

# *Work-related population flows*

## *– measurement of commuting time*

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***Necessary information to get you started,  
helpful in understanding the further presentation***

# Administrative division of Poland



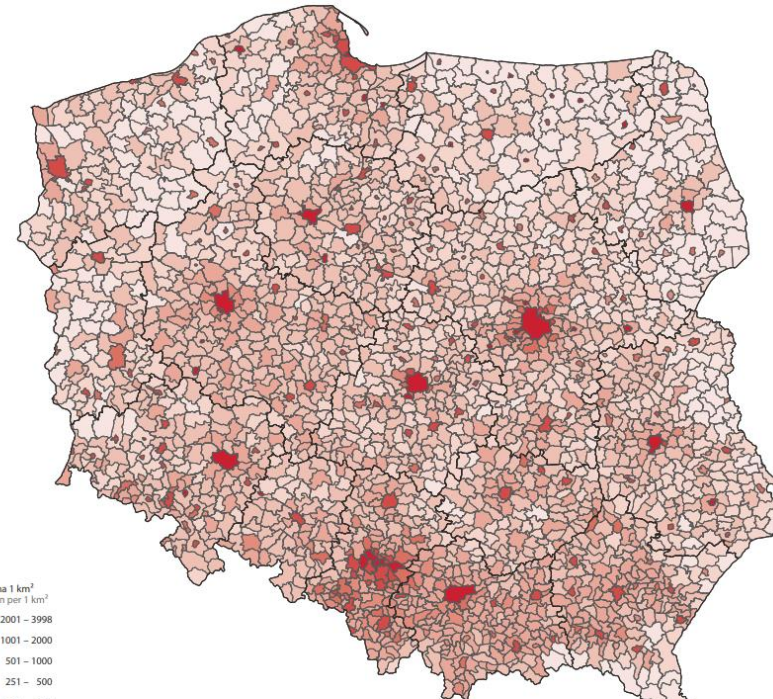
Territory of Poland: **322 714 km<sup>2</sup>** (311 895 km<sup>2</sup> land area)  
Population (as of 31.12.2022): **37.8 millions**  
(national definition)

In Poland, there is a three-tier administrative (territorial) division.

The territory of country is divided into voivodships, then voivodships into powiats, and powiats into gminas.

- 16 voivodships,
- 314 powiats,
- **2477 gminas** <sup>a)</sup>

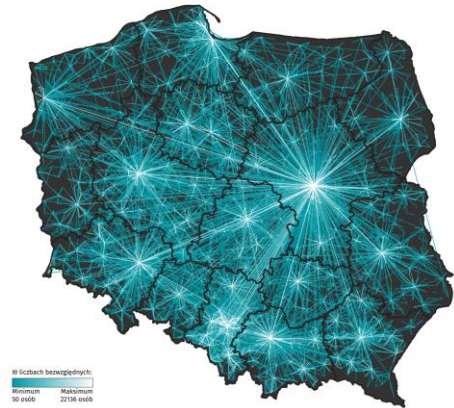
a) Of which 66 gminas that are also cities with powiat



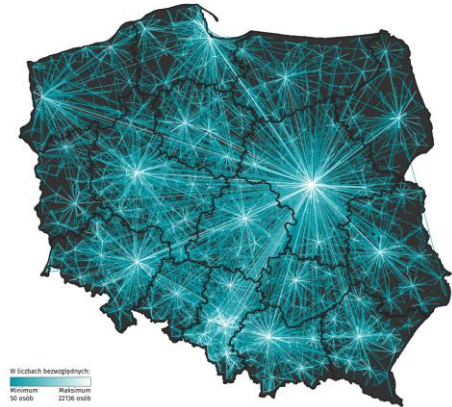
**Population density by gminas (in 2016)**

*What am I going to talk about  
in the main presentation?*

*Work-related population flows*



# *What am I going to talk about in the main presentation?*



(1) Number of commuters,  
Commuting matrix

between gminas of:



**Place of residence**



**Place of work**  
(of the main job)

(2) **Accessibility matrix**

(road distances and travel times between centroids of gminas)

## Estimation of commuting time

# Handbook on Measuring Quality of Employment

A Statistical Framework

Prepared by the Expert Group on Measuring Quality of Employment

## Indicators in Sub-dimension 3c: Work-life balance

3c1	Employment rate of mothers and fathers	Percentage of women, respectively men aged 20-49 years who are employed with and without children under compulsory school age
3c2	Possibility to work at home	Percentage of employed persons whose working arrangements offer the possibility to work at home
3c3	Commuting time	Mean duration of commuting time between work and home (one way)
3c4	Care leave entitlement	Percentage of employed persons entitled to leave for care responsibilities for children or adults
3c5	Parental leave	Percentage of parents in employment on parental leave
3cx	Child care use (experimental)	Percentage of employed parents with children under compulsory school age who currently use child care

# (1) A study of work-related commuting flows

## Study methodology



### I. Data processing

- Identification of main job for employed persons
- Identification of the address of the workplace.
- Generation of the population of commuters according to the following definition:

#### **A commuter :**

#### ***an employed person***

- ***living in a gmina other than the one in which their workplace is located and***
- ***as an individual Taxpayer reported higher deductible expenses owing to commuting costs***

## (1) A study of work-related commuting flows

### Study methodology (cont.)



## II. Data sources

The population of commuters was identified using data from:

### 1. Registers

- Ministry of Finance – database containing information about payers of personal tax (PIT-11, PIT-40) - **21,6 milion records (2016)**
- Social Insurance Institution (ZUS) – Central Register of Taxpayers, Central Register of Insured Persons - **16,4 milion records (2016)**

### 2. The National Census of Population and Housing (2021)



## Commuting to work according to the results of the National Census of Population and Housing 2021

**The methodology** of the study of *work-related population* flows was developed on the basis of previous experience of statisticians from the office in Poznań (**2006, 2011, 2016**).

