





Ministerium für Energie, Infrastruktur und Digitalisierung

#### Changes in accessibility and mobility – impact on regional and local labour markets and public services

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## Aims of the presentation

#### Agenda

- To examine the impact of accessibility and mobility changes on the local labour markets and the services of general interests distribution
- To discus the results from the BSR urbanization trends point of view

- Accessibility as a measure of territorial cohesion
- European examples
- Polish examples
  - Accessibility
  - Mobility
- Local examples
  - Labour market impact
  - Sedge impact
- Conclusions for BSR

### Projects used in the presentation

- Accessibility of the Baltic Sea Region, Dynamics during 2006-2011-2016, Spiekermann & Wegener for VASAB
- TRansport ACCessibility at regional/local scale and patterns in Europe (TRACC), Projekt Programu Uinii Europejskiej ESPON II; partner wiodący: <u>Spiekermann& Wegener</u> Urban and Regional Research (S&W),
- The project financed by the Polish National Science Centre "Concept of the territorial cohesion in cohesion policy. Implications for Economic Growth"(no. 2012/05/B/HS4/04212); leader Jacek Zaucha
- GRINCOH EU FP7 Project (Leader: Euroreg Warsaw University)
- Studies on the changes in road and railway accessibility in Poland after the accession to the EU structures, in the years 2004-2023 (for Polish Ministry of Investment and Development)
- Projects concerning delimitation of the Areas of Strategic Intervention for the Strategy of the Responsible Development (2016-2018)
- Polish Ministry of Science and Higher Education <u>"Multi-criteria evaluation of the impact of selected road corridors on the environment and socio-economic development of adjacent areas".</u>
- Complex modelling of road traffic in Poland with the identification of local socio-economic determinants". The project was financed by funds of the National Science Centre on the basis of the number: decision DEC-2012/05 / B / HS4 / 04147.

### ACCESSIBILITY AS A MEASURE OF TERRITORIAL COHESION

#### Polish EU Presidency (2011) "Territorial keys":



A 2020 <i>versus</i> E	U 2020	How to str of Europe based of projected at the re	An end of the EU Cohesion Policy REPORT on the Territorial Agenda 2020 Provember 2015 Provember 2015 Prov	Territorial keys	<ul> <li>Linking issues</li> <li>Global accessibility</li> <li>European and trans-border accessibility</li> <li>National accessibility and daily accessibility between metropolises</li> <li>Accessibility of the main, and secondary, centres (regional accessibility including services of general economic interest)</li> <li>Modal split, public transport, intermodal transport change</li> <li><i>E</i>-connectivity</li> <li>Access to energy networks</li> </ul>
	<ul> <li>'Eur</li> <li>Smart growth:</li> <li>3% GDP in R&amp;D</li> </ul>	ope priorities/headline tar Sustainable growth: • 20/20/20 climate/	gets Inclusive growth: • 75% of pop. aged 20-	Service of general economic interest	<ul> <li>Services of general economic interest (sparsely populated areas)</li> <li>Access to services of general economic interest</li> <li>Investing in education</li> </ul>
Correspondence between priorities of 'Europe 2020" and TA 2020		energy targets	<ul> <li>64 employed</li> <li>Share of early school leavers &lt; 10%; more than 40% of younger generation with a tertiary degree</li> <li>20m. less people at risk of poverty</li> </ul>	Territorial capacities/ endowments/ assets	<ul> <li>Territory-bound factors (local <i>milieus</i> etc.)</li> <li>Local innovation systems &amp; networks</li> <li>Wise management of cultural and natural assets</li> <li>Renewable and local energy production</li> <li>Territorially-related characteristics for energy production</li> <li>Revitalisation of cities</li> </ul>
<ol> <li>Polycentric and balanced territorial development</li> </ol>	+	No correspondence	+	O'to an discussion	Interactions between metropolises at the EU scale     Interactions between the main national growth poles
Integrated development in cities, rural and specific regions.     Territorial integration in grace border	+	÷	+	City networking	<ul> <li>Growth poles,</li> <li>Territory-bound factors (local <i>milieus</i> etc.)</li> <li>Accessibility of metropolises and between metropolises</li> </ul>
transnational functional regions	+	No correspondence	No correspondence		Enlargement of local labour markets,
<ol> <li>Global competitiveness of the regions based on strong local economies</li> </ol>	+	+	+		Critical mass of means through territorial
<ol> <li>Improving territorial connectivity for individuals, communities and enterprises</li> </ol>	+	+	+	Functional regions	<ul> <li>cooperation,</li> <li>Accessibility of secondary growth poles and regional centres</li> </ul>
6. Managing and connecting ecological,	+	No correspondence	No correspondence		<ul> <li>Public transport connections to regional</li> </ul>

