

## **PERMEABILITY OF CZECH-POLISH BORDER USING BY SELECTED CRITERIA**

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### **ABSTRACT:**

Czech-Polish border, 800 km long, includes the longest-lasting international borders in Europe in its western half. In the period of real socialism it represented a genuine development barriers and obstacles of cross-border cooperation. After both countries joined the EU (2004) and the Schengen area (2007), the importance of boundaries as barriers significantly weakened. The joint research team of Czech and Polish geographers evaluated the permeability of 100 km long sections of the border according to the criteria for which are publicly available data and GIS processing technology. Following criteria were used for the border permeability evaluation: the presence of orographic or hydrologic barriers in two levels of intensity, the number of road crossings, the number of other crossings, the availability of the inland roads, contrast of population density in the border micro-regions, the number of entrepreneurs from the neighboring country in the villages on the other side of the border, the number of solved micro-projects and the number of solved large projects. Numerical characteristics of criteria were transferred to score and the resulting values are divided into three levels of permeability, while using 1) the same weights of criteria and 2) the doubled weights of the key criteria. Cartographic presentation of the results then showed persistent difficulties with permeability especially in the central section of the Czech-Polish border.

*Key-words:* *Natural barrier, Cross border co-operation, Population pressure, Foreign entrepreneurs, Border segments.*

### **1. INTRODUCTION**

Even in the early 90s of the last century the terms of cross-border cooperation and euroregions were unknown to most Czechs, Poles, Hungarians and other inhabitants of the countries in Central and Eastern Europe. Sealed state borders of these countries did not allow almost any cross-border contacts. People did know neither the place nor the neighbour on the other side of the border. Boundaries arising during the last three centuries and even intensified after World War II, thus bring impassable barrier between regions that historically belonged to each other, and amplified their peripheral and neglected position as not too attractive areas to live. After the year 1989, the desire of the population living along the border for the same quality of life as in the interior of the country has led towns and cities to seek new common solutions of problems specific to the border regions. Following the example of Western European countries, regional associations have been established and have started to cooperate with similar organizations on the other side of the border. Thus in Central and Eastern Europe were created "euroregions" that as "bridges" unite neighbouring countries and which became the driving force of cross-border cooperation ([http // www.euregion-silesia.cz](http://www.euregion-silesia.cz)). The possibility of a free movement of workers has been established later on as well as the conditions for entrepreneurial activity for the European

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Union population on the territory of any of the Member States under the same conditions as citizens of a particular state.

Although Poland and the Czech Republic (Czechoslovakia respectively) were the countries of the former "socialist camp", cross-border contacts between Polish and Czech municipalities and residents themselves in the border zone began to develop after 1990. Until then, the border was a guarded space and its crossing was allowed only at the official international border crossings. It is true that beside the official border crossings, the residents living within 15 km distance from the state border could also use so-called local traffic border crossings, designated only for residents of the border areas. Since both countries joined the Schengen area (21 December 2007) it has been possible to cross the border at any place outside the territory with special status, such as nature reserves and bird sanctuaries. Also, the movement of labour is not limited in any way.

Verification and documentation of the current state of permeability of the Czech-Polish border after the implementation of European, inter-state, inter-regional, Euro-regional and local agreements was subject to a one-time research made in the years 2013 and 2014. Stage of permeability of the Czech-Polish border (the movement of persons, vehicles and human activities) was assessed during the research carried out by a joint Czech-Polish team.

Permeability criteria were the following:

- 1) the existence of roads and paths of different categories crossing the border, their density per unit of length of the border,
- 2) the density of border crossings, their typology and the maximum tonnage of vehicles,
- 3) isochrones of time accessibility of territory from the border crossing,
- 4) frequency of business entities operating across the border.

The selected criteria may possibly be extended to some other relevant indicators (e.g. citizens of neighbouring countries overnights in border areas accommodation establishments, the number of cross-border bus and rail lines, etc.). This may be the subject of the follow-up studies.

## **2. BORDERS AND THEIR SIGNIFICANCE**

The topic of borders is often discussed in the geographic community. Generally speaking, the border is seen as a dividing line between two specific areas / territories; in geography then particular spaces within the meaning of the regions. Haggett(2001) considers the border as the circumference of the territory, which has a specific entity in its ownership. In the Dictionary of human geography (Gregory et al, 2009), the boundaries are defined as lines or zones that separate the two spatial units that are qualitatively different from each other.

Of course, attention has been paid to the topic of border for a long time, e.g. work of Guichonnet and Raffestin (1974), Prescott (1987), Maier (1990), Lippert (1997) and Anderson and O'Dowd (1999). Given the plethora of effects that can be (in geography) qualitatively distinguished, there is a considerable number of different divisions or typologies of boundaries. One of the first steps is usually the determination whether a boundary is natural or artificial. As noted Chromý (1999), these elements are functional limits only when they are used for separating areas / communities as a barrier. As artificial boundaries we denote those that were in various ways associated with human activities,

including the boundaries that the man has created himself, e.g. on the basis of human subjective symptoms or behaviour (linguistic boundaries, etc.).

Boundaries as barriers to social communication of the inhabitants on both sides of the frontier are also an important topic in geography (see, e.g. the situation prior to 1989 in the study area). The national borders as development barriers in the Central European countries after the Second World War are an example. The so-called "Iron Curtain" was not only an idea, but in many places also an actual wall between Western and Eastern Europe (Dokoupilet al., 2011). Its fall constituted, among other things, the development of "border" topics in the scientific community, as show, e.g. the articles of Ravbar (1999), Anderson and O'Dowd(1999), Runge (2003). The problems of joint solution of natural risks start to be the forefront of professional interest (Balteanu&Sima, (eds.), 2013).