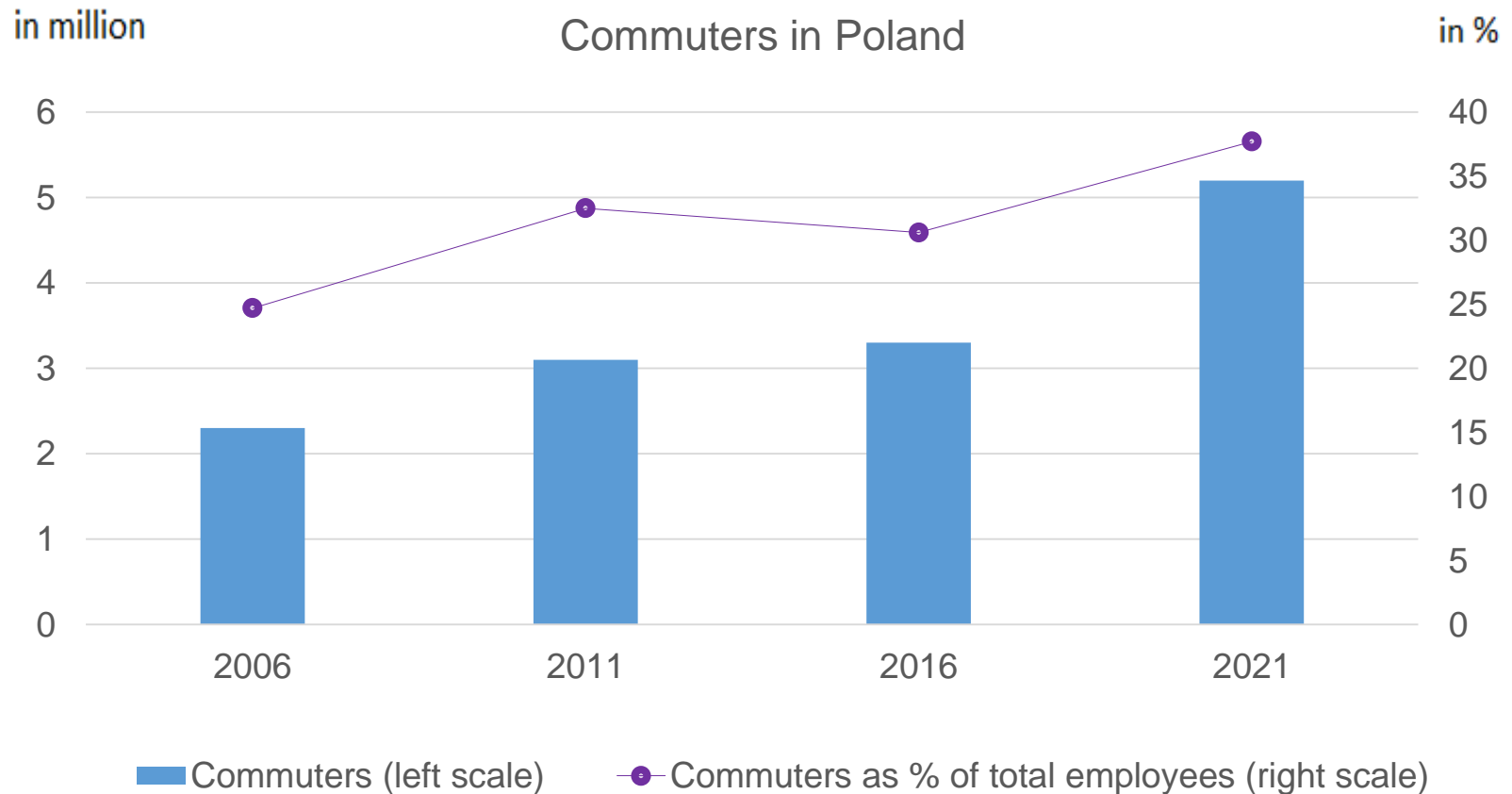
**Previous editions** of the commuting survey were based solely on data from administrative registers (data from the Social Insurance Institution and the Ministry of Finance).

The **Census 2021** was carried out using a mixed method, i.e. using data collected from respondents and data from administrative sources

**For 2021**, the previous source of data for this topic (tax registers) has been enriched with additional registers and answers from Census individual questionnaire. The information provided from these sources enabled commuters to be characterised by gender and age and, in particular, made it possible to better identify their workplaces, which, in combination with their actual place of residence, determine the direction of work-related flows.

## Results for the whole country

*In 2021 there were 5182,6 thousand employees commuting to work in Poland, which represented 37.7 % of the total number of employees.*



# Data sources and methodology

(2021 Census questionnaire + administrative registers)

- The study of work-related commuting was conducted for the group of **employees<sup>1)</sup>** who indicated that their **main place of work** was located in Poland at **an address other than their place of residence**.
  - When a person's employee status was determined on the basis of information provided directly by respondents in the Census questionnaire, the place of work was determined based on the respondent's answer.
  - However, if a person's employee status was determined on the basis of an administrative register (with information about people's economic activity), information from this register was used as the person's place of work <sup>2)</sup>. To identify the target population, the gmina of residence was compared with the gmina of work determined in the way described above.
- **The population of employees for whom the gmina of residence was different from the gmina of employment is defined as the **population of commuters**.**
- The size and intensity of commuting showed significant spatial variation. **Individual inter-municipal flows are included in the **matrix of work-related population flows**.**
  - In the study, work-related population flows were analysed between gminas, which were treated as the basic. Since the distinction between urban and rural areas is important in the study of these flows, urban and rural parts were analysed separately.

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1) The population of employees was determined on the basis of the population by the national definition.

2) The 2021 Census was a mixed-mode census, which means it was based on data collected from respondents and data from administrative registers