#### Why accessibility?

- It is difficult to find the statistical correlation between infrastructure construction and economic development (including trade development); Rodriguez-Pose 2012
- It is possible to measure the "chances" for development using accessibility indicators
- On the local level accessibility is also the live quality measure
- Accessibility indicators proposed:
  - accessibility understood as the transport infrastructure (expressed, for instance, in road and railway network density);
  - time (isochronal) accessibility, frequently equated to cumulative accessibility;
  - potential accessibility, which includes all relations within a given set of regions (matrix approach), as well as their mass and time distance;
  - person-based accessibility, including daily accessibility in the particular mode of transport.
- Potential accessibility has an important components from the TC point of view: population or GDP migration, infrastructure development, possibility to compare different geographical level of marginalization.

#### Potential accessibility indicator

 $A_i = \sum_{i} g(M_j) f(c_{ij})$ 

where Ai is the accessibility of unit *i*, g(Mj) is the function determining the attractiveness of 'mass' measured e.g. in terms of the **population** of unit *j*, and f(cij) is a **distance decay function** representing the generalised cost (distance, **time**, cost or effort) needed to reach this 'mass'.

 $A_i = (M_i f(t_{ii})) + \sum M_j f(t_{ij})$  $\sum M_k f(t_{ik})$ 

**International potential** – including the travel time, including border waiting time, between municipality *i* and one of the transport units encompassing the territory of the whole European continent outside of Poland

Intranational potential – inlcuding the travel time between two Polish municipalities i and j

Selfpotential of municipality i

 $f(t) = exp(-\beta t)$ 

Exponential distance decay function

The more locally we look, the shorter the trip length and sharper is the distance decay (with higher  $\beta$  values). This procedure results in the use of:

 $\beta = 0.02$  for short trips (intranational level)

 $\beta$  = 0.005 for long trips (international level).

#### Potential Accessibility Dispersion index

 Consequences of changes in accessibility for territorial cohesion - Potential Accessibility Dispersion (PAD) index.

PAD takes into account the standard deviation of potential accessibility values across municipalities using population as the weighting variable (López *et al.*, 2008; Ortega *et al.*, 2012; Stępniak and Rosik, 2013; Rosik *et al.*, 2015).

$$PAD = \frac{SD_{A_i}}{\frac{\sum A_i * P_i}{\sum P_i}}$$

 $A_i$  is the value of the potential accessibility indicator calculated for unit *i*,  $P_i$  is the population of unit *i*,  $SD_{A_i}$  is the standard deviation of  $A_i$  values weighted by population.

The higher the PAD values, the greater the diversity of accessibility within the country

### **EUROPEAN EXAMPLES**

# BSR road and rail accessibility changes – demographic component



Figure 2.8 Accessibility potential, road, relative change 2006-2016.

Figure 2.13 Accessibility potential, rail, relative change 2006-2016.

# Changes in travel time for 100 km roads rail





# Changes in travel time – main nodes roads





### Example of the North-South project: Via Carpatia corridor ex ante evaluation (potential accessibility changes simulation)



### POLISH EXAMPLES – ACCESIBILITY

### Accessibility 2015

#### • Peripheries:

- European
- National
- Regional



## Relative road accessibility changes at the municipal level

2007-2015









# Relative rail accessibility changes at the municipal level

2007-2015





2013-2023





#### **The role of demography - road accessibility monitoring** 2000-2005



Źródło: Monitoring spójności terytorialnej...., 2012, autorzy: Rosik P., Komornicki T., Stępniak M., Pomianowski W.