Of course, after the fall of the "Iron Curtain" perceptions of political (state) border and borderland respectively came to shift. Until then determining the importance of boundaries as barriers retreated into the background. Significant issues in changing perception of boundaries were certainly the accession to the European Union and the subsequent accession to the Schengen area. These two events opened up even more space to integrate the borderland, andeven „erased” political boundaries of states. One of the consequences is the convergence of the landscape (at the same environmental conditions) as a result of convergence of economies and lifestyles (Breuer et al., 2010).

Removing barriers leads logically to greater throughput and penetrability of boundaries. However, certain residuals in human thinking remain, it isso called border effects (e.g. area), mentioned by Dokoupil (2000).

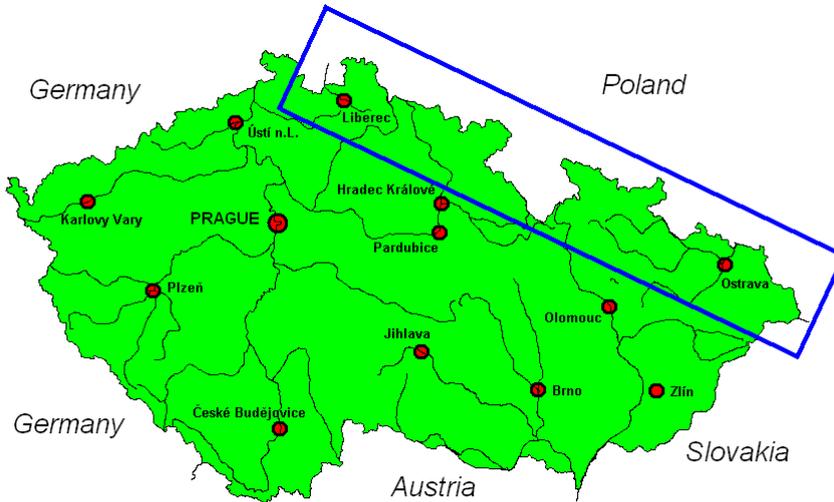
### **3. ORIGIN AND CHARACTER OF THE CZECH-POLISH STATE BORDER**

The present northern boundary of the Czech state (**Fig. 1**) was being formed through centuries and its current shape is a result of the situation after the First World War. The current Czech state consists of three historical lands (from west to east): Bohemia, Moravia and Silesia (so called the Czech Silesia – the majority of Silesia was separated from the Czech lands after Habsburg-Prussian wars in the 18th century).

After the collapse of Austro-Hungarian Empire in 1918, the border with former Prussia and Poland was defined by the Treaty of Versailles. According to this Treaty, the state border maintained historical land border with a few exceptions. In accordance with a plebiscite in 1920 the Hlučín Region of the former German Silesia was connected to the Czechoslovakia. Ethnically mixed Cieszyn Silesia was divided between Poland and Czechoslovakia in 1920. Since then the border has not practically undergone any changes. Apart from a brief war episodes (in 1938-1945), when not only northern border regions fell to the Third Reich and Poland, the boundary did not change.

Although after the WW II the state border was restored, there was a fundamental change in the constitutional arrangement of the territory north of the Czech border. On the basis of the Yalta agreement the border between former Germany and Poland was moved to the west and the rivers Odra/Oder and (Lusatian) Nisa became the state border. According to the Yalta and Potsdam agreements the German population from Poland, Czechoslovakia and other European countries was transferred to post-war Germany. While on the Czech border territory there was no complete change of the population, the situation was different on the Polish side. The territory was practically depopulated and the Polish population from

the former eastern Polish territory ceded to Soviet Union was resettled here. On the Czech side of the border new residents included both immigrants from the Czech interior and Czech and Slovak returnees from abroad. With regard to the political situation in Czechoslovakia and Poland at that time it was no political interest of the governments nor of the population as allochthonous element for trans-border contacts.



**Fig. 1** Study area along Czech-Polish border.

While Bohemia has a typical closed basin character, where the inner lower part of the area is bounded by a ring of high border mountains, (and for the northern borderland with Poland it is particularly true), Moravia and Czech Silesia, on the contrary, are characterized by an open transit landscape, where the territory is relatively widely opened to the surrounding lowlands in neighbouring states, in its northern part especially to Poland. Thus Bohemia has mostly natural mountain even high mountain border in the north (border with Poland crosses the highest mountain in the Czech Republic – Sněžka 1602 m a. s .l.) in Krkonoše/Karkonosze Mts. This border has existed for more than 1 000 years. Only in the Frýdland hook area, where the territory of Bohemia exceeds to the north over the mountain territory, the state border does not follow any conspicuous mountains and rivers. A similar situation exists on the border between Bohemia and Polish Kłodzko area, where however, the continuity of the natural boundary was disrupted by the separation of the historic Czech Kladsko area to the then Prussia in the 18th century. In the above-mentioned territory the border runs across depressions of the Broumovská kotlina Depression in northwestern of the Kłodzko area and of the Kladská kotlina/Kotlina Kłodzka Basin in the south of the Kłodzko area. A part of the watercourses of the Divoká Orlice River in the elongated depression of the Orlické Záhoří area also forms the border. The border between the Polish and Czech Silesia is in a major part artificial, as border was established by several divisions and partial joining in this area of historical Silesia. With the exception of a few sections of the Opava, Oder and Olše/Olza Rivers, the state border runs in an open terrain and has no natural justification. Only the easternmost part of the Czech-Polish border runs along the distinctive ridge of Slezské Beskydy/Beskid Śląski Mts. However, in the most eastern tip of

the Czech Republic, the boundary changes in the line going across the valley of the upper part of the Olše River.