## Structure of the commuting matrix

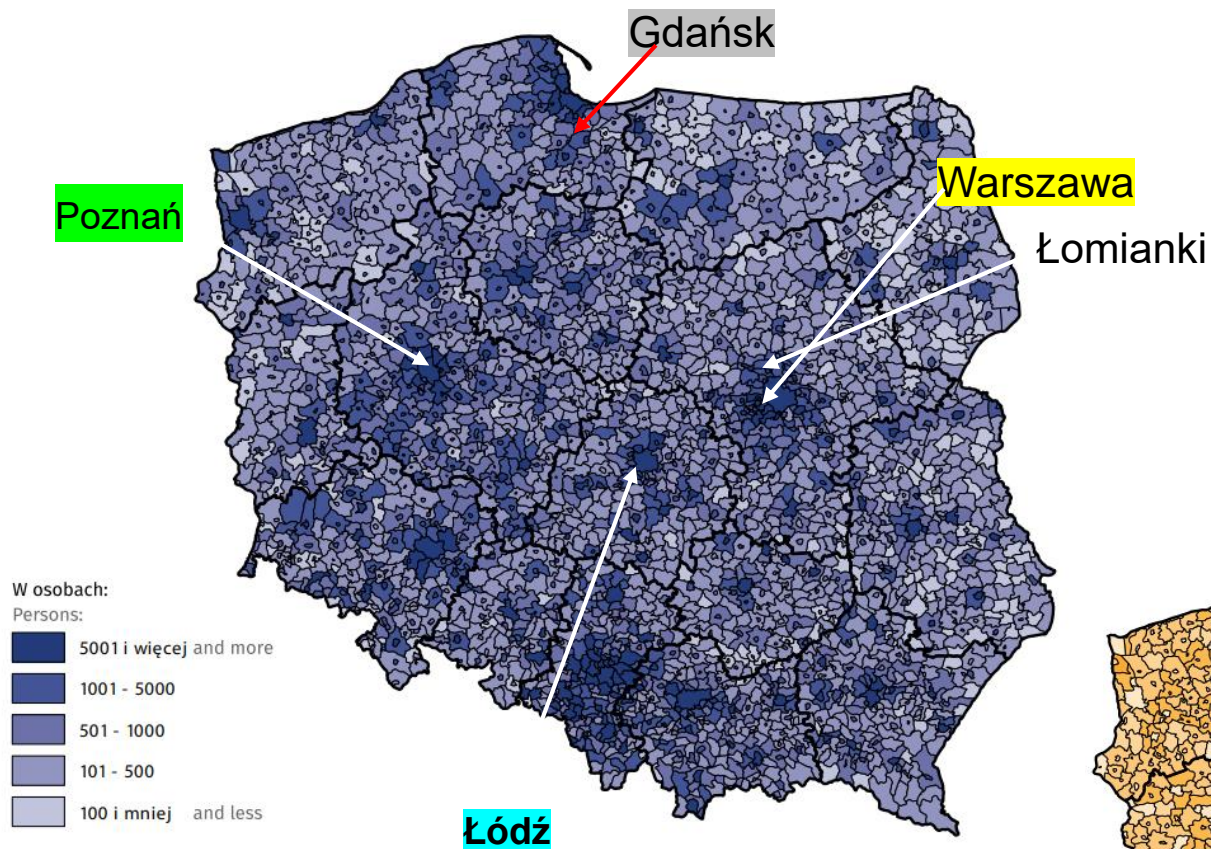
The commuting matrix could be presented in the so-called „long form”.

From: Gmina of residence		To: Gmina of workplace		Number of Commuters
Territorial code	Name	Territorial code	Name	
1432054	Łomianki - city	1465011	Warszawa	2981
1432055	Łomianki - rural areas	1465011	Warszawa	2244
1061011	Łódź (city)	1465011	Warszawa	4978
3064011	Poznań (city)	1465011	Warszawa	2718
2261011	Gdańsk - (city)	1465011	Warszawa	2472
1465011	Warszawa	1061011	Łódź (city)	793
1465011	Warszawa	3064011	Poznań (city)	590
1465011	Warszawa	2261011	Gdańsk (city)	437
3064011	Poznań (city)	1061011	Łódź (city)	152
1061011	Łódź (city)	3064011	Poznań (city)	362
1061011	Łódź (city)	2261011	Gdańsk - (city)	158
2261011	Gdańsk (city)	1061011	Łódź (city)	154
1465011	Warszawa	1432054	Łomianki - city	1628
1465011	Warszawa	1432055	Łomianki - rural	436
1002092	Oporów (rural areas)	1465011	Warszawa	7
1465011	Warszawa	1002092	Oporów (rural)	-

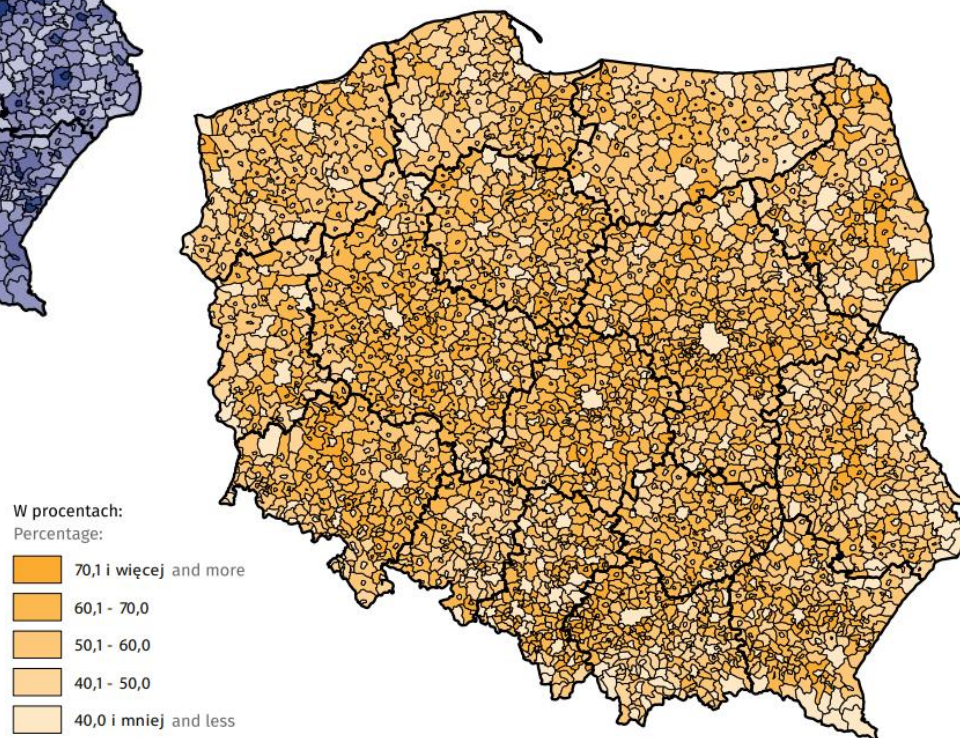
or „Classical form” of matrix

		Gmina of workplace				
		1061011 Łódź	3064011 Poznań	2261011 Gdańsk	1465011 Warszawa	...
Gmina of residence	1061011 Łódź		362	158	4978	
	3064011 Poznań	152		144	2718	
	2261011 Gdańsk	154	231		2472	
	1465011 Warszawa	793	590	437		
	...	...				

