

# CITIES IN EUROPE AND CENTRAL ASIA

## POLAND



### METHODOLOGY

This country snapshot was produced as part of an Advisory Services and Analytics (ASA) work developed by the Urban, Social, Rural and Resilient Global Practice (GPSURR). The objective of this ASA is to analyze economic, spatial and demographic trends in the urban systems of countries in Europe and Central Asia. City-level population data was obtained from the National Statistics Institute. In the absence of city-level economic and spatial data over the period of analysis, nighttime light (NLS) satellite imaging was used to assess spatial and demographic trends in cities. In previous studies, NLS intensity has been found to be positively correlated with levels of economic activity as measured by GDP. Regional-level regressions of NLS and GDP were conducted to assess the validity of using NLS as a proxy for economic activity in Poland. The results suggest a significant and positive correlation between NLS intensity and GDP. In Poland, GDP to NLS elasticity was found to be 0.61 (*an increase in light intensity of 1 percent is associated with a 0.61 percent increase in GDP*). This country snapshot presents its results at the city level. Due to measurement error, city-level economic and spatial results should be analyzed with caution; and when possible, additional city level data (*i.e. satellite imagery, firm-level data, and etc.*) should be consulted to corroborate results. This snapshot classified 409 settlements in Poland as cities. Only settlements with more than 10,000 inhabitants were used in this analysis. Demographic trends are available for all 409 cities but NLS analysis is only available for 350 cities; the remaining settlements did not produce enough light to be considered “urban” by the NLS threshold employed in this analysis. Similar assessments done for other countries suggest that NLS are able to capture most settlements with 30,000 inhabitants or more. For additional information on this ASA please contact Paula Restrepo Cadavid ([prestrepocadavid@worldbank.org](mailto:prestrepocadavid@worldbank.org)) or Sofia Zhukova ([szhukova@worldbank.org](mailto:szhukova@worldbank.org))



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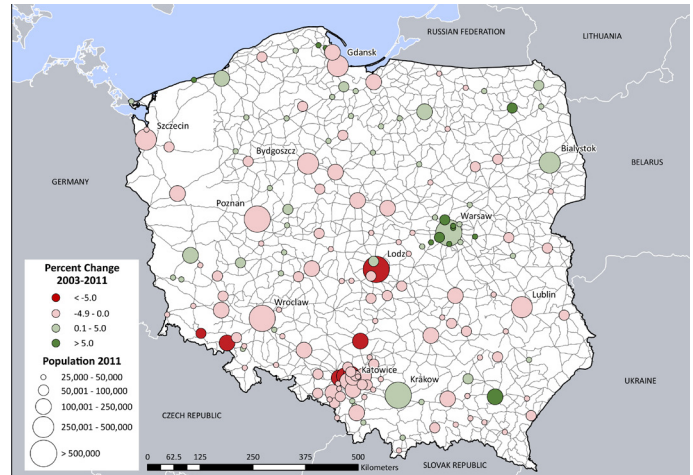