Therefore the Czech-Polish state border has in its western part mostly natural mountain barrier effect. On the other hand, border in the eastern part has an open barrier-free character. The exceptions are sections in the terrain of hooks in the western part of the border; in the east part of the border the exceptions are the barriers of larger rivers and mountains of the Slezské Beskydy Mts.

#### **4. NATURAL ASPECTS OF THE PERMEABILITY OF THE CZECH-POLISH STATE BORDER**

The natural character of the border was assessed specially for the needs of the research by the presence of two main types of geographic barriers: orographic (mountains) and hydrographic (water courses and other water objects), which determine considerably the permeability in the border area (**Fig. 2**). The analysis was performed using topographic maps of the Czech Republic (scale 1:50 000), the results were stored in the GIS database. The border was divided into sections according to the occurrence alternatively the absence of concrete types of barriers or their combination. Orographic conditions were assessed. Morphometric relief types (plains, hilly lands, highlands, mountains, high mountains) characterized by relative high dissection (Demek, 1987) were the base of the evaluation. Significant partial landforms (isolated ridges and hills) were taken into account in terrain depressions (basins, furrows, gates and grabens) which they have a good throughput.

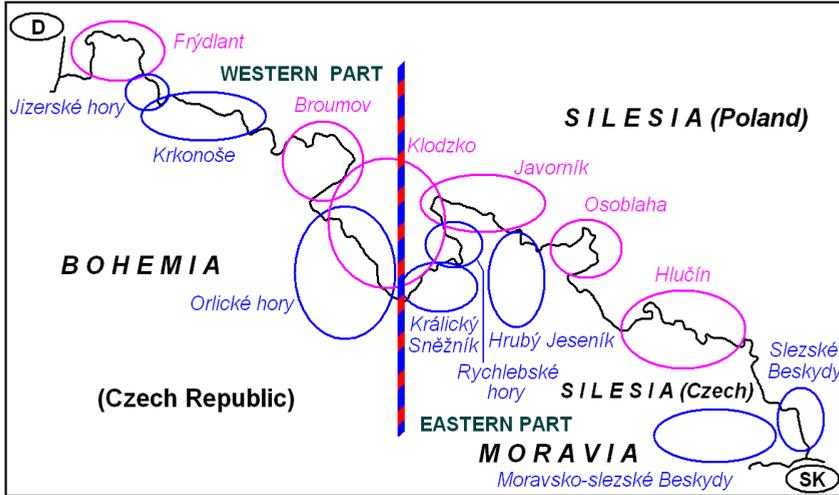
The two main types of barriers were still conventionally divided into two subcategories with respect to their significance (highly difficult and difficult barrier for the movement across the border).

1. Highly difficult orographic barrier (O1) includes continuous ridges of high mountains, mountain and highlands with steep often rocky slopes usually in altitudes higher than 950–1000 m a. s. l.
2. Difficult orographic barrier (O2) includes lower continuous ridges of mountains and highlands as well as distinct partial ridges and isolated hills in altitudes 650–900 m a. s. l.

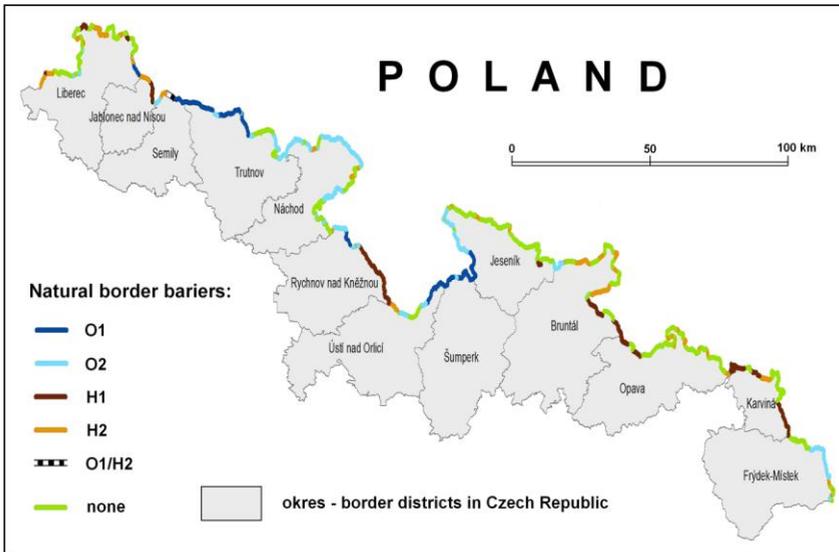
Furthermore, for the border area hydrographic barriers were defined on the basis of permanent watercourses and the width of their channels. Stagnant surface water objects (dams, ponds, lakes) do not exist in the area. Factually, these categories of hydrographic barriers are considered:

1. Highly difficult hydrographic barrier (H1) includes the existence of a permanent watercourse with a developed riverbed (width 5 m and more), a flood plain is often developed.
2. Difficult hydrographic barrier (H2) includes the existence of a permanent watercourse with a developed riverbed (width to 5 m) the valley bottom is insufficiently developed. This category includes waterlogged areas with extensive wetlands and peat bogs as well.

