a relatively significant position in the region of the electrotechnical industry and telecommunications. Its importance is

growing especially thanks to the activities of foreign investors. Informatics, communication technologies and electronics are important sectors with a long tradition, especially in research and development, but also in software and hardware production. At present, the automotive industry is the biggest development due to the location of VW, KIA and their suppliers in the region. Many other companies related to the automotive industry have also established themselves in the region in recent years. The region has also a permanent research base, particularly in the fields of logistics, information and communication technologies, the chemical, textile and food industries.

Economic and human activities in the region have a direct impact on the quality of the environment. In terms of air quality, technological progress has led to gradual reductions in emissions and air pollution. The most significant pollutant in this area is carbon monoxide, other pollutants include SO₂, NO_x, PM₁₀ and PM_{2,5} and benzene. These pollutants, especially in the case of heating months or intensive transport areas, pose significant risks to the health of the inhabitants of the Žilina Region.

Strategic documents:

At the regional level of the Žilina Region, the following strategic and conceptual documents are relevant to the area of economic development and the environment:

- Economic and Social Development Program of the Žilina self-governing Region for 2014-2020: Medium-term development document prepared in accordance with the goals and priorities of the national development strategy which responds to the socio-economic situation of the territory.
- Note: At strategic level, strategic documents with focus on air and emissions are not elaborated.

4.1.4 Moravian-Silesian Region

The region lies in the northeast of the Czech Republic and forms one of the most marginal parts. In the north and east it borders the Polish Voivodeships - Silesian and Opolsk, in the southeast with the Žilinský Region in Slovakia. Within the regional structure, Moravian-Silesian region is flanked by the Olomouc Region and in the south it is affected by the Zlín Region. The cross-border nature of the region provides opportunities for effective cooperation in the sphere of production, infrastructure development, environmental protection, cultural and educational activities and especially in the field of tourism.

People are the basic determinant (together with the surrounding environment) of all economic, cultural, social and other activities, since they are driven by human needs and realized through resources in people embodied. In 2017, 1 207 419 inhabitants lived in the Moravian-Silesian Region, with the population declining continuously since 2008. Over the last 10 years the region has lost more than 42 000 inhabitants.

The performance of the region's economy, due to strong industrial tradition, is largely driven by the concentration of export-based heavy-industry enterprises and the associated value chains in raw materials processing and engineering, which are significant exporters of knowledge to advanced foreign markets around the world. Companies within these chains have a high R & D innovation potential. However, in the field of research, development and innovation, the region can also rely on the existence of a number of intermediary institutions, clusters and initiatives. Cooperation between the public, academic and private spheres is high compared to other regions.

Since the beginning of the nineties, the environment has been substantially improved due to the decline in industrial production, the use of more technology, and considerable investment in environmental measures. In spite of these improvements, the region continues to be one of the most heavily affected areas in the Czech Republic, as all the components of the environment have been polluted in the past. Today, the most serious is the contamination of soil and groundwater as a result of industrial activity, mine drops and pollution of surface water and air. The region is one of the most disadvantaged regions in Europe that negatively affects the health of the population and the region's image.

It is necessary to realize that the current state of the environment limits further development of the region (fulfillment of the stated objectives of the strategy), both in particular affected areas with a heavily encumbered environment, as well as in areas of valuable nature whose degradation would reduce the attractiveness of the region. The long-term insufficient involvement of the population in economic processes and low entrepreneurial activity compared to other regions in the Czech Republic is the cause of below-average economic performance. Companies which, due to the economic downturn, will not hold back the long-term fall in supply, risk extinction and loss of markets. Further development of research and development-based innovation activities in the future will not be possible without close links between knowledge institutions and the application sphere; therefore, the innovation system in the region needs to be further strengthened to reverse the unfavorable trend in public research and development funding. The education of the inhabitants of the region is lower than the Czech average, despite the presence of universities, which in recent years have registered a dynamic increase in the number of students. For more than a decade, the Moravian-Silesian Region has seen the negative balance of migration, especially of educated and working-age people. If this trend fails to reverse, the region's residents will continue to move away from the region and the population will continue to age, which will negatively affect its competitiveness.

Despite these facts, it can be said that the Moravian-Silesian Region will build on the future and, if it sufficiently exploits its specialization based on the use of knowledge in traditional industries and exploits the development of new outlets in global markets, has the potential to become a dynamic, rapidly growing developmental pole of Central Europe. To do this, we need to create the conditions for the development of R & D and innovative entrepreneurship and for the involvement of local firms in global value chains. At the same time, it is necessary to stimulate the labor market and increase its ability to involve as many inhabitants as possible in the economy. This also relates to the emphasis on lifelong learning and the development of skills and competences. The region must also offer an environment and conditions improving the quality of life that will be attractive not only for the inhabitants but also for their visitors.

Strategic documents:

At the regional level of the Moravian-Silesian Region, the following strategic and conceptual documents are relevant to the area of economic development and the environment:

- Development Strategy of the Moravian-Silesian Region for the years 2009-2020: Medium-term strategic document fulfilling the conditions resulting from Act No. 248/2000 Coll. on the promotion of regional development. As part of its strategic objectives, it reflects all the regional development components, including environmental protection.
- Measures of a general nature on the issue of the Air Quality Improvement Program Moravia Silesia - CZ08Z: The objective of the Program is to achieve the required air quality for the pollutants in the shortest possible time.

At the level of the Moravian-Silesian Region, subsidies for the exchange of local heating systems for more efficient and environmentally friendly sources of heating (so-called boiler subsidies) are regularly implemented. In the years 2017 - 2018, a second call for these subsidies took place, the funds of which were fully exhausted by the applicants. Potential applicants may continue to report to grant programs while being included in the stack for further program challenges.

4.2 Pilote Cities

4.2.1 Ostrava

Brief Characteristics

Ostrava is the third largest city in the Czech Republic in terms of population. It has a strategically advantageous location - it is located near the border with Poland and Slovakia, from the capital city of Prague it is 370 km, 170 km from Brno, 90 km from Katowice, 310 km from Vienna. The Ore, Ostravice, Opava and Lučina rivers flow through the town. Ostrava is divided into 23 district districts, the largest of which is about 100 thousand of inhabitants, and the smallest is less than 1 thousand residents. Ostrava is very characteristic in its settlement structure and differs significantly from other Czech and European cities. Ostrava consists of three natural centers of settlement, forming a polycentric structure of settlement around three core areas - the neighborhood of the historical core of the city in Moravia Ostrava, Ostrava-Jih, Poruba, where each of the cores has its specific qualities.

Within the area Ostrava is the second largest city of the Czech Republic. The area of the city is 21,400 hectare. The loose area, the number of vacancies, peripheral sites and barriers represent a major problem in developing the city and effectively maintaining its infrastructure. Although the number of inhabitants of Ostrava has been decreasing since the 1990s, the decline is not large enough to reduce the present and future importance of Ostrava. Ostrava-Jih and Poruba are characterized by human settlements of the settlement type, in the historical core of Moravian Ostrava the traditional urban area prevails.

The historical center with its surroundings is, at the same time, the center of the Ostrava polycentric metropolitan area - an agglomeration around Ostrava with a population of approximately 1 million, is after Prague the second largest settlement agglomeration in the Czech Republic. The Ostrava agglomeration represents a compact area with very high mutual interactions between the municipalities in the background and other cities (Havířov, Karviná, Frýdek-Místek, Opava). The Ostrava agglomeration (defined in the ITI - Integrated Territorial Investment Strategy) concentrates 79 % of the population of the Moravian-Silesian Region to 35 % of its area and can be considered as the second development economic pole of the Czech Republic.