from the British people



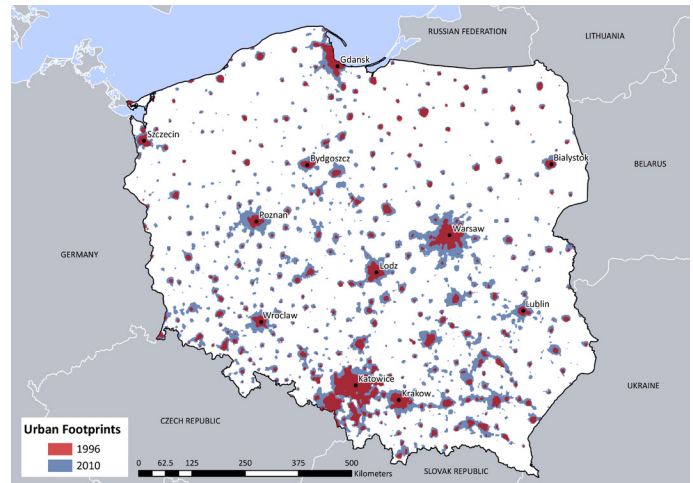
## DEMOGRAPHICS

		BEFORE	RECENTLY
Fertility Rates	Poland	1.22 <sup>1</sup>	1.30 <sup>2</sup>
	ECA	1.56 <sup>1</sup>	1.70 <sup>2</sup>
Life Expectancy	Poland	74.59 <sup>1</sup>	76.75 <sup>2</sup>
	ECA	73.50 <sup>1</sup>	76.36 <sup>2</sup>
% of Population Above Age 65	Poland	12.98 <sup>1</sup>	13.70 <sup>2</sup>
	ECA	14.07 <sup>1</sup>	14.81 <sup>2</sup>
Population Growth (Average Annual %)	Poland		-0.05 <sup>3</sup>
	ECA		0.35 <sup>3</sup>
Urban Population Growth (Average Annual %)	Poland		-0.23 <sup>3</sup>
	ECA		0.60 <sup>3</sup>
Urbanization Level (%)	Poland	61.68 <sup>1</sup>	60.78 <sup>2</sup>
	ECA	68.78 <sup>1</sup>	70.15 <sup>2</sup>
Annual Urbanization Rate (%)	Poland		-0.18 <sup>3</sup>
	ECA		0.24 <sup>3</sup>
City Average Population	Poland	52,236 <sup>1</sup>	51,767 <sup>2</sup>
	ECA	61,105 <sup>1</sup>	64,914 <sup>2</sup>
% Cities With More Than 100,000	Poland	9.77 <sup>1</sup>	9.50 <sup>2</sup>
	ECA	10.41 <sup>1</sup>	10.57 <sup>2</sup>
% Cities With More Than 500,000	Poland	1.22 <sup>1</sup>	1.23 <sup>2</sup>
	ECA	1.56 <sup>1</sup>	1.83 <sup>2</sup>
% Cities losing Population	Poland		52.94 <sup>3</sup>
	ECA		61.07 <sup>3</sup>



## SPATIAL

		BEFORE	RECENTLY
Built Up Area (100,000km <sup>2</sup> )	Poland	7,831 <sup>4</sup>	10,846 <sup>5</sup>
	ECA	213,244 <sup>4</sup>	288,046 <sup>5</sup>
Built Up m <sup>2</sup> Per Capita	Poland	204.69 <sup>4</sup>	281.49 <sup>5</sup>
	ECA	247.39 <sup>4</sup>	320.89 <sup>5</sup>
Built Up Area Growth (%)	Poland		38.50 <sup>6</sup>
	ECA		35.07 <sup>6</sup>
Built Up m <sup>2</sup> Per Capita Growth (%)	Poland		37.52 <sup>6</sup>
	ECA		29.54 <sup>6</sup>
Number of Cities in Analysis	Poland	409 <sup>3</sup>	
	ECA	5,549 <sup>3</sup>	
Number of Identified Cities (NLS)	Poland	350 <sup>7</sup>	
	ECA	3,687 <sup>6</sup>	
Number of Growing Cities (NLS Area)	Poland	185 <sup>7</sup>	
	ECA	1,804 <sup>7</sup>	
Number of Agglomerations (NLS)	Poland	29 <sup>7</sup>	
	ECA	352 <sup>7</sup>	