By combination of orographic and hydrographic barriers the map of natural barriers with delineating of the relevant categories was created (**Fig. 3**). This map was analyzed with regard to the presence of the border crossings points.



**Fig. 2** Working division of the Czech-Polish border area with study regions (purple – lowland or basin regions, blue – mountainous regions).



**Fig. 3** The presence of natural barriers on the Czech-Polish state border (Explanations: O1 - orographic barrier difficult passing across, O2 - significant orographic barrier, H1 - hydrographic barrier difficult to pass across, H2 - hydrographic barrier significant, O1/H2 - combined hydro-ographic barrier).

## 5. TRANSPORT PERMEABILITY OF THE BORDER AND DISTRIBUTION OF THE OFFICIAL BORDER CROSSING SITES

Evidence and cartographic display, together with an evaluation of spacing between official border crossings on the Czech-Polish state border (total 171 registered official

border crossings) show that there is a certain relation between the presence of natural barriers and the existence of official border crossings.

High concentration of road border crossings is typical to the territory without significant natural barriers, namely in the eastern part of the border. In the attractive mountain areas of Krkonoše Mts., the Orlickéhory/GóryOrlickie Mts. in the west, KrálickýSněžník/Śnieżnik Mts., Rychlebskéhory Mts. and SlezskéBeskydy Mts. in the east mainly the pedestrian border crossings can be found (**Fig. 4**).

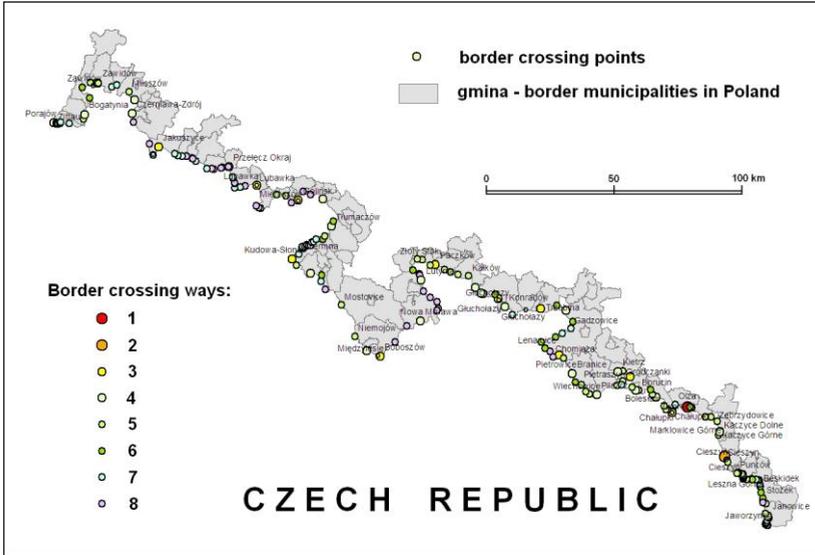
Generally, it is typical for the whole border that the role of barriers is fulfilled by the best way by rivers, even on its upper courses, where water levels are only low. It seems that it is not that much about their size, but rather about a symbolic meaning, when the river on the borderline forms a visual personification of a physical boundary, while generally flat watershed in the high mountains in the Czech-Polish borderland is easily passable for hikers but not for road or rail transport. Significant role in the permeability of the state borders is played by the density of the border crossings and particularly by their capacity perceived in terms of the category of the road going across the border.

Based on the knowledge of the road network categories an accessibility map of the territory from border crossings both in the Czech Republic and Poland was constructed (**Fig. 5**).

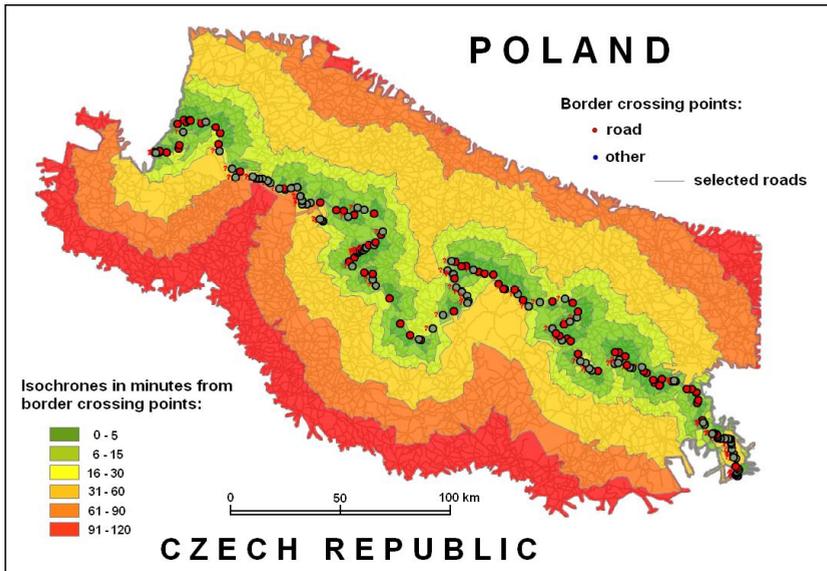
The methodology is based on consideration of the potential speed of the movement of vehicles on the roads of each category. This is generally respected as the quality of the road surface (assumption: the higher category road, the higher possible speed of vehicle movement) and routing of roads in the terrain (assumption: the road of lower orders are more tortuous and more deviate from the shortest line of endpoints than the main road). An overview of the vehicle speed in different categories of roads is shown in **Table 1**.