In the year 2017, 290 450 inhabitants lived in Ostrava. In recent years, there has been a significant decline in the population of the city, only over 5 000 inhabitants have survived in Ostrava over the last 5 years. The reason for this development can be seen in all possible factors. They are both inferior birth rates and higher mortality, although the age structure of the population tends to lead to opposite or at least less negative expectations. Equally, the big difference between the number of people moving to and out of the city reduces the size of Ostrava's population. Part of these inhabitants are people who have moved to the Ostrava base and continue to use its functions.

The average age of the population in Ostrava is rising, in line with the nationwide trend, in 2017 it is worth 42.6 years. This trend is mainly due to an increase in the number of people over 65 with a simultaneous decrease in the number of people of productive age.

In 2011, 14.4 % of the population aged 15+ had higher education. This proportion is lower than that one of the comparing cities, but it is growing faster (in the period 2001-2011 the share of undergraduates in Ostrava increased by 36.3 %, in Brno by 31.8 % and Plzeň by 24.1 %). Also, the proportion of people with HEIs, extras or graduates is lower than the reference cities. On the contrary, the share of the teachers and persons with basic education is higher in Ostrava. Interestingly, given the structure of the local economy, the share of the technically educated workforce is not significantly higher in Ostrava than in the reference cities, on the contrary, the share of people with social science education is dominated by university students. Therefore, it can not be assumed that the level or fields of education would create a comparative advantage in the field of technically educated labor at the level of the compared cities.

The Ostrava agglomeration is still strongly dependent on a few strong employers in the heavy industry. Many companies have undergone their own internal transformation, namely the modernization of production, the changing of the markets (in product and geographical sense), which ensured their viability not only in the Czech but also in the European market. Typical industrial cities are characterized by the trend of disindustrialisation and restructuring, and the associated risk of losing job opportunities for many people and the slow development of services and new industries. On the other hand, the restructuring process is linked to the diversification of the economy, the emergence of new companies and foreign investors, as well as the creation of many new jobs in new fields, in Ostrava, for example in the field of information technology and electrical engineering. The Ostrava region is specific to other regions due to the development of areas such as the development of a special SW associated with counseling and system integration, development and production of special equipment for energy (often based on energy recovery of waste), development and production of special (measuring) instruments and equipment for metallurgical, engineering and power engineering, or specialized engineering especially for heavy engineering. But there are also branches such as robotics, industrial automation, electronics or the chemical industry. Ostrava's economy is also a specific concentration of technical knowledge in the European context due to its economic focus. In addition to business, this knowledge is maintained and developed by universities and several research and support innovative organizations, such as the Automobile Cluster or the IT4Innovation Superpower Computing Center.

The Ostrava-city district has long been moving to the front rungs from the unemployment yard. However, in line with the nationwide trend, unemployment also drops significantly in Ostrava. While at the end of 2014, 10.8 % of unemployed persons of working age were 10.8 % unemployed in the Czech Republic, at the end of 2017 this share was only 6.9 %; in the middle of 2008, even only 6.0 %. However, the problem is a very unfavorable structure, which consists in the high share of the long-term unemployed (55 % of the unemployed are unemployed for more than one year) and the high share of the less qualified persons (72.7 % of the unemployed have obtained a maximum secondary education with a certificate of education).

Air pollution is one of the most important topics for Ostrava. Long-term elevated pollutant concentrations have been shown to have a negative impact on human health, increase the incidence of respiratory and cardiovascular diseases, and particulate matter and related substances (e.g. benzo (a) pyrene) have carcinogenic effects. The most vulnerable population groups are small children and pregnant women. It can be assumed that these health risks can significantly contribute to lower life expectancy (in Ostrava it is lower by about 2.8 years for men and 1.6 years for women compared to Brno). Mediating these facts and knowing the state of air pollution leads, on the one hand, to the deterioration of the image of Ostrava and to a higher tendency (especially in the case of young families) to emigrate from Ostrava. In the last 5 years, in the case of the Pilsen region, CZK 1,27 billion was spent on investments in air protection, irrespective of the source of funds, CZK 1,90 billion in the case of the South Moravian Region and CZK 8,02 billion under the Moravian-Silesian Region (equivalent to 28.2 % of all investments in air protection in the Czech Republic). The level of pollution from large sources (REZZO 1) significantly decreased in the period 2003-2012 in the Ostrava-City District, by 51.1 - 76.5 % depending on the pollutant. Despite this, air pollution in Ostrava is alarming compared to selected cities (or districts).

Ostrava is currently pursuing the title of European Green Capital 2020. Two key issues in assessing cities in the competition are mitigating the impacts of climate change and adapting to climate change. Mitigating the impacts of climate change in general involves reducing human (anthropogenic) greenhouse gas emissions. Conversely, adaptations to global warming are measures taken to defend against the possible (or unavoidable) effects of global warming. One of the greenhouse gases influencing the climate is carbon dioxide (CO₂). In November 2011, the City of Ostrava became an official member of the Covenant of Mayors and, in 2015, it also announced the European Commission's Smart Cities and Communities initiative. As part of these initiatives, it has committed itself to

reducing emissions by 2020 in line with the EU strategy. Under the set conditions, cities are reducing CO₂ emissions by 20 percent between 2000 and 2020. Ostrava has voluntarily accepted a commitment above this threshold by reaching a quarter of its CO₂ emissions by 2020, by a total of 25 %. The progressive fulfillment of this commitment should be confirmed by the ongoing monitoring emissions inventory (balance) for 2015.

Ostrava produces an average of 3.7 tonnes of CO₂ per inhabitant per year. This figure is particularly interesting compared to other cities. Of the candidates for the European Green Capital 2019, it is better for Oslo (2.3 t CO₂). Other cities lag behind: Lisbon produces 3.8 tonnes of CO₂, Gent 5.64 tonnes of CO₂, Lahti 6.96 tonnes of CO₂, and Estonian Tallinn even 8.5 tonnes of CO₂.

To mitigate the effects of climate change is also contributing to the expansion of forests that remove CO₂ from the atmosphere. Only as part of the greenhouse projects in the years 2013-2015 the number of planted trees was 7 000 and the bushes were 20 000 pieces. Within the framework of the TSEs (Territorial System of Environmental Stability) projects, between 2013 and 2016, even 120 000 trees and 300 000 shrubs were planted in the city.

Energy efficiency can also play an important role, for example by improving the thermal insulation of buildings. In the past, Ostrava has implemented projects to reduce the energy performance of buildings. Within the Ekotermo I-IV and three other projects, 31 buildings with an area of almost 100 000 m² were insulated, which resulted in a reduction of energy consumption by 18 thousand GJ per year and ultimately reducing CO₂ emissions by 1.4 thousand tonnes per year.

Ostrava, as one of eight cities in the Czech Republic, prepares an Adaptation Strategy for the Impacts and Risks of Climate Change. It is a key document that represents a long-term strategy to increase the city's resilience to the negative impacts and risks of climate change at local level. It will be completed in September 2018. An overview of type projects will also be prepared and pilot projects and implementation measures will be proposed.

In parallel with the Adaptation Strategy, the Sustainable Energy and Climate Action Plan (SECAP) is also being updated and actively involved by experts from all urban organizations and companies, which is also reflecting both mitigation measures and climate change adaptation. Its main component is the extensive collection of energy data and the subsequent production of CO₂ emission inventories for 2015.

Strategic documents of the city

The Statutory City of Ostrava has on its territory a number of valid strategic documents related to the solved problems of economic development and the environment. Main documents are:

- **Strategic Plan for the Development of the Statutory City of Ostrava 2017-2023:** Key Strategic Documents of the City of Ostrava for Planning its Development. Priority C, called HEALTH CITY, also addresses the issues of air quality, especially in the context of transport issues.
- **Program for improving the air quality of the agglomeration Ostrava /Karviná/Frýdek-Místek - CZ08A.**
- **Short-term Air Quality Improvement Program - Ostrava:** A document presenting an action plan containing concrete activities to be implemented to achieve a better quality of air in the city.
- **Sustainable Urban Mobility Plan Ostrava:** Concept of a sustainable transport system for the city and its catchment area, which is in line with environmental policy requirements.