Map 1. **Incoming commuters** by gminas in 2021



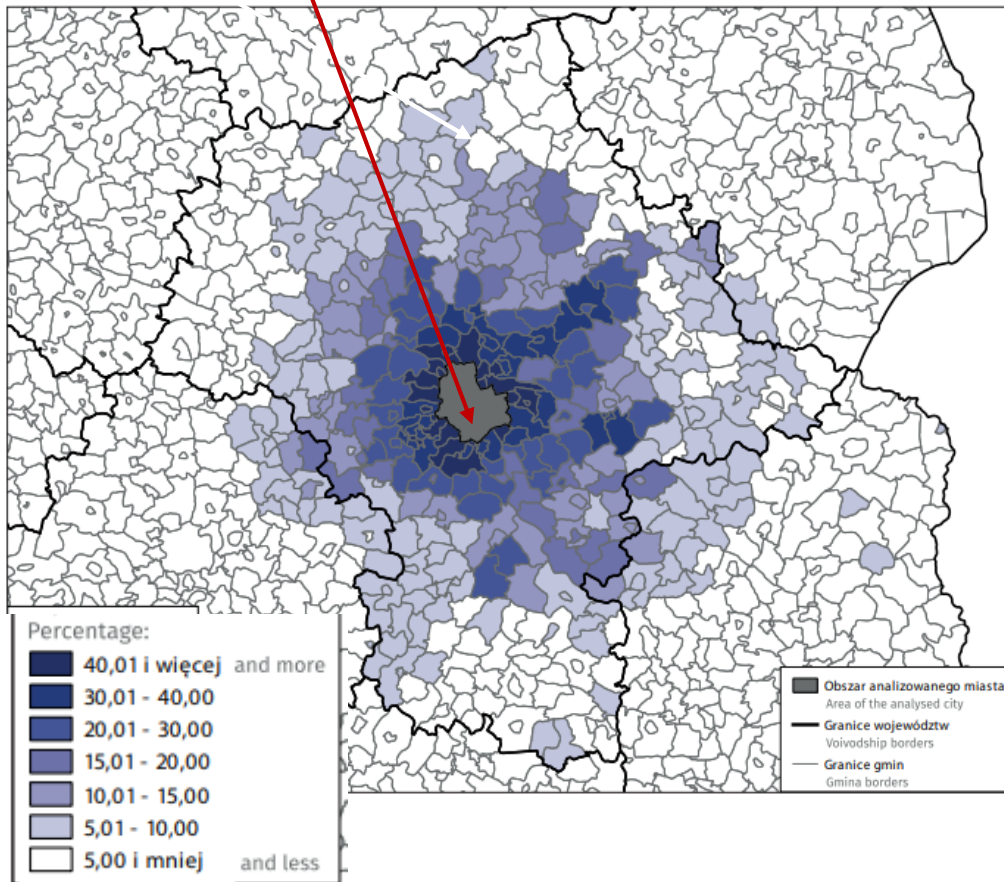
Map 2. **Outgoing commuters** as % of total employees by gminas in 2021



## Gminas by work-related population flows in 2021 (in thousands)

From: Gmina		<i>Incoming commuters</i>	<i>Outgoing commuters</i>
Territorial code	Name		
1432054	Łomianki - city	4.4	3.8
1432055	Łomianki - rural areas	1.4	3.2
1061011	Łódź (city)	65.1	27.0
3064011	Poznań (city)	106,7	40.7
2261011	Gdańsk (city)	69.5	31.8
1465011	Warszawa (city)	390.4	56.0
1002092	Oporów (rural areas)	< 0.1	0.6

Map 1. The share of **incoming commuters to Warszawa<sup>1)</sup>** in the number of employees in the *gmina* of residence in 2021



## 390.4 thousand people living outside Warsaw<sup>1)</sup> commuting to work in the capital of Poland.

By far the largest number of people coming to work in Warsaw had their place residence in the Mazowieckie Voivodeship (66.1%). From 370 gminas of this voivodeship, 258.2 thousand people came to Warsaw.

**The gminas from which the largest percentage of residing there employees came to work in Warsaw are concentrated in several rings surrounding the city.**

Employees from outside the Mazowieckie Voivodeship (132.2 thousand) accounted for 33.9% of the total number of people coming to work in Warsaw. These were the inhabitants of 2752 gminas in the country, most of which were located in the Wielkopolskie (319; 11.6%), Lubelskie (243; 8.8%) and Małopolskie (230; 8.4%) voivodeships. The largest streams of people coming to work in Warsaw were directed from the Łódź Voivodeship (19.0 thousand), the Śląskie Voivodeship and the Lublin Voivodeship (15.4 thousand each).