# Accessibility polarisation

Results – road accessibility and cohesion until 2023 After the accession to the EU the regional disparities in accessibility have increased.

- Trend break and the situation started to slightly improve after 2012.
- Freight accessibility is getting more polarized pattern due to:
  - $\Box$  GDP concentration,
  - Lower HGV speeds (relative to individual) on motorways (smaller impact on periphery)



#### PAD index - roads

#### Accessibility in public transport bus rail



Źródło: projekt NCN Multimodac; kierownik dr hab. Piotr Rosik

# Accessibility: individual versus public transport



Źródło: projekt NCN Multimodac; kierownik dr hab. Piotr Rosik

## POLISH EXAMPLES -MOBILITY

#### Migration: Warszawa, Kraków



### Migration: Lublin, Białystok



#### Commuting: Warszawa, Kraków



#### Commuting: Wrocław, Lublin

![](_page_25_Figure_1.jpeg)

#### Commuting traffic model (COM) R<sup>2</sup> = 0,65

![](_page_26_Figure_1.jpeg)

![](_page_26_Figure_2.jpeg)

- pon. 1000

#### Migration model (visiting relatives or friends) $R^2 = 0,66$

![](_page_27_Figure_1.jpeg)

## LOCAL EXAMPLES – LABOUR MARKET

![](_page_29_Picture_0.jpeg)

### Accessibility to jobs

Jobs accessible within 60 minutes by car

0 - 50,000 50,000 - 100,000 100,000 - 250,000 250,000 - 500,000 500,000 - 1,000,000 1,000,000 - 2,000,000 2,000,000 < ....

![](_page_29_Figure_2.jpeg)

Figure 3.3 Accessibility to jobs at municipal level in Finland, Estonia, Latvia, Lithuania and I land, road (Source: Spiekermann et al., 2015).

![](_page_29_Figure_4.jpeg)

#### Figure 3.4 Accessibility to jobs in Poland, road (Source: Stepniak et al., 2013).

![](_page_29_Figure_6.jpeg)

Figure 3.5 Accessibility to jobs in Poland, public transport (Source: Stepniak et al., 2013).

#### Labour markets – isochrones 60 minutes

![](_page_30_Figure_1.jpeg)

Population inside 60 minutes isochrone to the regional centres - 69% in 2013 and 74,6% in 2023

		Diagnoza			Zmiany	
	2013	2015	2023	2013- 2015	2015- 2023	2013- 2023
Białystok	692	691	753	-1	62	61
Bydgoszcz	1 285	1 285	1 568	0	283	283
Gdańsk	1 732	1 746	1 910	14	164	178
Gorzów Wielkopolski	704	807	869	103	62	165
Katowice	5 526	5 581	5 806	55	225	280
Kielce	952	947	1 193	-5	246	241
Kraków	3 822	3 833	3 962	11	129	140
Lublin	1 230	1 245	1 316	15	71	86
Łódź	2 050	2 084	2 045	34	-39	-5
Olsztyn	674	675	749	1	74	75
Opole	1 487	1 475	1 496	-12	21	9
Poznań	1 784	1 799	2 039	15	240	255
Rzeszów	1 323	1 504	1 635	181	131	312
Szczecin	821	821	862	0	41	41
Toruń	1 668	1 690	1 742	22	52	74
Warszawa	3 574	3 638	3 930	64	292	356
Wrocław	1 886	1 910	2 070	24	160	184
Zielona Góra	834	836	972	2	136	138

## LOCAL EXAMPLE – SEGI

# Accessibility to SEGI hostpitals swiming pools (all seasons)

![](_page_32_Figure_1.jpeg)

![](_page_32_Figure_2.jpeg)