4.2.2 Opava

Brief Characteristics

The Statutory city of Opava lies on the same river at an altitude of 260 m. It is an industrial and cultural center of Czech Silesia and its significance extends beyond the borders of the district. The first written report of the settlement lying at the crossroads of trade routes and its naming after the Opava River dates back to 1195. The city's establishment is documented by a document dating back to 1224. At the beginning of the 14th century, the Opava principality was established within the Czech Crown, and Opava became its administrative center. Since 1742, after the lost war, when most of Silesia was assigned to Prussia, Opava was the capital of Austrian Silesia.

The town of Opava is situated in a slightly wavy, relatively flat, open countryside, north of the highlands of the Lower Jeseník near the state border with Poland. The axis of the area consists of the Opava River (the left-bank tributary of the Odra River in Třebovice), which flows from the northwest to the east.

In 2017, 57 019 inhabitants lived in Opava. In recent years, there has been a gradual decline in population over the last 5 years, with a population of nearly 1 000 inhabitants. This decline is due to the displacement of the population; the natural increase is positive in recent years.

Opava is a statutory town, the seat of Silesian University, secondary schools, cultural and scientific institutions. The Silesian Land Museum, founded on 1st May 1814, is the oldest museum in the Czech Republic and one of the most important institutions in the republic (exposition of nature and history of Silesia, lifestyle development and art from the Gothic to the present). Opava also houses the Silesian Institute and the Institute of Archeology of the Academy of Sciences of the Czech Republic.

Opava is an important administrative, service and production center of a relatively large catchment area, a source of employment opportunities and a center of civic amenities for the surrounding communities. Opava is one of the most attractive towns in the Moravian-Silesian region, both through its historical development and the preserved historical center of the town, with sufficient civic amenities and relatively good transport accessibility.

Opava, a town located in the Opava hillside on a river of the same name with a population of less than 60 thousand, is due to its location in the region, the quality of the environment and the developing transport infrastructure, is a suitable place for business. In 2017 there are more than 19 000 business entities registered.

Opava is actively involved in the Healthy City Project initiated by WHO - World Health Organization. All Healthy Cities combine the idea of a better, healthier and more satisfied life of their citizens. That is why they are intensively engaged in all areas of life that can affect the health and well-being of the population (living and social environment, city development, ...). Cities, municipalities and the region are grouped into so-called national networks that enable them to share experience in promoting public-service quality, quality strategic planning and management in terms of sustainable development, quality of life and health. In the Czech Republic, it is an internationally certified association of the National Network of Healthy Cities, which provides municipalities with information on financial resources, mediates cooperation with professional partners, educates staff in the field of sustainable development, strategic management, etc., and, last but not least, promotes successful city activities to nationwide level.

Strategic documents:

The key strategic documents valid in the territory of the statutory city of Opava related to development and the environment are:

- **Strategic Plan of the City of Opava 2015 - 2020:** The main development document of the city, which also deals with the quality of the air in the priorities of infrastructure and the environment.

- **Sustainable Urban Mobility Plan Opava:** Concept of a sustainable transport system for the city and its catchment area, which is in line with environmental policy requirements.

4.2.3 Opole

Opole is located in southern Poland on the river Odra. With a population of 127 792 (as of January 1, 2017), it is the capital of the Opole Voivodship located in the south of Poland, near the border with the Czech Republic (Trzebinia-Bartulovice - 54 km). It covers an area of 149 km² and with adjoining municipalities it forms an urban agglomeration inhabited by more than 262 000 inhabitants. The population of the Opole Voivodeship reaches about 1 million inhabitants. The Opole has good connections to the railway network and shipping (there are 2 ports in the city). The city lies on the international Berlin-Kiev transport corridor (A4 motorway). The nearest international airport is in Wrocław (about 100 km) and Katowice (about 110 km).

City advantages:

- Strategic position - motorway A4, 14 km from the city center.
- Entrepreneurship - one of the highest indexes of entrepreneurship among Polish cities - 162 businesses per 1000 inhabitants.
- Well developed and active food industry, electrical machinery industry and building materials industry.
- Professional employees - 6 higher education institutions, research and development centers.
- The city of young people - 36 000 students, 9 000 graduates per year.
- Attractive location for services BPO and SSC.
- Wide investment offer, including the Wałbrzych Special Economic Zone sub-area "INVEST-PARK".
- The capital of Polish music - since 1963 the city has organized the National Festival of Polish Songs.

The high quality of infrastructure, access to all levels of education, modern health services, efficient urban transport, a large number of cultural and artistic centers, and sports and leisure facilities are among the elements that make living standards in Opole one of the highest in Poland. Opole is at the head of many national charts: the first place in the order of EU funds per capita; fourth in the ranking of business cities; second in the ranking of the cheapest Polish cities. Due to the factors evaluated in these charts and a number of others such as the quality of children's education, access to medical services, wealth of the population and access to the Internet, the index of life in Opole is the highest among Polish cities, according to the study "Social Diagnosis 2009" Janusz Czapiński. Opole is generally known as the capital of Polish music. Every year there are popular festivals, the most famous of which is the National Festival of Polish Songs, which attracts tens of thousands of tourists for over 50 years, media attention and millions of television viewers. Festival fans can recall their previous release in the newly established Museum of Polish Songs. Another prestigious event in Poland's cultural life is Opole's Theatrical Confrontation - the Polish classic. Another important event is the National Puppet Theater Festival. The festival features a wide array of contemporary art puppetry and a performance that was prepared for it is intended not only for children or young adults. The cultural offer is complemented by a modern urban public library, which building has been recognized as one of the seven wonders of European funds. Opole offers its inhabitants and guests rich recreational and tourist offerings. The gradual development of the cycling route network soon connects with a large number of cities and includes a coherent transport system. There are many parks and recreational areas in Opole. Perfect places for weekend walks include: Bolko Island City Park, Młynówka Canal; Oder River Park; boulevard Karol Musioł; and Opole Zoo, which is one of the most beautiful of its kind in Poland. SWOT analysis of The development strategy of the Opole Voivodeship until 2020 indicates that Opole

is a key city center influencing the pace and dynamism of the whole region. Opole strengthens the Opole Voivods' competitive position in the national space - apart from regional functions, it performs a number of national functions.

Strategic documents:

The following documents relevant to the issue in Opole are:

- **Development strategy for Opole for 2012 - 2020:** The city's strategic document, which, among other things, deals with environmental protection.
- **Local Opole Revolutionization Program for 2023:** A Starteg document, which also includes measures related to air quality.

4.2.4 Rybnik

The name of the town refers to the period before the industrial period when the inhabitants of Rybnik predominantly hunted fish, and on the site of today's market was a great pond for fishing. Rybnik is located on the Rybnice Plateau, which is part of the Silesian Highlands, in Upper Silesia. The town of Rybnik is divided into 27 parts, which are an auxiliary level of self-government. The mild climate is affected by the proximity of the Odra River. Rybnik belongs to the Polish cities with the most polluted air³.

Rybnik is a center characterized by a number of positive features, which are attractive for the inhabitants. It is a city that excels positively in its subregional and regional environment. In a strategic sense, positive features play a key role in shaping city development and building its position in the environment.

Demographic development of Rybnik is closely linked to the integration of neighboring towns and villages. The largest population jump occurred in the 1970s when the number of inhabitants tripled after counting the surrounding municipalities. In the 1980s, the growth rate of the population declined, stagnation occurred in the 1990s, followed by a slow decrease in the population, but the declining trend was clearly lower than in other Polish and European cities. In 2006, the natural increase was positive and reached 1.3 %; in 2008-2009 there was a slight increase in the population of Rybnik, which had temporarily interrupted the downward trend since 1997. In 2016, Rybnik had 139 540 inhabitants.