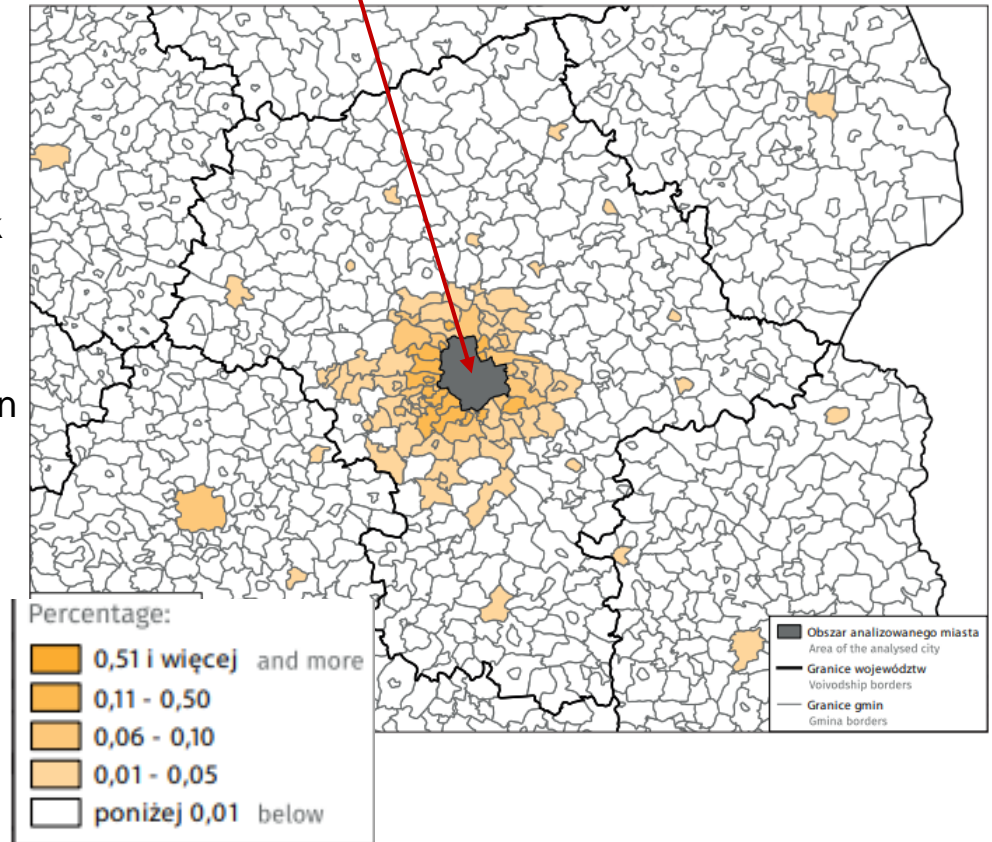
1) Warszawa is the capital of Poland and the capital of the Mazowieckie Voivodeship.

## 56.0 thousand people left Warsaw to work in other territorial units.

Departures from Warsaw to work in the Mazowieckie Voivodeship in 2021 were mainly addressed to municipalities neighbouring the city.

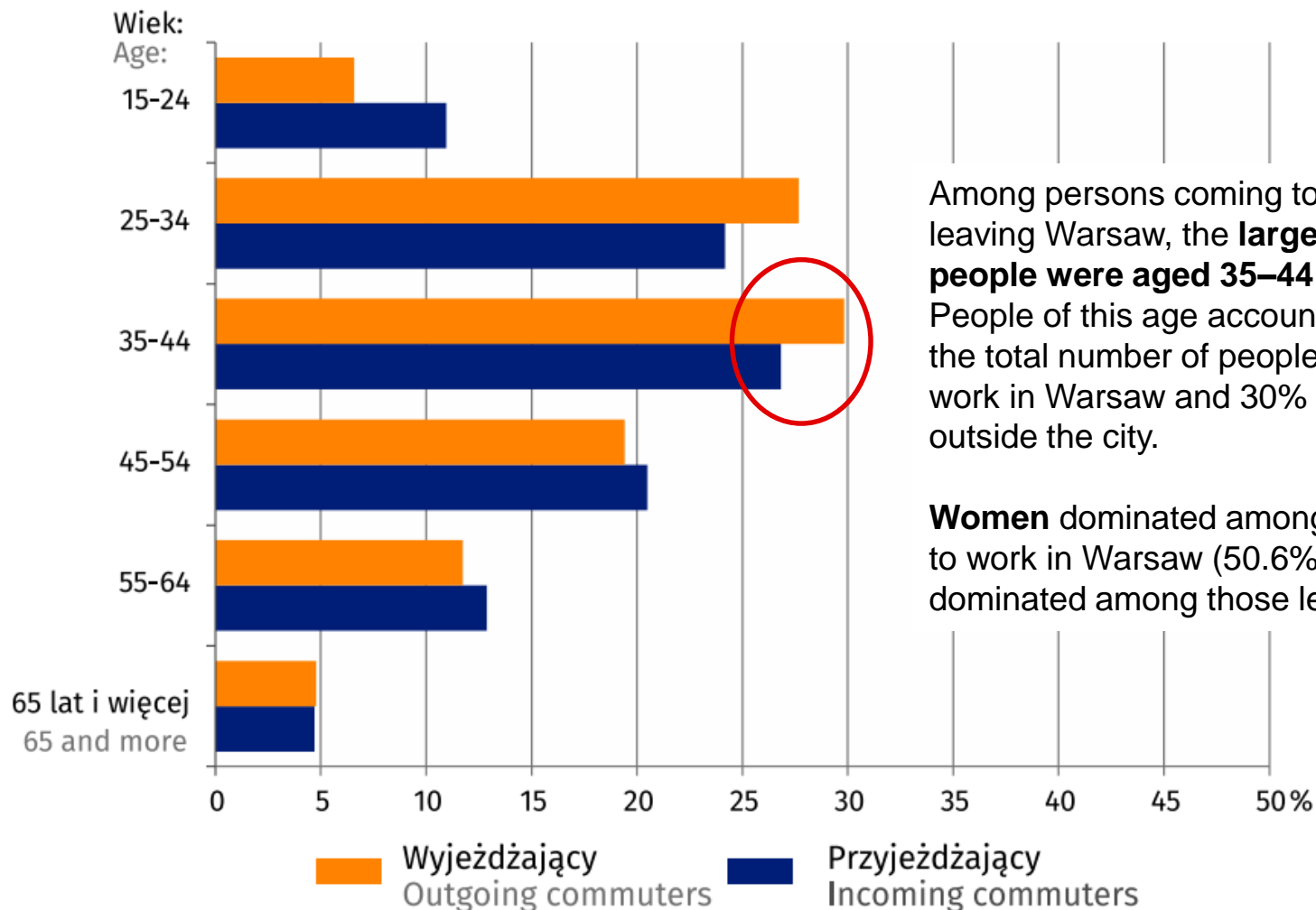
Employees living in Warsaw and going to work outside the Mazowieckie Voivodeship accounted for 19.6% of the total number of people leaving the city. They went to work in 1133 communes, most of which were located in the following voivodeships: Łódź (117), Lubelskie (112) and Wielkopolskie (105). The place of work of the largest group of these people was in Cracow. The next places in this respect were occupied by the following cities: Wrocław, Łódź and Poznań

Map 2. The share of **outgoing commuters from Warszawa** in the number of employees in the gmina of residence in 2021





**Chart 1** The structure of incoming commuters **to Warszawa** and outgoing commuters **from Warszawa** by age in 2021



Among persons coming to work in and leaving Warsaw, the **largest number of people were aged 35–44**.