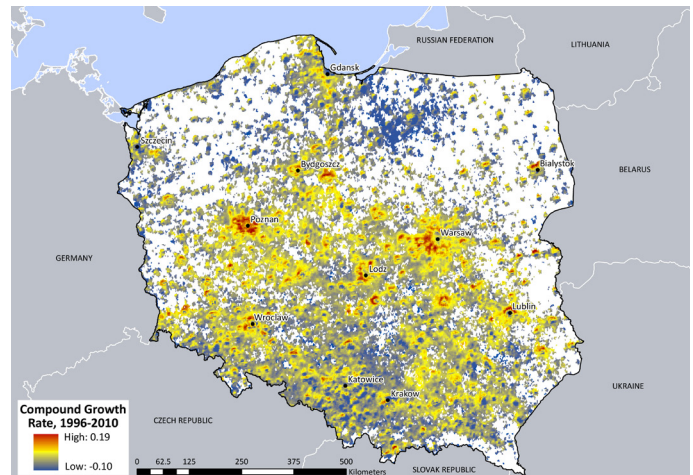


This section uses data from the Global Human Settlement Layer (GHSL) developed by the Joint Research Centre of the European Commission. The GHSL extracts geospatial imagery to map and report on human settlements and urbanization.



## ECONOMICS

		BEFORE	RECENTLY
Average Annual GDP growth (%)	Poland		4.54 <sup>3</sup>
	ECA		1.75 <sup>3</sup>
Average GDP per capital growth (%)	Poland		4.60 <sup>3</sup>
	ECA		1.38 <sup>3</sup>
Estimated contribution of urban GVA to GDP growth (%)	Poland		92.93 <sup>8</sup>
	ECA		—
Unemployment Rate (%)	Poland		9.60 <sup>2</sup>
	ECA		9.03 <sup>2</sup>
Poverty rate (% at national poverty line)	Poland		17.70 <sup>2</sup>
	ECA		—
Urban to rural GDP ratio	Poland		18.27 <sup>9</sup>
	ECA		—
Urban NLS Intensity Growth (% annual average)	Poland		4.31 <sup>7</sup>
	ECA		4.03 <sup>7</sup>
% City Economies Growing (in NLS intensity)	Poland		85.93 <sup>7</sup>
	ECA		86.12 <sup>7</sup>
GVA to NLS Elasticity	Poland		0.61 <sup>10</sup>
	ECA		0.55 <sup>10</sup>



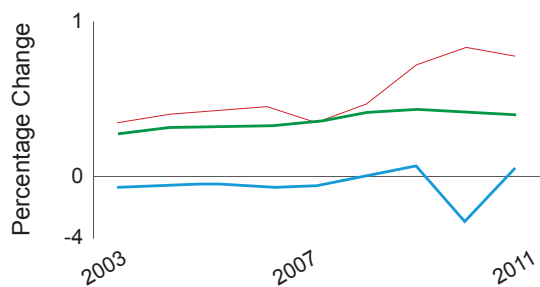
<sup>1</sup> 2003, <sup>2</sup> 2011, <sup>3</sup> 2003–2011, <sup>4</sup> 2000, <sup>5</sup> 2013, <sup>6</sup> 2000–2013, <sup>7</sup> 2002–2010, <sup>8</sup> 2003–2008, <sup>9</sup> 2008, <sup>10</sup> 1996–2010.



## URBANIZATION TRENDS

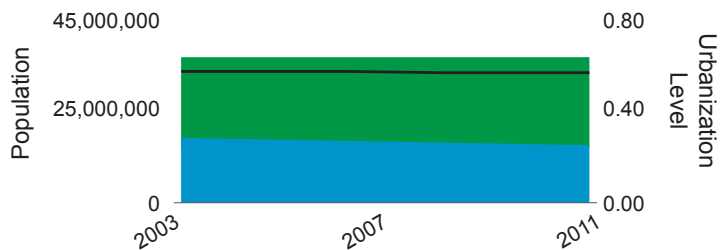
**Poland's population is slowly declining.** Between 2003 and 2011 Poland's population declined by an annual average of 0.05 percent. During the same period, ECA had a compound population growth rate of 0.35 percent. Projected population data predict that Poland's population continued to decline by an annual average of 0.03 percent between 2011 and 2014. Although fertility rates have increased in Poland, they are still below replacement levels and are lower than ECA's average.