There are about 13 000 registered business entities in the city. Their factories include, among others, Purmo, Tenneco Automotive. The annual per capita income per inhabitant in 2005 was PLN 2 805.42.

There are two coal mines in the city that are part of the Polish mining group: KWK Chwałowice and KWK Jankowice. After a change in ownership, Rybnicka Fabryka Maszyn won RYFAMA S.A. a high position in the market for mining machinery and equipment manufacturers. In recent years, a number of factories have been closed down in Silesia. The areas around these former industrial complexes are usually transformed into large-scale shops and shopping and entertainment galleries. On the outskirts of the city is also a thermal power plant with a capacity exceeding 1700 MW.

The roads in Rybnik converge to the city center. Traffic jams often occur during the peak time - morning on Mikołowska Street (the road to Kameny and Czerwionka-Leszczyn) and Gliwicka street (the way to Ochojca and Gliwice). During the afternoon peak, Żorská and Gliwická roads are blocked, especially Rondo and Mikołowska. The City Office is aware of these problems and plans to build a new road link, now for Kamień and Czerwionka-Leszczyn. In the following years, construction of a parallel road to Wiosny Ludów and Mikołowska will begin. Most transit traffic takes place in the main streets of the city. The construction of the Rybnik bypass was started in 2013. The following national and regional road journeys are under way by Rybnik:

³ Nowy Targ, Sucha Beskidzka a Proszowice mezi nejkarcinogenějšími městy v Polsku. "Dziennik Polski", 2015-01-05. Varšava.

- Motorway A1 (Gdańsk - Rybnik - Gorzyczki)
- National road # 78 (Chatupki - Wodzisław Śląski - Rybnik - Gliwice - Zawiercie - Chmielnik)
- Regional road # 920 (Rudy - Rybnik)
- Regional road # 925 (Rybnik - Orzesze - Ruda Śląska - Bytom)
- Regional road # 929 (Rybnik - Świerklany)
- Regional road # 935 (Racibórz - Rydułtowy - Rybnik - Żory - Pszczyna)

In Rybnik the following documents are relevant to the issue:

- **Rybnik Integrated Development Strategy for 2020:** City Strategy Paper. The strategy also includes environmental objectives in and around the city.
- **Sustainable urban mobility plan of Rybnik:** Concept of a sustainable transport system for the city and its catchment area, which is in line with environmental policy requirements.
- **Rybnik's Environment Protection Program until 2020 with a Perspective until 2024:** Strategy specifically focused on the environment in the city.

4.2.5 Žilina

The town of Žilina is the center of northwestern Slovakia and the fourth largest city in the Slovak Republic. It is the seat of the authorities of the Žilina self-governing region, one of the eight regions of the Slovak Republic with an area of 6 788 km². The Žilina Region includes the historical areas of Považie, Kysuce, Liptov, Orava and Turiec. Žilina district has an area of 815 km², with a population of 157 281. The city of Žilina covers an area of 80.03 km² with a population of 83 195 (as of 30th April 2018). In Gross Domestic Product (GDP) per capita, Slovakia ranges from 2nd to 3rd place. It is a city of automotive and engineering, construction, energy, electrical, textile, paper, chemical industry, and services. It is a major transport hub connecting routes of international significance; in the future there will be intersecting the D1 and D3 motorways. Žilina is also an international railway junction with a nearby airport. In the long run, Žilina is also planned for a river port. Žilina consists of 14 cadastral areas: Žilina, Bytčica, Závodie, Bánová, Strážov, Žilinská Lehota, Považský Chlmec, Vraní, Budatín, Brodno, Zádubnie, Zástranie, Trnová and Mojšova Lúčka. The town lies at an altitude of 328 m. The town of Žilina lies in the valley of the Váh river in the Žilina basin, at the confluence of the Váh river with the rivers Kysuca and Rajčianka. The cadastral area has a compact semi-circular shape with the outgrowths of affiliated municipalities. Almost two thirds of the cadastral area of the city is urbanized, the balance is free, agricultural land and forests. Žilinská kotlina is located between the Mala Fatra Mountains, Strážovské vrchy, Súľovské vrchy, Javorníky and Kysucká vrchovina. Žilina has been perceived in the past as a progressive, modern, industrialized city. Today, it seeks and wants to become a modern center of business, administration, employment, industry, regional self-government, education, transport, congresses, culture, sports and tourism.

At present, Žilina is the center of north-western Slovakia, where the rich history and architecture blends with modern and dynamic development. Historical developments, traditions and presentations include Žilina undoubtedly one of the most important cities in Slovakia.

Demographic conditions

Since 2001, when the city of Žilina had 85 400 inhabitants, the development of the natural population growth of the city to today's 83 195 did not change significantly. Over the past 10 years, the city's population has changed 300-500 a year, either up or down. That's why Žilina has for about a few years still about the same number of inhabitants. Estimates of city planners and independent expert calculations are that the expected development will be in the city of Žilina in the year 2025 about 100 000 - 110 000 inhabitants. Žilina has its geographic location, history, current and future transport connections, the potential for one of the most significant growth in Slovakia. Urban development not only in Slovakia has negatively affected the economic and financial crisis in recent years, the consequences of which have persisted to this day. It has, among other things, led to a significant decline in the standard of living and employment. These are factors that have had a very negative impact on the birth rate and thus on the population growth. The positive effects of the migration to

Žilina for work, as a result of the large KIA car factory near Žilina and a number of smaller subcontractors, did not reflect the increase. The reasons are several. Hundreds of new employees in these companies come daily to work from their more, or less distant homes because it is financially more profitable than a large investment in the purchase of an apartment in Žilina. Another factor is the very good traffic and time availability of the city for workers. In addition, there is a long-term trend of Žilina inhabitants to build a house in the countryside, small villages, in the nearby easily accessible countryside around Žilina. The last factor is also the fact that mainly young, single people leave for better working and financial conditions either to Bratislava or abroad. Together we can talk about numbers in the order of several hundred to thousands of inhabitants, which are statistically missing and do not fit into the calculations of the assumptions of past growth. Necessary part of the next period will be the marked aging of the population. The accompanying sign of decreasing birth rates will be the decrease in the number of household members and hence the occupancy of dwellings. Possible migration gains can be gained by the city of Žilina mainly from the districts located in the northern part of the Žilina Region, Kysuce, Orava, where the situation with job opportunities is much worse. The city of Žilina has suitable locations for the construction of dwellings, it has facilities for development of services, light industry and areas for the development of industrial plants, especially on the site of former large factories (Slovene, PCHZ, Makita, dairies, bricks).

Education

The city of Žilina is the founder of 18 elementary schools, including 6 elementary schools with kindergarten, 20 kindergartens, 3 primary schools of art, 2 leisure centers. The city also houses 3 primary schools, one private school, two special primary schools, and a private primary school for pupils and children with autism, a church free time center and a private elementary school. There are 8 grammar schools in the city, of which one is bilingual, 19 secondary vocational schools, one of them special. At the University of Žilina, around 12,000 students are studying at 7 faculties.

Economy

The town of Žilina is the economic center of the district. There are several industries in the district: engineering, chemical, wood, textile and paper industry, furniture, bearings, etc. There are also other companies involved in the production of components for agricultural technology. There is also a cement plant and hydropower plants. There are good conditions for plant production, which makes this area among the major potato producers. The district is an important traffic junction. Kia Motors Slovakia, s.r.o. is the most important enterprise representing the automotive industry. Its production creates a suitable environment for other subcontractors who make automotive components. These include MOBIS, HYSCO, DONGHEE, Johnsons CONTROL. Other large companies that strategically invested their capital in Žilina are Metso TISSUE, SIEMENS, Scheidt & BACHMANN. Strong companies on the market are also domestic companies based in Žilina, such as Stredoslovenská energetika.