**Table 1: Road categories and average speed of vehicles**

No.	Road category	Assumed vehicle speed (km/h)
1	I.	140
2	II.	100
3	III.	75
4	IV.	60
5	V.	50
6	VI.	25
7	VII.	10



**Fig. 4** Border crossings and category of roads (1 – highways, 2 dual carriageways, 3 – 1st class roads, 4. 2nd class roads, 5 - 3rd class roads, 6. paved side roads, 7 – ground roads, 8 - paths, possibly passable for mountain bikes). (Source: own processing)



**Fig 5** Run-out time from Czech-Polish border. (Source: own processing)

In general, the depth of the availability of the Czech territory is smaller compared to the Polish one, apparently due to a more dissected relief. There are some differences in accessibility of the other state territory in the western and eastern part of the borderland. In the western part a car can regularly reach the distance of 40 km from the border crossing in the Czech territory and 50 km in the Polish one. In the eastern part the distances are practically equal. The exception to this is a very good access of the Czech territory via

motorway-type roads. But there are also areas in the hinterland of the state border on both sides of the border which are difficult to reach. Their occurrence is associated with the lack of publicly accessible roads closed to the border areas, usually both in mountainous areas (the Jizerskéhory/GóryIzerskie Mts., Krkonoše Mts., Orlickéhory Mts. in the Western part of the boundary and KrálickýSněžník Mts., Rychlebskéhory/GóryZłote Mts., Jeseníky Mts., the SlezskéBeskydy Mts. and Moravsko-slezskéBeskydy Mts. in the Eastern part of the borderland respectively), and in agricultural regions of the Frýdlant, Jeseník and Osoblaha Regions.

## **6. POPULATION OF BORDERLAND AND CROSS-BORDER COOPERATION**

It can be stated that all districts, adjacent to Czech-Polish boundary, are a proper part of the Phare Cross-Border Cooperation Programme, which is based on bi- or tri-lateral cooperation among neighbourhood countries. This programme was established in 1994–2003 during the Pre-Accession period. The reduction of the negative impact of the boundaries on inhabitants' quality of life as well as the intensification of the cross-border cooperation was assessed as a main goal of the Phareprogramme. The Phare mission has been done with three tools (Dokoupil& Kopp (eds.), 2013):

1. Large investment projects (especially in technical and transport infrastructure)
2. Microproject Fund (field of environment, tourism, culture, education, etc.)
3. Grant Scheme

Regional cooperation has been going on with INTERREG programme, focused on EU members mutually and accession countries. In common, we can summarize this support with programmes of European territorial cooperation, interregional cooperation and bilateral international cooperation (see Wieckowski et al., 2012).

Population density in the Czech Republic was about 133 inhabitants per square km (1.1.2014), which resulted from the population of 10 517 408 inhabitants and 78 886 square km area. The same indicator for Poland reached 123 inhabitants per square km (1.1.2013) with 38 502 396 population and 312 679 square km area.

The barrier impact of the border could be monitored by comparison of the population density in administrative units, localised in the closest neighbourhood of border. It is believed that the population density in the borderland is usually lower than the density in the core areas of the country (but this is not generally valid) as same as the average density of the state.

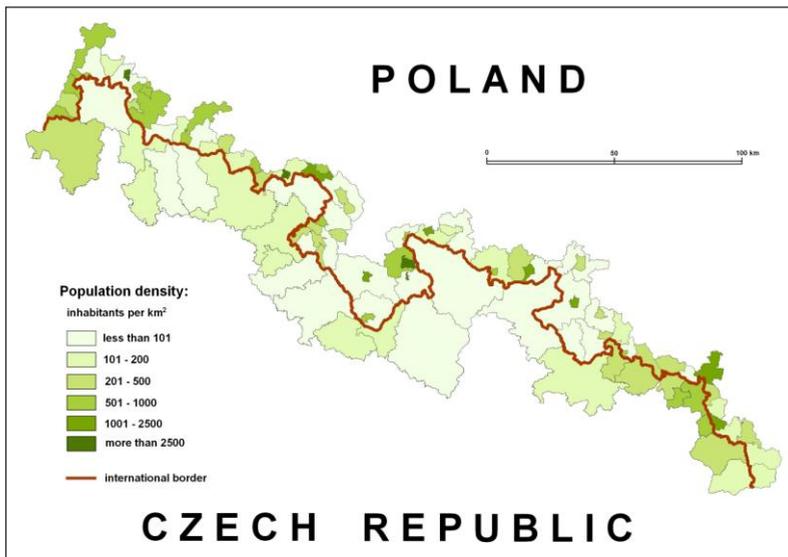
Additionally, we count the population density for lower administrative territorial units – in the case of the Czech Republic we use small districts so called “municipalities with extended power regions” (ORP) as well as “gminas” for Poland. Our analysis brings some key facts: the population density observed in Polish borderland is average and above-average (**Fig. 6**) in comparison to the national value and it is valid for both rural and urban gminas. Resulting values can be caused by administrative differentiation of gminas to rural and urban ones. Rural units are always affiliated with an urban gmina, and that brings high values of density which contrast the rural gminas level. From the regional point of view, we can sum up that high densely populated areas in borderland of both countries are in close connection in the most western and the most eastern parts of the common border. Other densely populated areas in Poland are located in Jizerskéhory Mts., Krkonoše Mts. and Kłodzko area, rare occurrence can be found in Osoblaha region.