**Not only is Poland's population slowly declining, Poland is also slowly de-urbanizing.** Poland's urbanization level in 2003 was 61.68 percent (ECA was at 68.78 percent) and declined by 0.90 percent to 60.78 percent in 2011. In 2011, the urban population in Poland was 1.54 times larger than the rural population. However, between 2003 and 2011 the urban population declined by 1.81 percent while the rural population increased by 1.96 percent in the same period.



Population Growth, 2003–2011

— Poland — ECA (All Income levels)  
— ECA (Developing Only)



— Rural Population — Urban Population — Urbanization Level

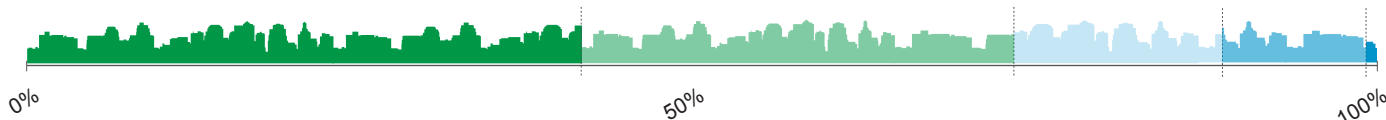


## DEMOGRAPHICS OF THE URBAN SYSTEM

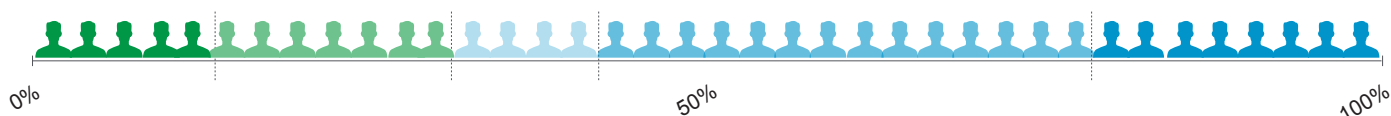
**Cities with less than 50 thousand inhabitants are concentrating most of Poland's population growth.** 52.9 percent of the cities used in this analysis declined in population between 2003 and 2011, a level that is lower than what is observed in other countries in the region. Of the 15 largest cities in Poland, only 3—Warsaw, Krakow and Bialystok—experienced positive population growth between 2003 and 2011. In contrast, 14 of the 15 fastest growing cities in Poland had populations below 50 thousand inhabitants. In fact, cities with less than 50 thousand inhabitants fared the best, averaging a population growth of 1.41 percent between 2003 and 2011. Cities with more than 100 thousand inhabitants fared the worst declining an average of 2.61 percent in population between 2003 and 2011. There are regional disparities in the demographics of the urban system. Cities in Pomorskie, a region in Poland bordering the Baltic Sea, underwent the highest population growth between 2003 and 2011 (*average grow of 3.24 percent*). On the contrary, cities in Opolskie, a region north of Czech Republic underwent the highest population decline in Poland declining on average by 5.13 percent.

**Population growth is uneven within Poland's agglomerations.** The nighttime lights threshold used in this analysis identifies 29 agglomerations in Poland, of which Krakow is the largest with 63 cities. Despite population decline in Poland, the 15 fastest growing cities all belong to an agglomeration and have experienced substantive population growth between 2003 and 2011 (see table below). There are three dynamics that can be observed within Poland's agglomerations. First, some agglomerations, like Warsaw, experienced growth rates that were higher than the population growth rate of the main city (*see population change map on page 1 and tables below*). Second, some agglomerations, like Lodz, declined less in population than the main city. These two dynamics suggest suburbanization is occurring in some of Poland's cities. Finally, there are agglomerations, like Krakow, that are losing population while the main city's population remains stable.