If Žilina wants to maintain its growth rate in the near and far future, and thus fulfill the function of the metropolitan center of northwestern Slovakia, it must fulfill the necessary development goals based on tradition, geography, history, demography, administration, politics, industry, education, culture and sport. Further development and growth of the city can only be ensured by creating suitable conditions for the natives to live in Žilina and to move immigrants from other places. These conditions include, above all, sufficient job opportunities. New jobs will be created here only if favorable conditions for the arrival of new investors, employers, are created in the city. It is difficult to expect the investor to build a KIA Motors plant in the near future in Žilina, or in the neighborhood of the city. Given the shape of the Žilina basin, we do not have a similarly large, untapped area. Still, they are still in a relatively near area, although not in the immediate vicinity of the city, even in the neighboring district, smaller open areas ready for the arrival of investors and the construction of industrial parks. These are mainly small industrial parks in Varín, Strečno, Hričov, Kotešová and Bytča. If the prospects for the construction of new plants and the creation of new jobs in these localities were to succeed in the future, it would certainly have a positive impact on the growth and development of Žilina. The planned completion of the D1 motorway from Žilina to Košice is

paradoxically likely to pose a potential risk of shifting the interest of prospective investors towards the east of the country where there is high unemployment and cheap labor. The non-existent highway link between Žilina and the east of Slovakia and the completion of the D1 motorway from Bratislava just in Žilina may be an asset to the region's attractiveness for potential new employers.

Unemployment

Unemployment in Slovakia has been decreasing continuously since 2016. This trend is copied by the district of Žilina. Currently, the unemployment rate in Žilina is 3.5 % (March 2018). The city of Žilina is characterized by a lot of new jobs, but by an inappropriate structure of job seekers. Therefore, the city of Žilina plans to focus in the future on narrower profiling and specialization of elementary and secondary schools, as well as the support of the cooperation of Žilina University with regional employers.

City strategic documents:

- The following strategic documents relevant to the issues of economic development and environment valid in Žilina are:
- **Strategic Development Plan of the City of Žilina until 2025:** The main document for planning the development of the city of Žilina, as such, does not directly address the issue of air pollution.
- **Air quality improvement program for air quality management:** A program aimed at reducing emissions from transport, industry and local heating.
- **Žilina Green Action Plan:** Strategic document focused on the ecologicalization of transport in the city by supporting cyclotourism.
- **Mobility Action Plan for the City of Žilina:** Concept of a sustainable transport system for the city and its catchment area that is in line with environmental policy requirements.
- **Low Carbon Action Plan for the City of Žilina:** A document containing a proposal for the implementation of measures for the transport of coal in the city of Žilina.

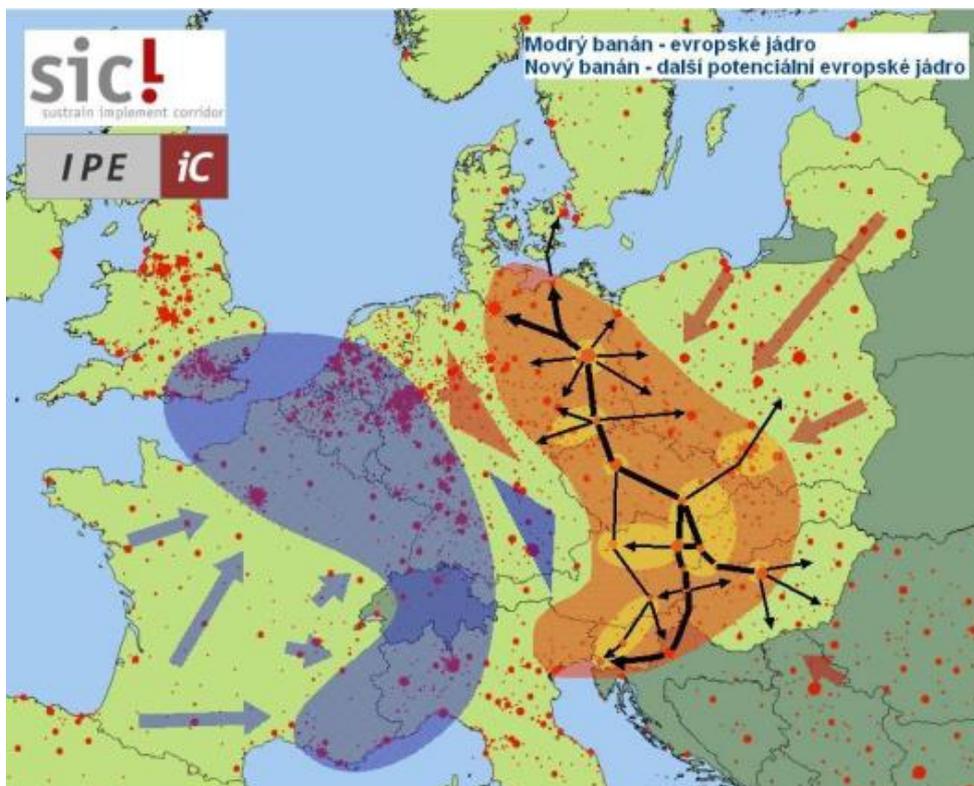
5. Conclusion

The European Commission's European Spatial Development Perspective (ESDP, adopted in 1999 at the Informal Meeting of EU Ministers in Potsdam) describes the development potential of peripheral areas as well as the concentration risk in core areas. The polycentric concept is perceived as a strategy to resolve the current undesirable division of European space into a core and a periphery. The concept of polycentric development needs to be addressed in order to ensure a balanced development of the regions, as the European Union is fully integrated into the global economy. The polycentric settlement structure helps to avoid economic and demographic concentration in core areas and helps to develop regions more evenly and to make better use of their economic potential. Greater engagement of regions in the global economy then increases the European Union's competitiveness on a global scale.

There are several views on putting the concept of polycentric development into practice. One is the reinforcement of several major areas in the integration of the European Union into the global economy, including peripheral areas, through transnational spatial development strategies. The second is to strengthen the polycentric structure and better balance of metropolitan systems and agglomerations through closer cooperation between structural policies and trans-European networks (TENs) and improving transport network interconnections at international, national and regional-local levels.

Within Europe, there is a single core area characterized by a high population density, the presence of the largest metropolitan areas with high density of high-quality transport networks and a high economic return called Blue Banana. The Ostrava agglomeration is part of the new vision (intent) of the desirable spatial economic development in Europe, the so-called New Banana⁴.