Situation with above-average densely populated area is a bit different in the Czech part of the border. Those areas can be found only in industrial and settlement agglomerations of regional metropolises – Liberec (and Jablonec) in the west part and Ostrava (with Opava, Havířov, Karviná, ČeskýTěšín and Třinec) in the eastern one. Therefore, Polish borderland is more densely populated with three exceptions – western part of Krkonoše Mts., southern parts of Klodzko and Opavsko regions. It means, in theory, a higher population pressure to the border line from Polish side.

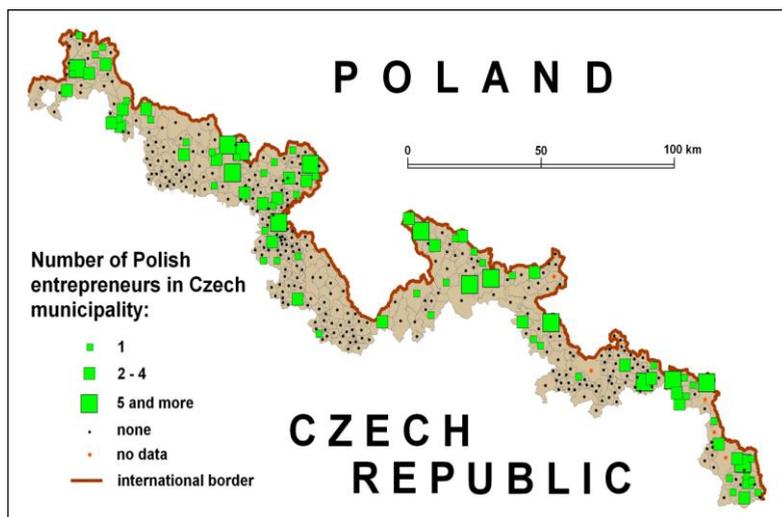
The regional labour market is also remarkable. Besides a mutual employment of workers, there are increasing trends in entrepreneur activities of Czech people in Poland and the other way around. There are three databases used for our research: Business Register, Trade Register and Database of agricultural entrepreneurs. Unfortunately, our database is not complete – above-mentioned registers do not cover the Polish who are members of joint-stock or limited liability companies, but with Czech statutory authorities. Despite that fact, 465 economic companies established by Polish entrepreneurs (persons with places of permanent residence in Poland) were identified. If comparing sector/branch structure of the economy, most of them are active in retail and wholesale, constructing, agriculture (including services for agriculture) and forestry. The rest consists of projection services, cleaning services and similar. The common overview of business activities is visualised in **Fig. 7**. The regional distribution shows that most of Polish entrepreneurs locate their business in the eastern part of the Moravskoslezský Region, which corresponds with areas settled by a high share of people with Polish nationality. Similar situation has been discovered in Náchod region (south-western part of Klodzko), probably due to optimal transport accessibility among countries.

Cross-border activities based on contract cooperation among non-entrepreneurial subjects can display a different sight (**Fig. 8**). There is a much more even distribution of activities along the border in the case of the INTERREG IIIA programme. In contrast with the business activities (which significantly depend on the distance from the border, most of Polish entrepreneurs do their jobs close to it), the cross-border non-commercial activities have been done in deep inland territory in the range of 50 kilometres as well. Cooperating subjects are not too regionally concentrated on the Polish side (data for Czechia were not available) and many of them form a cooperation without a direct contact with the border (Ratibor and Hlučínsko Region, Bielsko-Biała region in Silesian Beskyd Mts. and its surroundings).

In the opposite, more financially demanding large projects (under INTERREG IIIA programme, see **Fig. 9**) are closely tied to the common boundary. They usually concern the activities connected with technical infrastructure (quality improvement of the transport infrastructure or of the environmental public facilities eventually) and events forming both manufacturing and social environment, sometimes also a long way from the border. In that case, spatial distribution of the projects on the Polish side corresponds to the business activities in the Czech borderland considerably – extensive amount of the latter is located in the Klodzko/Náchod regions in the west and in Těšínsko area in the eastern part. It seems, that “European” projects inspire private commercial cross-border activities as well.

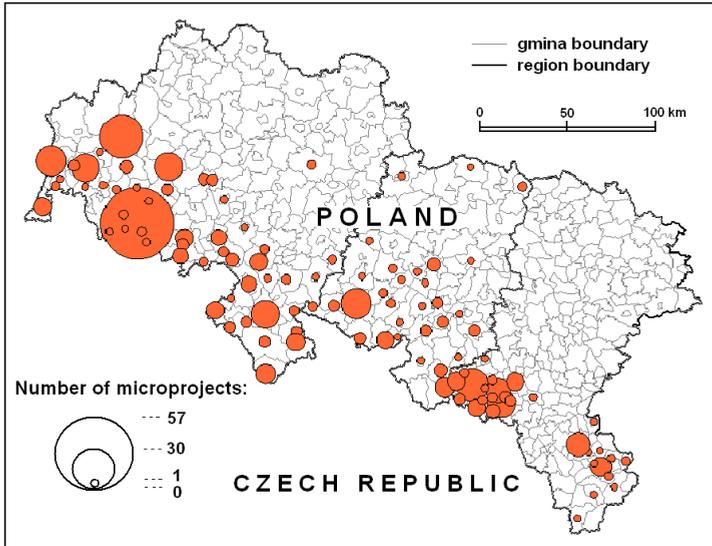


**Fig. 6** Population density of administrative units in Czech-Polish borderland (ORP and gminas) applies to 1<sup>st</sup> January 2014. (Source: own processing)