People of this age accounted for 27% of the total number of people coming to work in Warsaw and 30% going to work outside the city.

**Women** dominated among those coming to work in Warsaw (50.6%), while **men** dominated among those leaving the city.

# The matrix of work-related population flows available at:

[https://stat.gov.pl/download/gfx/portalinformacyjny/pl/defaultaktualnosci/6536/9/2/1/macierz\\_przeplywow\\_ludnosci\\_zwiazanych\\_z\\_zatrudnieniem.xlsx](https://stat.gov.pl/download/gfx/portalinformacyjny/pl/defaultaktualnosci/6536/9/2/1/macierz_przeplywow_ludnosci_zwiazanych_z_zatrudnieniem.xlsx)



Główny  
Urząd Statystyczny

Narodowy Spis Powszechny Ludności i Mieszkań 2021 · Powszechny Spis Rolny 2020 · Badania statystyczne

[Solidarni z Ukrainą](#)

[Pomagam Ukrainie](#)



Podstawowe dane



Opracowania sygnałne



Publikacje



Bank Danych Lokalnych



TranStat



SDG



Dziedziczne Bazy Wiedzy



STRATEG



Portal Geostatystyczny



Portal API



Dashboard gospodarczy



REGON, TERYT

Strona główna · Spisy Powszechne · NSP 2021 · NSP 2021 - wyniki ostateczne

## Spisy Powszechne

Narodowe Spisy Powszechne

NSP 2021

Bieżące informacje o NSP 2021

Harmonogram publikacji wyników NSP 2021

Konsultacje Społeczne

NSP 2021 - wyniki wstępne

NSP 2021 - wyniki ostateczne

NSP 2011

## Macierz przepływów ludności związanych z zatrudnieniem – NSP 2021



A A A



W Polsce w 2021 r. do do pracy wykazywały ludności związanych

DOJAZDY DO PRACY W ŚWIETLE WYNIKÓW  
NARODOWEGO SPISU POWSZECHNEGO LUDNOŚCI I MIESZKAŃ 2021  
COMMUTING TO WORK ACCORDING TO THE RESULTS OF  
THE NATIONAL CENSUS OF POPULATION AND HOUSING 2021

31.01.2024

Pliki do pobrania

[Macierz przepływów związanych z zatrudnieniem / The matrix of employment-related population flows](#)



Macierz przepływów Mieszkań 2021

[Wyjeżdżający z gmin / Outgoing commuters](#)

[Przyjeżdżający do gmin / Incoming commuters](#)

PL/EN version of matrix

One should bear in mind that the Polish Census questionnaire`2021 did not contain questions about commuting time, frequency of commuting, means of transport used, remote work or any other kind of additional information.

However, the Statistical Office in Poznań prepared ***an accessibility matrix***, (*as experimental work*) which contains information about ***estimated distance and travel time by car*** between selected gminas in Poland.

**The purpose of the study was** to estimate the selected characteristics of spatial accessibility using resources of ***OpenStreetMap*** and making them available in the form of an accessibility matrix to users interested in conducting advanced spatial analyses.

The information included in the matrix fills the gap in official statistics in this area. It also meets the needs of users interested in problems associated with work-related commuting.

## (2) An accessibility matrix. Estimation of distance and travel time between selected gminas

### Assumptions:

- Remote work is not taken into account
- Means of transport – passenger car
- Only the commute from home to work is taken into account
- Gminas are represented by their centroids

### Data Source Provider:

- Census 2021 Commuting Matrix
- Time matrix derived from OpenStreetMap resources

The methodology described for the 2016 study,  
available at:

[Statistics Poland / Experimental statistics / Functional areas. Territorial accessibility / Estimation of distance and travel time between selected communes in Poland in 2016](#)

## (2) An accessibility matrix. Estimation of distance and travel time between selected gminas

In 2019, Statistics Poland (the Centre for Urban Statistics in the Statistical Office in Poznań) published **accessibility matrix** containing distances in "straight line", the so-called orthodromes, road distances and travel times between gmina centroids. The last measure is given either in minutes and hundredths of a minute or in the format "minutes:seconds".

From: Gmina of residence		To: Gmina of workplace		Orthodrome (in km)	Road distances (in km)	Travel times (in minutes)	Travel times (minues: seconds)
Territorial code	Name	Territorial code	Name				
1432054	Łomianki - city	1465011	Warszawa	15,82	17,60	25,10	25:06
1432055	Łomianki - rural areas	1465011	Warszawa	18,70	20,97	29,00	29:00
1061011	Łódź (city)	1465011	Warszawa	119,34	137,68	92,94	92:56
3064011	Poznań (city)	1465011	Warszawa	281,91	315,45	180,78	180:47
2261011	Gdańsk (city)	1465011	Warszawa	286,45	422,71	237,16	237:10
1465011	Warszawa	1061011	Łódź (city)	119,34	135,85	93,16	93:10
1465011	Warszawa	3064011	Poznań (city)	281,91	312,75	180,39	180:23
1465011	Warszawa	2261011	Gdańsk (city)	286,45	426,94	233,84	233:50
3064011	Poznań (city)	1061011	Łódź (city)	189,18	216,13	134,75	134:45
1061011	Łódź (city)	3064011	Poznań (city)	189,18	216,60	137,34	137:20
1061011	Łódź (city)	2261011	Gdańsk - (city)	294,05	341,89	188,41	188:25
2261011	Gdańsk - (city)	1061011	Łódź (city)	294,05	334,03	188,45	188:27
1002092	Oporów (rural areas)	1465011	Warszawa	104,20	161,60	104,22	104:13

## (2) An accessibility matrix. Estimation of distance and travel time between selected gminas

The matrix follows the format of the [matrix of work-related commuting flows](#).

Important facts about the matrix:

- **gminas of work and residence are represented by their centroids**, i.e. geometric centres;
- **spatial and attribute data used to produce the matrix come from the National Register of Boundaries (PRG) for 2016 and the OpenStreetMap file** as at the turn of 2016 and 2017, downloaded from the resources of [www.geofabrik.de](http://www.geofabrik.de);
- **the orthodromic distance (the shortest distance in km) between gmina centroids was calculated using** the `distGeo()` function from the *geosphere* package in R;
- **road distance (in km) and travel time (in mins) was estimated using** the `ors_matrix()` function from the [openrouteservice](#) package.