Figure 5.1: Blue banana and New banana

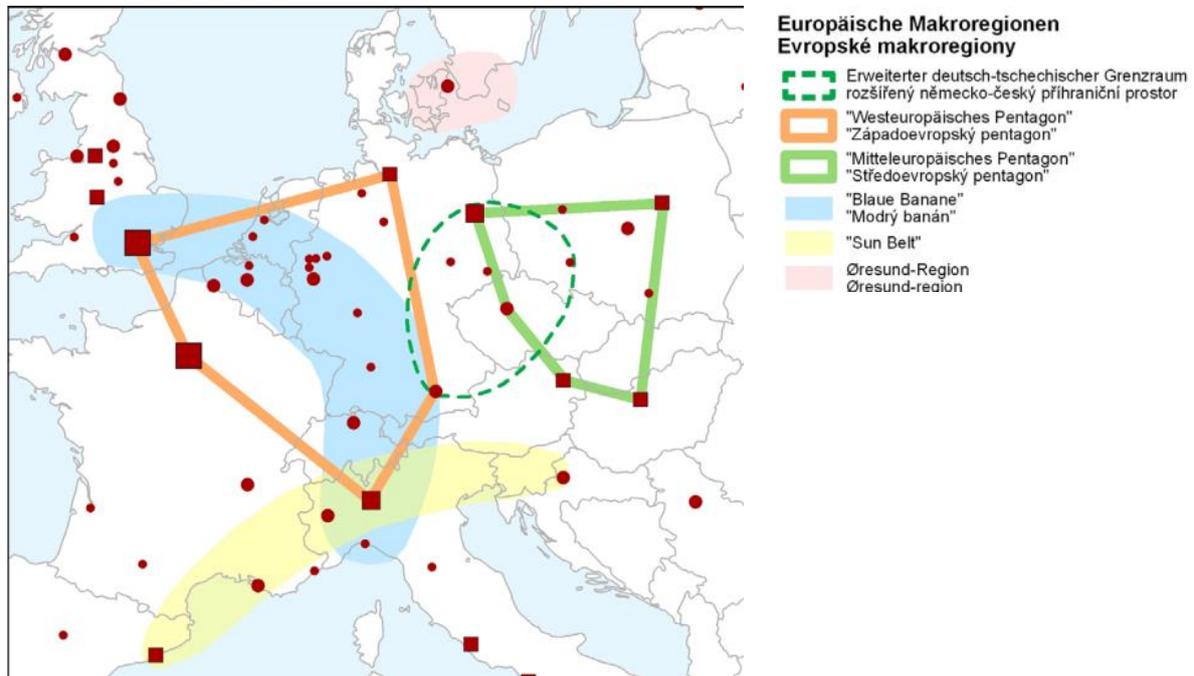


Source: SIC! sustrain implement corridor. Short fact-book.

⁴ VESELÝ, R. Rozvojové oblasti a osy v dokumentech územního rozvoje vybraných zemí střední Evropy IN Příloha časopisu Urbanismus a územní rozvoj, ročník 2007, číslo 5.

Another approach to spatial planning in the EU is the definition of major macro-regions, where besides the Blue Banana is the Öresund macro-region with Copenhagen and Malmö centers and the Sun Belt located from Barcelona through Milan to Zagreb. For Central European space, in this context, it is important to define the Central European Pentagon, in the vicinity of which the Upper and Western agglomerations are located. This strengthens its importance, which is also associated with the development of the Pan-European North-South Corridor.

Figure 5.2: Western European Pentagon and Central Pentagon



Source: Cross-border territorial development: cooperation between Germany and the Czech Republic. Berlin 2007.

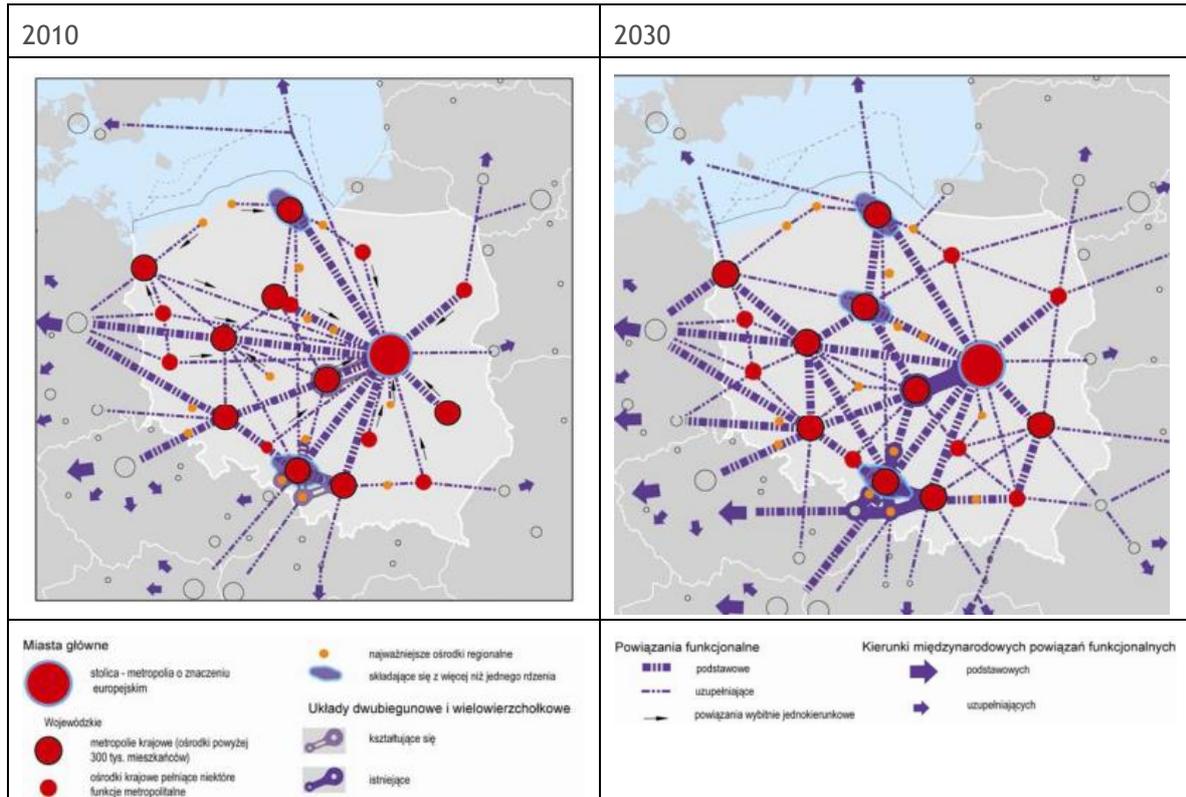
If we look at Europe, we find that the economic power expressed in terms of the absolute amount of gross domestic product is again concentrated in the so-called "pentagon". The importance of the "pentagon" will increase further if it maintains strong growth dynamics. At present, it is the "pentagon" instead of population concentration, economic strength, and positive economic development.

On the other hand, within the European Union, strategies are being developed for different macro-regions, namely the Baltic Sea macro-regions (Poland) and the Danube River Basin (EU Strategy for the Danube Region), to which the Czech Republic and Slovakia. The disadvantage is that these strategies divide the space between the Ostrava agglomeration and Katowice agglomeration and do not contribute to their interconnection. Nevertheless, links to Poland and Slovakia can be expected to develop very dynamically, in line with the gradual decline in the importance of national borders in the European Union. It is therefore necessary to predict the development of the settlement structure of the area of interest in confronting the situation of the settlement structure of the surrounding regions. It has to be said that this knowledge is not entirely clear and very low in the case of foreign regions. From this point of view, it is necessary to consider also the developmental possibilities of a dynamically constitutive settlement and economic north-south corridor in the Gdańsk-Warsaw-Katowice-Ostrava-Břeclav-Vienna-Graz-Maribor-Ljubljana-Trieste axis.

5.1 Development of the Silesian and Opole Voivodeship's Settlement Structure

A central document that maps the current state of the settlement structure in Poland and defines new development axes is the *Koncepcja Przestrzennego Zagospodarowania Kraju 2030*, which was adopted by the Polish government in 2011. This concept defines new development axes and foresees the interconnection of the Upper Slope agglomeration with the Ostrava agglomeration in 2030.