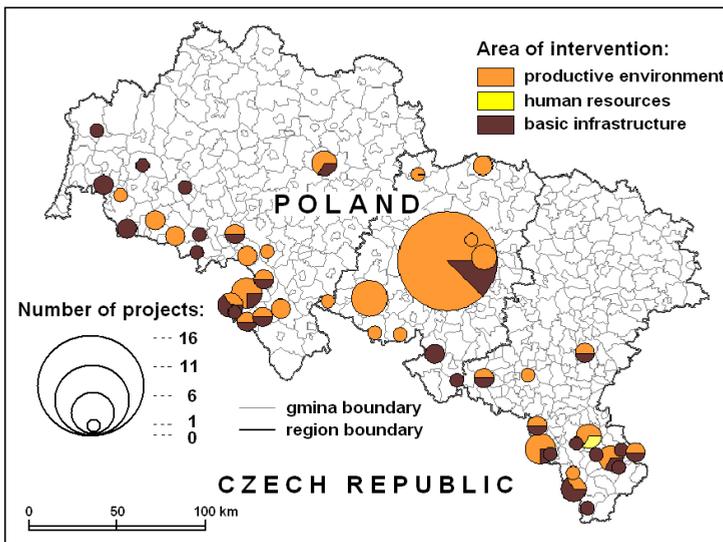


**Fig. 7** Number of Polish companies in Czech border microregions. Source: ARES, own processing. (Source: own processing)

So this is a potential way to fulfill one of the goals of the European Union policy, which makes efforts to eliminate the barrier effects of state borders and to enable the constitution of a common European economic and social space.



**Fig. 8** Spatial distribution of “microprojects”, realized among the Polish part of borderland by Interreg IIIA programme during 2004–2013. Source: own processing using data from Euroregions



**Fig. 9** Spatial distribution of “big projects” among the Polish part of the joint border, supported by Interreg IIIA programme during 2004–2013. Source: own processing based on the data made by Ministry of Infrastructure and Development (Poland)

## 7. INTEGRATION OF FINDINGS AND GENERAL EVALUATION OF CZECH-POLISH BORDER PERMEABILITY

The data used above documents different possibilities, assumptions and current state of the cross-border cooperation among localities. The package of data consists of selected indicators or criteria only, which describe proper permeability. Selected indicators are

easily available and provable from public databases and materials, often prepared for national institutions in both countries. This is their main advantage. Of course, it is possible to draw a much longer list of parameters, but for further processing – especially for integrated evaluation and comparison among both countries – it would be necessary to reclassify the exact values to the comparable form and to put the data into interconnection

The reference background for interconnection of collected data is the Czech-Polish state borderline which length is 795.8 km (see <http://www.statnihranice.cz/indexcesky.php>). However GIS data used for the spatial analysis operates with the length of 801.1 km. This difference can be understood as insignificant, even though it could be worthy of an additional discussion. We divided the borderline into eight partial sections, each of 100 km length from west to east (here a fine resolution to 50 km parts for the next research should be considered). Then the converted values of the criteria have been assigned to each of these sections.



Fig. 10 Permeability of Czech-Polish border, based on the same weight of criteria. (Source: own processing)



Fig. 11 Permeability of Czech-Polish border, based on the double weighted criteria. (Source: own processing)

The conversion of both qualitative and quantitative indicators (which means values of permeability criteria) has been processed according to the united scale. So we can recognize three levels of border permeability rate – 1 - very good permeability, 2 – average permeability and 3 - weak permeability. The exact evaluation of the permeability (in relation to the border sections) was based on the summarization of partial values by individual criteria. Evaluation has been done in two ways: firstly, using the same weight of criteria and

secondly using double weight of selected key criteria. The doubled weight belonged to natural barriers (they exist objectively), road border crossings (enable radically cross-border motion of people and commodities), number of Polish entrepreneurs in Czech municipalities (this is a real image of permanent border crossing) as well as large cross-border projects (usually related to common transnational infrastructure).

After the results were drawn into the border-line map, it became obvious that the weakest permeability (due to the selected criteria and their evaluation) is observed in the middle part of the common border, between towns Náchod and Lipová-lázně in the Jeseník region (**Fig. 10**). This border section is poorly equipped with road border crossings. This section of the border-line is formed by DivokáOrlice River (what reduces number of pedestrian crossings) as well as the high ridges of KrálickýSněžník and Rychlebskéhory Mts. In combination with a sparsely populated area in peripheral location, there is not enough motivation to cross-border entrepreneurship or more intensive cooperation among municipalities. Similarly, weak permeability is also typical for the westernmost section of the border, which is located in extremely peripheral position from the Polish point of view. However, it is an economically prosperous part of Poland (brown-coal energy), well connected with the Czech Republic by modern roads and rails. It is possible to expect that the low permeability can be caused by a wide offer of opportunities in the homeland, accompanied by weak motivation to move and work abroad. Lack of motivation is typical for both municipalities and individuals (**Figs. 10 and 11**). If speculating with double weighted criteria, the area between towns Trutnov and Náchod as well as Ostrava region in the eastern part are distinguished by high permeability of border-line. Both sections are situated in the range of the main transportation corridors between Czechia and Poland, which have good potential for future development (there is an enormous interest of both countries to do so).