### DISTRIBUTION OF CITIES BY CITY SIZE: 2011



### URBAN POPULATION DISTRIBUTION BY CITY SIZE: 2011



■ Small Town (<10k) ■ Mid-Size Towns (10k–20k) ■ Large Towns (20k–50k) ■ Small Cities (50k–100k) ■ Mid Size Cities (100k–500k) ■ Major Cities (>500k)

### LARGEST CITIES BY POPULATION

CITY	POPULATION 2011	% CHANGE 2003–2011
Warsaw	1,700,612	0.73
Krakow	757,611	0.02
Lodz	728,892	-6.78
Wroclaw	630,131	-1.30
Poznan	554,696	-3.66
Gdansk	460,276	-0.26
Szczecin	410,131	-1.10
Bydgoszcz	363,926	-1.97
Lublin	349,103	-2.51
Katowice	310,764	-4.00
Bialystok	294,001	0.87
Gdynia	249,139	-1.75
Czestochowa	236,796	-5.37
Radom	221,287	-3.25
Sosnowiec	216,420	-6.20

### LARGEST URBAN AGGLOMERATIONS

AGGLOMERATION MAIN CITY	POPULATION 2011	% CHANGE 2003–2011	CITY COUNT
Krakow	4,437,771	-2.57	63
Warsaw	2,391,983	2.70	27
Lodz	1,034,661	-5.22	12
Gdansk	997,031	1.00	11
Poznan	671,733	-1.82	7
Stalowa Wola	216,056	-1.82	5
Walbrzych	237,997	-3.92	5
Rzeszow	260,343	8.38	4
Krosno	113,361	-1.31	3
Dzierzonlow	66,651	-12.56	3
Lublin	412,586	-2.06	3
Wroclaw	677,811	-1.03	3
Nowy Targ	61,669	0.65	2
Kedzierzyn-Kozle	76,427	-4.59	2
Aleksandrow Kujawski	23,535	1.16	2

### FASTEST GROWING CITIES

CITY	POPULATION 2011	% CHANGE 2003–2011	BELONGS TO AN AGGLOMERATION	AGGLOMERATION
Radzymin	10,084	32.16	Yes	Warsaw
Zabki	28,857	28.87	Yes	Warsaw
Marki	27,066	24.42	Yes	Warsaw
Piaseczno	42,378	22.47	Yes	Warsaw
Reda	21,579	22.00	Yes	Gdansk
Pruszcz Gdanski	27,787	20.62	Yes	Gdansk
Lubon	29,832	17.85	Yes	Poznan
Wasilkow	10,073	17.31	Yes	Bialystok
Kobylka	19,940	15.33	Yes	Warsaw
Jozeflow	19,476	12.96	Yes	Warsaw
Rzeszow	179,386	12.36	Yes	Rzeszow
Wejherowo	49,922	11.77	Yes	Gdansk
Grodsizk Mazowiecki	29,363	11.75	Yes	Warsaw
Wieliczka	20,559	11.13	Yes	Krakow
Lomianki	16,375	11.02	Yes	Warsaw

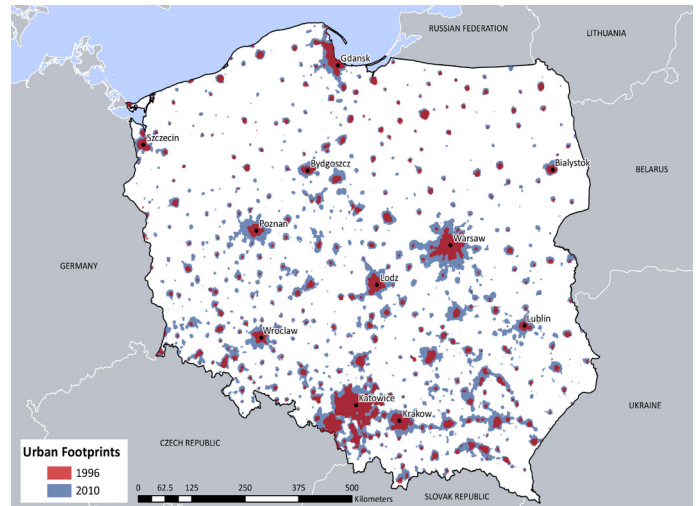
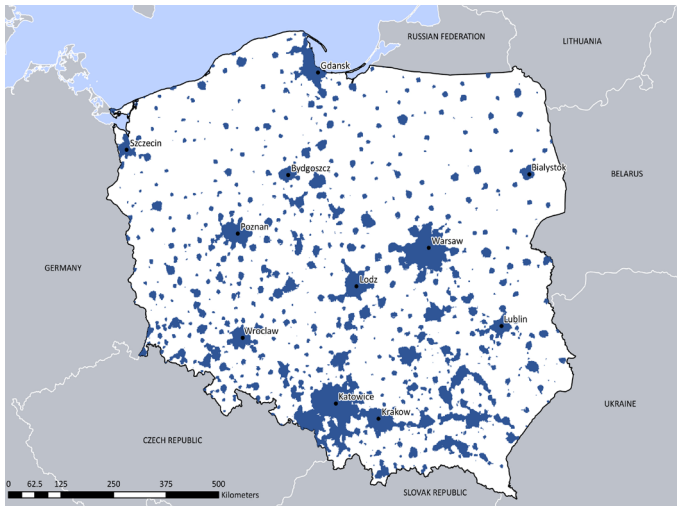