Figure 5.3: Spatial development of Poland



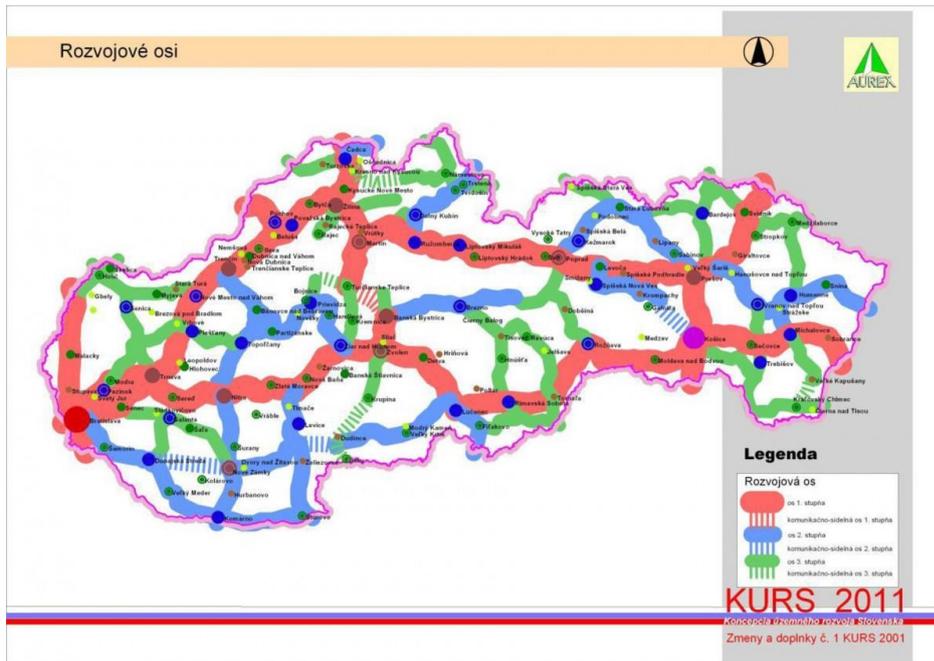
Source: RADY MINISTRÓW (2011) *Koncepcja Przestrzennego Zagospodarowania Kraju 2030*, p. 40.

5.2 Development of Settlement Structure in Slovakia

The Central Development Document of Slovakia is the updated Territorial Development Concept of Slovakia, which distinguishes three levels of development axes. Development axes are part of creating a balanced hierarchy of settlement structure. They support settlements between settlements and equilibrium settlement development, including rural development. They create the conditions for access to infrastructure, the preservation and development of the natural and cultural heritage, and the requirements of the settlement structure in terms of economic, social and environmental contexts.

The development axes, thus, effectively fulfill the requirements of sustainability and the creation of a healthy and environmentally sound living and working environment.

Figure 5.4: Development axis of Slovakia



Source: *Koncepcia územného rozvoja Slovenska*.

5.3 Further Development of Settlement Structure in the Moravian-Silesian Region

The key links at the national level include the development of settlement according to the development axis in the southwest direction to Olomouc, which is reinforced by the completion of the D1 motorway. The development of marginal settlements in the south of the region (namely Frenštát pod Radhoštěm and Frýdlant nad Ostravicí) in the direction of Rožnov pod Radhoštěm, Valašské Meziříčí and further to Vsetín also cannot be ignored. This area belonged to the North Moravian Region and there are still some functions related to the performance of public administration.

Also, the concept of local work systems and functionally urbanized spaces confirms the above trends, which show the interconnectedness of both regions (see the conclusions of the INTERREG IIIB - REPUS project⁵ (Maier a kol, 2008).

The settlement structure of the Moravian-Silesian Region was also significantly influenced by the terrain relief created in the middle of the Moravian Gate region, which passes through the basic transport corridors of European importance, whether it was the Amber Trail in the first four centuries AD, or in the middle of the 19th century "Ferdinand", which belonged to the most important lines of the Habsburg monarchy, and the completion of the D1 motorway in the north-south transport corridor of European significance given by the relief of the territory.

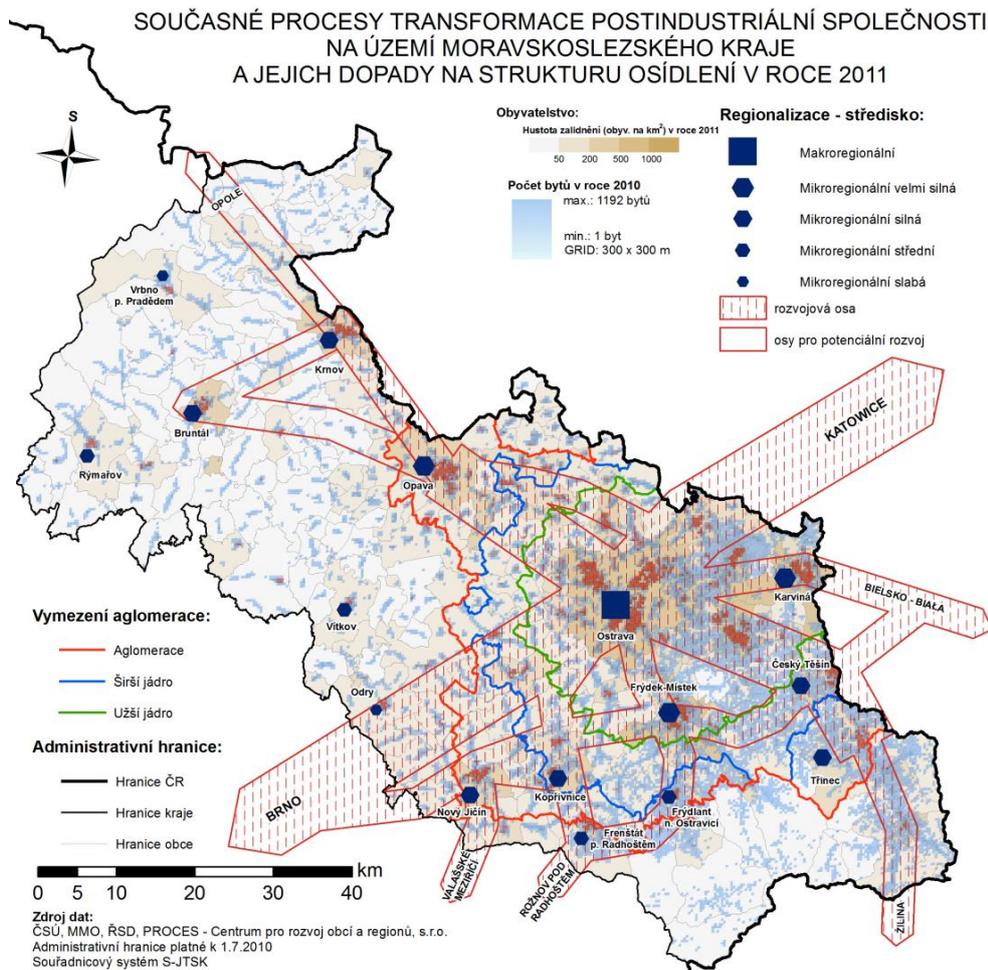
Transport is a key network linking individual headquarters and individual functional spaces within the settlements. It affects both the construction of residential units, the availability of services and the economic development of the whole area. With the development of society and the growing number of people, there is increasing pressure to move people, materials and information faster and easier,

⁵ MAIER, K. a kol. *Pomůcka pro pořizovatele územně analytických podkladů - Místní pracovištní systémy a funkční urbanizovaná území v ČR*. [online]. [cit. 2018-01-10]. Dostupné na: <http://www.mmr.cz/Uzemni-planovani-a-stavebni-rad/Stanoviska-a-metodiky/Pomucka-pro-porizovatele-uzemne-analytickych-podkl>.

in an effort to build ever denser transport networks and key transport nodes. Transport is key in the polycentric structure of the Moravian-Silesian Region.

Ostrava plays a very important role due to its favorable morphological position. The main road junction is the so-called Silesian Cross, which plays an important role in both domestic and international transport. The north-south direction leads through the Moravian Gate and then through the Ostrava Basin. It is a transport section of the D47/D1 motorway from the direction of Nový Jičín - Bohumín (on the international scale of Vienna/A - Brno - Olomouc - Ostrava - Bohumín - Katowice/PL - Warsaw/PL). The second part of the Silesian Cross forms the east-west transport route Krnov - Třinec (Krnov - Opava - Ostrava - Těšín - Žilina/SK) R56 road, respectively 56.

