Transport accessibility and the effects of the new investments

- the case of Poland and Central-Eastern Europe



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Sources/projects

- GRINCOH: Growth-Innovation-Competitiveness Fostering Cohesion in Central and Eastern Europe GRINCOH; Lead partner – Euroreg Warsaw University
- TRACC: Transport Accessibility at Regional/Local Scale and Patterns in Europe; Lead partner - Spiekermann & Wegener, Urban and Regional Research (S&W), Dortmund, Germany
- The project of Polish Ministry of Science and Higher Education "<u>Multi-criteria evaluation of the impact of</u> <u>selected road corridors on the environment and socio-</u> <u>economic development of adjacent areas</u>".
- Institute of Geography and Spatial Organization, Polish Academy of Sciences - Evaluation/accessibility projects for Polish Ministry of Regional Development including the latest results of the motorway construction evaluation (2007-2013)

METHODS

Why accessibility? The aim of transport policy: Demand response, regional development, modal shift?



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Car ownership / GDP

PKB

Methods of accessibility measurement

- There are different approaches to the methodology of measurement of accessibility. On the basis of literature survey one can identify five groups of methods:
 - infrastructure-based accessibility measure the regional infrastructure equipment is evaluated by its quantity and quality and the level of congestion,
 - distance-based accessibility measure (travel-cost accessibility) distance, time or cost of travel where the activity is sought (a single destination or a set of destinations),
 - cumulative accessibility measure (daily accessibility) assessment of set of destinations available in particular travel distance, time or cost from the origin,
 - potential-based (gravity-based) accessibility measure accessibility is measured by the number of activities (opportunities) which can be reached in a certain distance, time or effort weighted by the travel distance, time or effort to do so,
 - person-based accessibility measure analyzing accessibility at the individual level.

Potential accessibility indicator

 $A_{i} = \sum_{j} g\left(M_{j}\right) f\left(c_{ij}\right)$

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'.

 $M_i f(t_{ii}) + \sum M_i f(t_{ii})$ $M_k f(t_{ik})$

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 θ values). This procedure results in the use of:

> β = 0.02 for short trips (intranational level)

 β = 0.005 for long trips (international level).

Multimodal Potential Accessibility Indicator (WMDT) prepared for Polish Ministry of Infrastructure and Development

- First WMDT prepared in 2008
- WMDT II prepared in 2015 and used during the negotiation with EY Commission (also by regions)
- Including modal indicators for passenger transport (road, rail and air) and freight transport (road, rail and inland waterways)
- Different speed model and different distance decay functions
- Own dedicated software OGAM
- Passenger and freight transport 50:50
- Gmina level, all aggregation possible

Methods - GRINCOH





EUROPEAN AND MACROREGIONAL DIMENSION

The accessibility improvement possibility



1.32 Potential increase in road accessibility: high-speed scenario relative to current situation





1.36 Potential increase in rail accessibility: high-speed scenario relative to current situation



500 Km

Source: DG REGIO; Spiekermann & Wegener





ESPON TRACC – European and national dimension



Changes in travel time for 100 km roads rail





The effects of the new investement

- Western part of the region concentration (Cohesion? European – yes, macroregional – no)
- Most advanced motorways systems Czech Rep., Hungary and Slovenia
- Better connectivity between old and new members and in some cases between new member states
- Connectivity through external border improved only in some places (PL-UA, HU-UA)
- Rail investment only modernization, no new lines (including high speed);
- In rail transport internal investment dominated, however mutual accessibility between the main cities of the V4 Countries has improved
- Rail systems of Baltic States as well as Romania and Bulgaria remain isolated from the rest of EU

Transport investment versus GDP real national avarage 87,5 175 km Saint Petersburg 87,5 175 km Saint Petersburg enhagèn Va 🙆 Malm Main Minsk Minsk Kiev Lvis Lviv Vienna Munich Salzburg Salzburg in. Ljubljana ahitants ther of inhabitants above 3 million nstanta above 3 million between 1 · 3 million Constanta between 1 - 3 million between 500 - 1million between 500 - 1million between 250-500 thous. between 250-500 thous. een 100 - 250thous. of changes in GDP, 100=2003 between 100 - 250thous. namics of changes in GDP relativized 2004-2010 160 180 100 90 110 The value of 1 km investment [million €/1km] 2 3 5 10 15 25 The value of 1 km investment [million €/1km] Skopj 3 5 10 15 25 Istanbul 0 1 2 Road/rail Total investment in NUTS 3 Road/rail