## SPATIAL TRENDS OF THE URBAN SYSTEM

**Poland's cities are growing in area.** Between 2002 and 2010 the average area change for the identified cities in Poland was high at 751.56 percent with a standard deviation of 1,379.82 percent. The high standard deviation suggest an extreme range in the growth or decline of city footprints in Poland. Warsaw grew by 191.27 percent, Krakow by 146.00 percent and Lodz by 301.15 percent in nighttime light footprint. Some of the observed growth in footprint may be linked to a phenomenon called overglow, in which the light emitted by a city is reflected into its surrounding area. However, the magnitude of footprint growth in Poland is suggestive of meaningful growth in the size of Poland's cities. The two maps below reflect this.

**Note:** Night-Lights are used to define urban footprints and follow their change over time. A urban threshold (*above which a certain pixel is considered urban*) is estimated for each country and used to delimit cities' footprints. Agglomerations—as defined by NLS—are composed of cities whose NLS footprint merges. Single cities are cities who do not belong to any agglomeration.



**Urban Footprints**  
 1996  
 2010

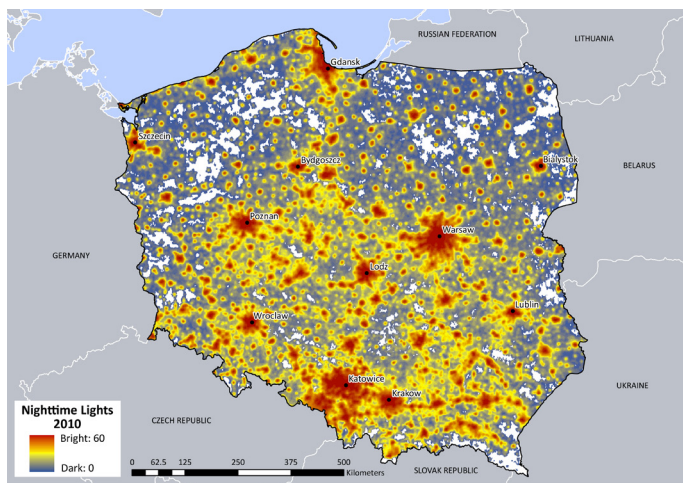


## ECONOMICS OF THE URBAN SYSTEM

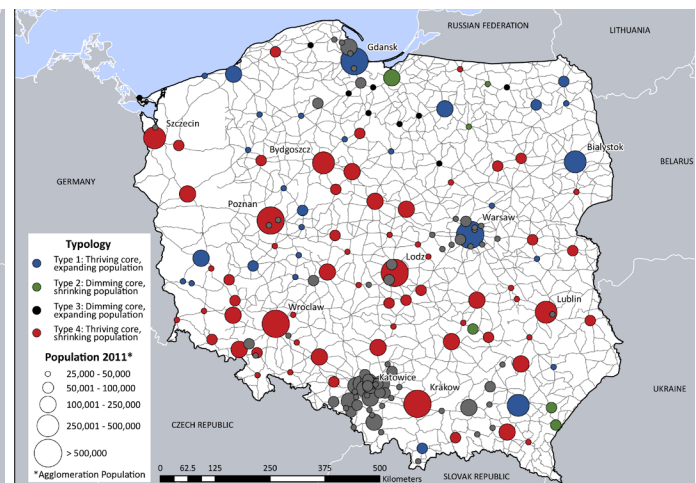
**The urban sector comprises a large share of Poland's economy and is an important driver of economic growth.** Between 2003 and 2008 the urban sector accounted for an estimated 92.93 percent of growth in Poland's gross value added. Furthermore, the urban to rural gross value added in 2008 was 18.27 while the urban to rural population ratio was 1.54, which suggest that urban areas are far more productive than rural areas. In Poland, both the contribution of the urban sector to growth and the difference in the productivity of urban areas to rural areas is greater than what is observed in other countries in the region.

**Most cities are increasing in economic activity but there are some regions lagging behind.** Nighttime lights are used as a proxy for economic activity in this analysis (*please refer to methodology on page 1*). According to the nighttime lights threshold used in this analysis, 85.93 percent of cities in Poland are growing in economic activity between 2002 and 2010. Lodzkie a region in southcentral Poland had the highest nighttime lights growth in Poland—increasing by approximately 144.49 percent. Conversely, the cities in Podkarpackie, a region located in southeast Poland on the border with Ukraine, and the cities in Warmunsko-Mazurskie, a region in northern Poland bordering the Russian Federation, had the lowest increase in nighttime lights between 2002 and 2010.