Figure 5.5: Development axis of Moravian-Silesian Region



Source: Regional Development study of Moravian-Silesian Region

The basic development axis of the Moravian-Silesian Region is in the north-east direction from Brno to Katowice. With the completion of the highway, there is an increased economic attractiveness in the vicinity of its congresses and there are already development projects. These activities are hampered by the economic recession, however, from the point of long-term development view, it can be assumed that this space will be concentrated as well.

The second axis passing from Třinec via Český Těšín, Ostrava, Opava with a closer connection to Krnov is influenced by the long-term development of the settlement structure and it can be assumed that its importance will remain key for the Moravian-Silesian Region. This link between Ostrava and Opava will be strengthened after the road I/11 has been completed. It can be assumed that the sub-urbanization processes will also strengthen the alternative development axis via Hlučín, Dolní Benešov and Kravaře. After the construction of the Třinec bypass, the settlement development and the

connection of the development axis to Žilina can be assumed. The importance of the Ostrava - Karviná development axis is diminishing due to the decline in jobs and the number of people in the city of Karviná. If the Karviná connection is not completed in Bielsko-Biała, this axis will be weakened. On the other hand, the axis Ostrava - Český Těšín - Bielsko-Biała will be developed.

Suburbanization processes will also strengthen the development axis Ostrava - Frýdek-Místek - Frýdlant nad Ostravicí - Frenštát pod Radhoštěm, which connects to Rožnov pod Radhoštěm, which is functionally connected with Frenštát pod Radhoštěm (higher commuting rate). Similarly, the development axis Ostrava - Příbor - Nový Jičín - Hranice, which was created historically. The weaker connection is between Nový Jičín and Valašské Meziříčí, where insufficient capacity road connections are completed.

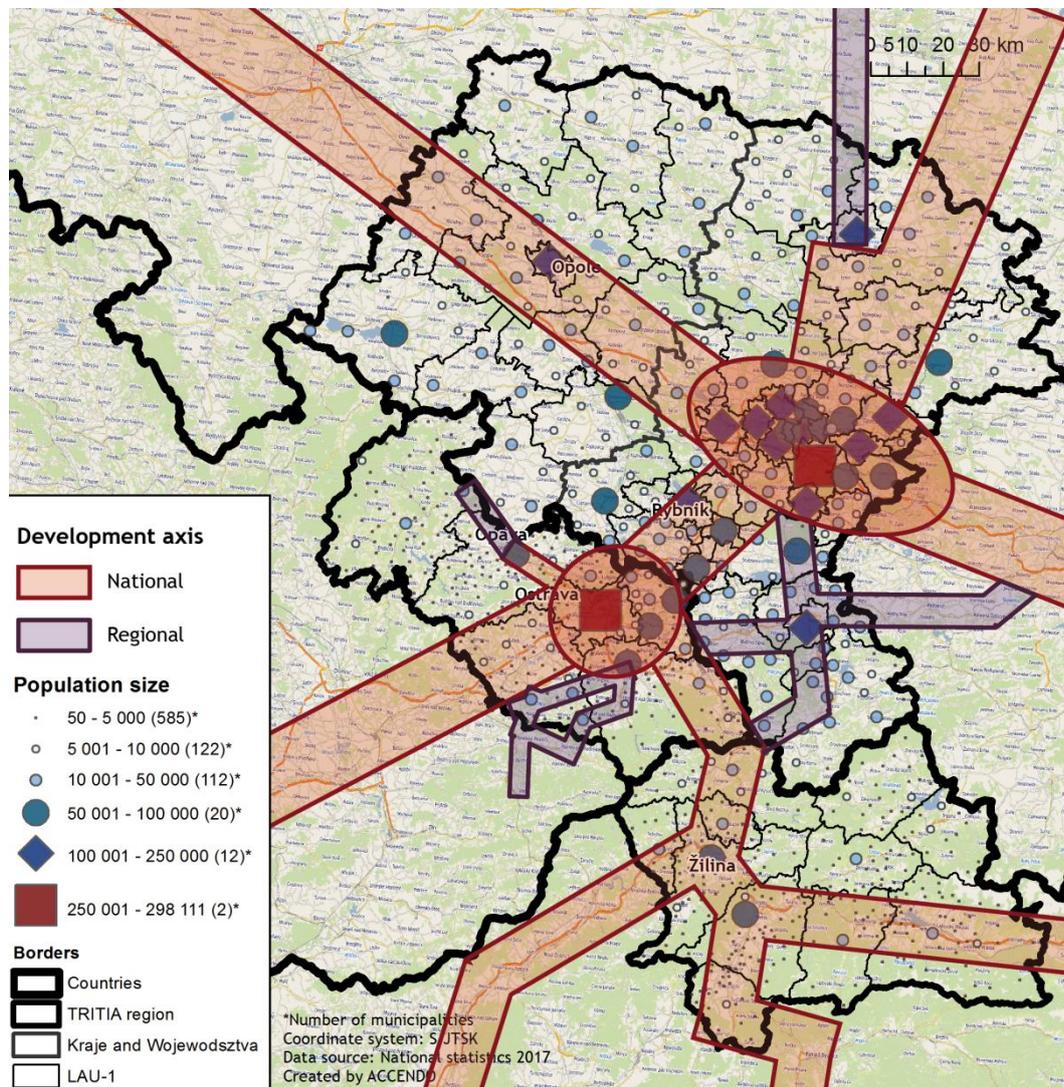
In order to maintain the basic structure of settlement in the western part of the region, it is crucial to support the potential development axis of Opava - Bruntál and Opava - Krnov, which create a potential development triangle that can stabilize the economic situation and thus, the population in this problematic area. Another potential development axis could be stretched from Krnov through Prudník to Opole. The possibilities of this development axis should be further developed in order to exploit the potential for greater cooperation with this area, which may inter alia link to the common historical roots of Upper Silesia, where Opole was a central metropolis and has a similar German-Slav history as Opava. The advantage is a small language barrier and a similar character of socio-cultural heritage. The territory is similar to the area of Kravaře and Hlučín ("Prajzská") with a strong influence of the German settlement.

5.4 Future Development of the Settlement Structure in the Area of Interest

Based on the primary analysis and the secondary analysis, the following map output was created, which shows the development of the settlement structure of the entire area of interest and is the

starting point for spatial planning within the whole area of interest, as well as the individual pilot cities.

Figure 5.6: Settlement system of the area of interest



Source: ACCENDO, 2018.

The Upper Silesian and the Ostrava agglomerations are among the potentially best integrated cross-border areas in Central Europe. The most important for further development is the interconnection of the Ostrava agglomeration and the metropolitan area of Katowice, as this area belongs to the potentially best integrated cross-border area and the creation of a cross-border metropolitan area. This is documented by the aforementioned cartogram. It is a strongly populated area that should be developed. The task is to initiate cooperation on the basis of the specialization of individual cities, and to promote it in the European space. The quality of the environment, especially the air, determines the element of further development, which is reflected in the current suburbanization process from large cities in agglomerations. Within the sphere of spatial planning it is necessary to support the influence of the development axes, namely the triangle of the Ostrava agglomeration - Katowice agglomeration - functionally urbanized area Bielsko-Biala. It is also crucial to link Ostrava and Katowice to Žilina.

Based on the abovementioned links, the creation of the European Grouping for Territorial Cooperation (EGTC) called TRITIA was initiated by bringing together four regions: the Moravian-Silesian Region, the Žilina self-governing Region, the Silesian Region and the Opole Voivodeship. The EGTC TRITIA is the Katowice-Ostrava agglomeration with eight million inhabitants with an area of 34,000 km². The

seat will be Cieszyn, the secretariat will work in Český Těšín. The development of the Tria region as part of the cross-border cooperation should be a key task for the Moravian-Silesian Region in strategic planning. In the current situation, coordination of cross-border cooperation policies is not so deepened that intensive cooperation between regions is taking place.