Authors also have included PNG files with isochrones of accessibility for gmina capital cities, i.e. choropleth maps showing areas with the same travel time to gmina capital cities, at 15-minute intervals. The maximum travel time is 90 minutes.

The study, which has led to the creation of the accessibility matrix and choropleth presenting isochrones of accessibility, is an experimental work whose innovative character consists in:

- the use of a new data source, in the form of OpenStreetMap resources. It is a crowd-source solution, based on the open data licence;
- the use of open source software for data processing: the [openrouteservice](#) R package licensed under [CC-BY 4.0](#) .

# (1)+(2) The commuting matrix +The accessibility matrix. Results.

The commuting matrix

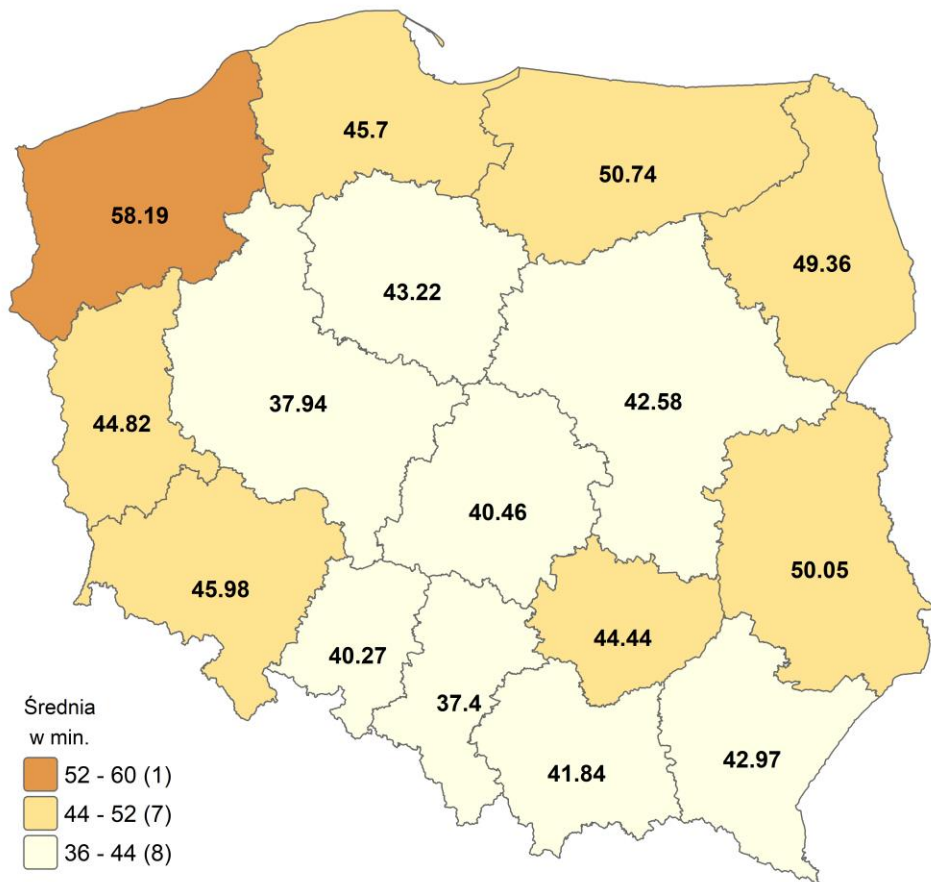
The accessibility matrix

From: Gmina of residence		To: Gmina of workplace		Number of Commuters	Orthodrome (in km)	Road distances (in km)	Travel times (in minutes)	Travel times (minues: seconds)
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3064011	Poznań (city)	1465011	Warszawa	2718	281,91	315,45	180,78	180:47
2261011	Gdańsk - (city)	1465011	Warszawa	2472	286,45	422,71	237,16	237:10
1465011	Warszawa	1061011	Łódź (city)	793	119,34	135,85	93,16	93:10
1465011	Warszawa	3064011	Poznań (city)	590	281,91	312,75	180,39	180:23
1465011	Warszawa	2261011	Gdańsk (city)	437	286,45	426,94	233,84	233:50
3064011	Poznań (city)	1061011	Łódź (city)	152	189,18	216,13	134,75	134:45
1061011	Łódź (city)	3064011	Poznań (city)	362	189,18	216,60	137,34	137:20
1061011	Łódź (city)	2261011	Gdańsk - (city)	158	294,05	341,89	188,41	188:25
2261011	Gdańsk (city)	1061011	Łódź (city)	154	294,05	334,03	188,45	188:27
1465011	Warszawa	1432054	Łomianki - city	1628				
1465011	Warszawa	1432055	Łomianki - rural	436				
1002092	Oporów (rural areas)	1465011	Warszawa	7	104,20	161,60	104,22	104:13
1465011	Warszawa	1002092	Oporów (rural)	-				

# Indicators characterizing commuting time – preliminary results

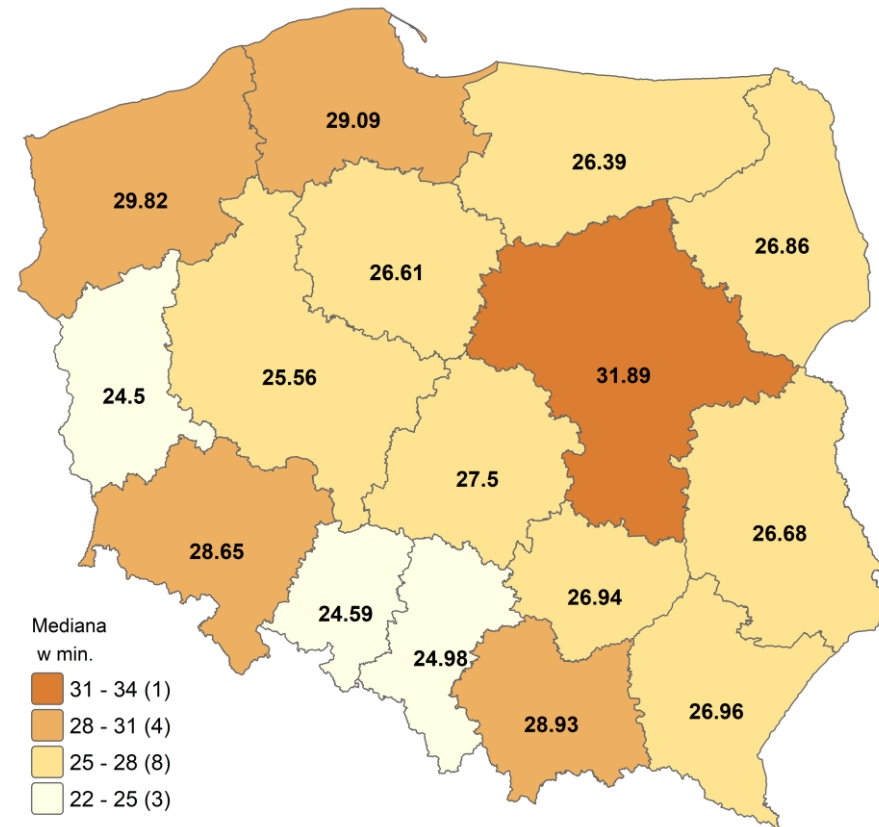
Average commuting time in 2021  
(minutes)