#### Poland (ESPON TRACC) – Accessibility to SeGI: secondary schools medical doctors

![](_page_33_Picture_1.jpeg)

Source: IGSO PAS, 2012 Origin of data: Local Data Bank, GUS, 2010 © EuroGeographics Association for administrative boundaries

Poland Case Study Higher secondary schools within 30 minutes travel time by car

![](_page_33_Figure_4.jpeg)

![](_page_33_Figure_5.jpeg)

EUROPEAN UNION Part-financed by the European Regional Development Fund INVESTING IN YOUR FUTURE Source: IGSO PAS, 2011 Origin of health care data: estimated by IGSO PAS based on Local Data Bank, GUS, 2011 © EuroGeographics Association for administrative boundaries

#### Poland Case Study

Potential accessibility to medical doctors by car ( $\beta = 0.04621$ )

3.9 - 25.0	<ul> <li>NUTS 3 Capitals</li> </ul>
25.1 - 50.0	
50.1 - 75.0	
75.1 - 100.0	100 (population weighted average) = 1 109
100.1 - 125.0	Minimum: 43
125.1 - 150.0	Maksimum: 5 038
150.1 - 175.0	
175.1 - 200.0	
200 1 - 454 2	

#### **Travel motivation- A1/DK91**

![](_page_34_Figure_1.jpeg)

Pruszcz Gdański

![](_page_35_Figure_0.jpeg)

#### Local dimension – SeGI travel time changes

![](_page_36_Figure_1.jpeg)

1 – commuting, 2 – school/university, 3 – children school / kinder garden transport, 4 – shopping, 5 – culture, recreation, 6 – family meetings, 7 – institutions, 8 – others

Green – shorter travel time Yellow – no changes Red – longer travel time

### Tunnel effect

- Scale of tunnel effects
  - regional
  - local
  - Properties access

![](_page_37_Picture_5.jpeg)

• The lowest score – local entrepreneurs

![](_page_37_Picture_7.jpeg)

## Travel behavoiur - Travel frequency changes (survey in the communes neighboring the new motorways)

![](_page_38_Figure_1.jpeg)

(evaluation: -3 to +3)

- 1. Shopping malls
- 2. Summer holiday
- 3. Weekend holiday
- 4. Cinemas
- 5. Banks
- 6. Pharmacies
- 7. Doctors
- 8. County administration
- 9. Posts
- 10. Regional administration
- 11. Small services
- 12. Rail stations

Taking into account the quality of life of the inhabitants, motorways and expressways seem to improve the access to services located at bigger distances from the peripheral areas (at the subregional and regional levels), not exerting positive influence on servicing of population at the local scale.

### **CONCLUSIONS FOR BSR**

### Impact on the BSR urbanization

- Fast development of the transport network has increased the disparities in spatial accessibility and in economic competitiveness between various areas (mainly on the southern Baltic rim)
- Accessibility growth is supporting policentricity on the BSR level, but probably not on the national or regional levels.
- Medium size cities could be both winners or losers of the accessibility and mobility changes
- Better accessibility could balance demographic losses (in terms of the labour force availability)
- Labour markets are growing territorially. Long commuting is a challenge for transport development
- Smaller cities are at risk of transport exclusion (even if the infrastructure is developed)
- Taking into account the quality of life of the inhabitants, new investment seem to improve the access to services located at bigger distances from the peripheral areas (at the subregional and regional levels), not exerting positive influence on servicing of population at the local scale.

#### Recommendations

- If we stop the transport modernisation program (TEN-T after 2023?), the disparities in spatial accessibility would be higher than 20 years ago.
- At the regional level the fundamental problem is constituted by proper integration of the large projects with the second order road system.
- When planning the European networks (TEN-T) we should take into account the possible positive regional effects
- Public transport should be treated multimodally. EU should support also bus transport development.
- Public services (SeGI) development are fundamental to keep the network of small cities
- Integration of transport policy with other territorial policies (health care, demographic, education,....)

#### Thank you for your attention,

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![](_page_42_Picture_2.jpeg)

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