## 8. DISCUSSION AND CONCLUSIONS

Used data/criteria, methods for evaluation and results interpretation correspond to functional possibilities of common multidisciplinary Czech-Polish research team, especially in the field of data accessibility. Real contribution of the research team can be observed in such areas of knowledge:

- a) Selection of data and criteria for evaluation of a border-line permeability.
- b) Compilation of an evaluating scale for different criteria.
- c) Definition of intervals on the scale corresponding with the values of criteria.
- d) Specifications of the length of border-line sections.
- e) Definition of the range of final evaluation of permeability for each section of the border.

These contributions can open miscellaneous discussions about their legitimacy. Similar discussions should test whether these changes would influence new results. Therefore, presented results show only one possible way of solving the problem of the cross-border permeability. We find the above-mentioned discussion about methodology open and accessible for another improvement (including e.g. more sophisticated statistical methods to set weight for criteria or deeper spatial analyses in GIS).

In spite of some methodological simplification, real results are interesting. It becomes apparent, that the real permeability depends on many different criteria and it is possible to define sections, which could be improved. National institutions, regional and local authorities should pay attention to these problematic parts of border. It is nonsensical to

unify the permeability in a whole length, but knowledge about the weak points can motivate participants to change the current situation. Nevertheless, future research has to use a wider portfolio of parameters, what depends on data accessibility. Current knowledge is limited by asymmetric data accessibility on both sides of border-line. It is evident, that proper process of data collection can also bring interesting impulse for future cross-border cooperation.

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## REFERENCES

- Anderson, J. & O'Dowd, L. (1999) Borders, Border Regions and Territoriality: Contradictory Meanings, Changing Significance. *Regional Studies* 33 (7), 593-604.
- Balteanu, D. & Sima, M. (eds.) (2013) *Hazards assessment and mitigation in the Danube floodplain (Calafat-Vidin – Turmu Magurele-Nikopol sector)*. Craiova: Editura Universitaria.
- Breuer, T., Kolejka, J., Marek, D. & Werner, E. (2010) Convergence of cultural landscape on the Czech-Bavarian border in Šumava Mts. *Geografie* 115 (3), 308-329.
- Demek, J. (1987), *Obecná geomorfologie*. Praha, Academia.
- Dokoupil, J. (2000), Teoretické přístupy k problematice pohraničí s aplikací v česko-bavorském prostoru. *Geografie* 105 (1), 10-18.
- Dokoupil, J., Kopp, J., et al. (2011), *Vliv hranice na přírodní a socioekonomické prostředí česko-bavorského pohraničí*. Plzeň, Západočeská univerzita v Plzni.
- Dokoupil, J. & Kopp, J. (eds.) (2013) *Der Einfluss der tschechisch-bayerischen Grenze auf die natürlichen und die sozioökonomischen Systeme. Pilsner Region*. Plzeň, University of West Bohemia.
- Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S., (2009) *The dictionary of human geography*. Malden, MA, Wiley-Blackwell.
- Guichonnet, P. & Raffestin, C. (1974) *Géographie des frontières*. Paris, PUF.
- Haggett, P. (2001) *Geography: A Global Synthesis*. Harlow, Prentice Hall.
- Chromý, P. (1999) Teoretický vstup do problematiky. In: Jeřábek, M. (ed.) *Geografická analýza pohraničí České republiky*. Praha/Ústí n. Labem, Sociologický ústav AV ČR, pp. 16-30.
- Jeřábek, M. (ed.) (1999) *Geografická analýza pohraničí České republiky*. Praha, Sociologický ústav AV ČR.
- Lippert, J. (1997) *Grenzüberschreitende Entwicklungskonzepte*. Kronach-München-Bonn, Carl Link Verlag.
- Maier, J. (1990) *Staatsgrenzen und ihre Einfluss auf Raumstrukturen und Verhaltensmuster. Arbeitsmaterial für Raumordnung und Raumplanung*. Bayeruth, Universität.
- Prescott, J. R. V. (1987) *Political Frontiers and Boundaries*. London, Allen and Unwin.
- Ravbar, M. (1999) General Characteristics of Border Areas in Slovenija. In *New Prosperity for Rural Regions*. Ljubljana, Inštitut za geografijo. pp. 11-20.
- Runge, J. (ed.) (2003), *Terytorialny system społeczno-ekonomiczny pogranicza województwa śląskiego i Północnych Moraw oraz strategie jeho rozwoju*. Katowice, Wydawnictwo Uniwersytetu Śląskiego.
- Wiecowski, M., Michniak, D. et al. (2012) *Polsko-slovenské pohraničie z hľadiska dopravnej dostupnosti a rozvoja cestovného ruchu*. Warszawa/Bratislava, Instytut Geografii i Przestrzennego Zagospodarowania, Polska Akademia Nauk/Geografický ústav Slovenskej akadémie vied.
- \*\*\*[Online] Available from: <http://www.statnihranice.cz/indexcesky.php>.
- \*\*\*[Online] Available from: [http // www.euregion-silesia.cz](http://www.euregion-silesia.cz).