**Poland: 43 minutes**



Median commuting time in 2021  
(minutes)

**Poland: 28 minutes**

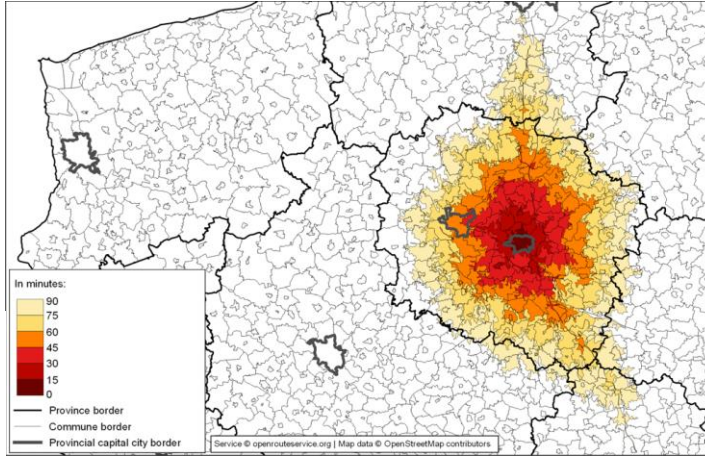




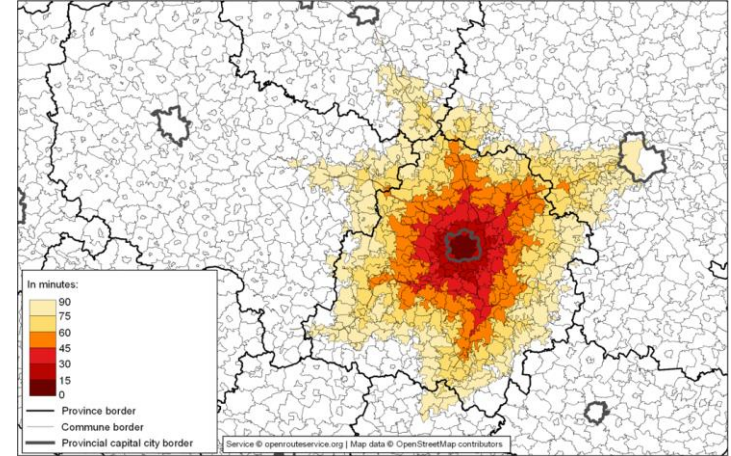
# Indicators characterizing commuting time – preliminary results

## Isochrones

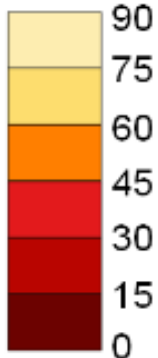
### TORUŃ



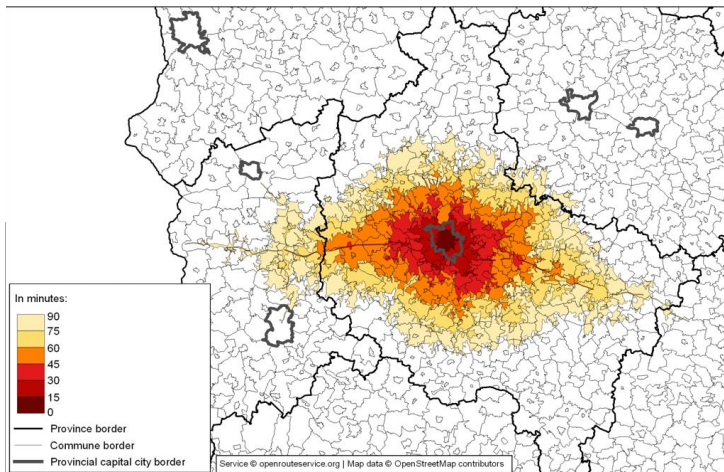
### ŁÓDŹ



W minutach:

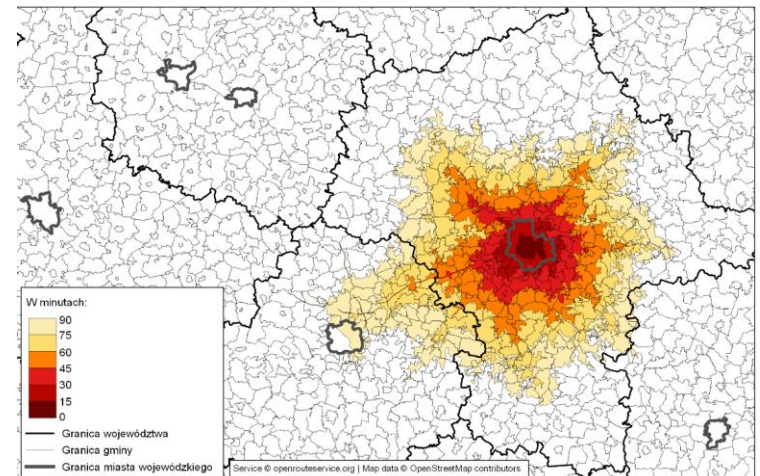


### POZNAŃ



### WARSZAWA

Dostępność czasowa Warszawy w 2016 r.



# Thank you for your attention

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