Munich

1 000

o 10

Total investment in NUTS 1 000

o 10

stanbul

hessalonik

Thessaloniki

Transport versus development





- Why not?
 - Results delay;
 - Economic crisis
 - Investment from other sources;

Typology (NUTS3)

- Type A high level of investment value (>253 million €) and high increase of the GDP value
- Type B high level of investment value (>253 million €) and low increase of the GDP value
- Type C low level of investment value (100-253 million €) and high increase of the GDP value
- Type D low level of investment value (100-253 million €) and low increase of the GDP value
- Type E very low level of investment value (<100 million €)





POLAND – ACCESSIBILITY IMPROVEMENT

Polish transport policy

- After the transition very low effectiveness .
- 90's strategy of "waiting for EU membership"
- Simultaneously the population mobility increased
- After EU accession: unreal plans for the perspective 2007-2013, accelerated by the Euro 2012 football championship
- Transport policy Ministry of Infrastructure, Cohesion policy Ministry of Regeional Development
- January 2013 a new Transport Development Strategy until 2020 was approved.
- First time territorial and cohesion policies aims. New measures including accessibility indicators were introduced.
- Since 2000 biggest national motorway construction programme in Europe.
- Majority of new roads constructed with the assistance of European funds (2004-2006 and 2007-2013 programming periods).
- Cohesion Fund and the European Regional Development Fund average share of EU co-financing - 68% of overall project costs

Old and new National Spatial Development Concepts: NSDC 2001 NSDC 2011



Powiązania funkcjonalne

podstawowe
 uzupełniające
 powiązania wybitnie jednokierunkowe

Kierunki międzynarodowych powiązań funkcjonalnych

podstawowych

uzupełniających

Road investement 2004-2013









Accessibility 2015

- Peripheries:
 - European
 - National
 - Regional



Accessibility changes (2004-2015)

- "Triple loosers" (central Pomerania)
- "Triple winers" (central regions, south-east peripheries)

Road accessibility monitoring 1995-2000



Road accessibility monitoring 2000-2005



Road accessibility monitoring 2005-2010



Road accessibility monitoring 2010-2015



Beta accessibility convergence (1995-2015)



Road Accessibility Indicator WDDT (passenger, freight, synthetic) - 2013.12.31



Road Accessibility Indicator WDDT (passenger, freight, synthetic) - 2023







Railway Accessibility Indicator WKDT (passenger, freight and synthetic) – 2023



Accessibility monitoring

Zróżnicowanie dostępności (wskaźniki WDDT i WKDT) w latach 2004-2023

* im wyższa wartość wskaźnika tym wyższe zróżnicowanie międzyregionalne



EU supported motorways and expressways (2004-2013)

Change of Warsaw time accessibility

Regional centres labour markets enlargement





Source: P.Śleszyński

LOCAL EFFECTS

Road safety (A2 motorway example)



Red – 6 months before the opening

Blue – six month after the opening

Travel time changes



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

Travel frequency changes



- 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

Tunnel effect

- Scale of tunnel efects
 - regional
 - local
 - Properties access
- Survey: evaluation of the possibility to move across motorway (in the rural communities)
- The lowest score local entrepreneurs



CONCLUSIONS

Conclusions

- The general increase of accessibility is an essential condition for the socio-economic development, although it certainly does not guarantee the development. This refers both to the urbanised areas and to the rural ones.
- At the regional level the fundamental **problem is constituted by proper** integration of the large projects with the second order road system.
- 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.
- The development of the country's network of motorways and expressways has increased the disparities in spatial accessibility and in economic competitiveness between various areas.
- Improvement of accessibility within the area of Eastern Poland may be realised by implementation of investment projects located in other regions, and in particular – in central Poland



Thank you for your attention

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