**Note:** Night-light intensity is being used as a proxy for economic activity at the city-level. For more information on the methodology please refer to page 1 of this snapshot. Gross value added (GVA) data by sector, as reported by the United Nations Statistics Bureau, is used to measure urban and rural production as a part of total production. The sectors were divided into those that are urban and those that are rural using the International Standard Industrial Classification of all economic activities (ISIC), rev. 3.



**Nighttime Lights 2010**  
 Bright: 60  
 Dark: 0



**Typology**  
 Type 1: Thriving core, expanding population  
 Type 2: Dimming core, shrinking population  
 Type 3: Dimming core, expanding population  
 Type 4: Thriving core, shrinking population  
**Population 2011\***  
 25,000 - 50,000  
 50,001 - 100,000  
 100,001 - 250,000  
 250,001 - 500,000  
 > 500,000  
 \*Agglomeration Population



## CITY TYPOLOGIES

Two city typologies were created based on nighttime lights (*see below*). These typologies are intended to shed light on economic and demographic trends in Poland's urban system. **Typology 1** divides cities depending on whether they emit enough light to be considered urban in 2002 and in 2010. In Poland, 85.57 percent of the cities emitted enough light to be considered urban in both periods (*identified*), 13.94 percent were considered urban only in 2002 (*submerging*) and the remaining 0.49 percent were not considered urban in both periods (*not identified*).

**Typology 2** classifies identified cities into four types based on their nighttime light trends (*thriving or dimming*), which are used as a proxy for growing or declining levels of economic activity, and population trends (*growing or declining*) (*please see page 3 for map of typology 2 cities*). In Poland, 34.17 percent of the identified cities have a growing population and growing economic activity (*type 1*). Type 1 cities include Warsaw, Gdansk and Bialystok. 4.02 percent of identified cities have a declining population and declining economic activity (*type 2*). Type 2 cities include Elbag, Przemysl and Starachowice. 8.04 percent of cities have declining economic activity and a growing population (*type 3*). Type 3 cities include Starogard Gdanski, Swinoujscie and Malbork. 53.77 percent of cities have a declining population and growing economic activity (*type 4*). Type 4 cities include Krakow, Lodz and Wroclaw. The typology 2 results underscore two trends in Poland. First, the overwhelming majority of cities, 87.94 percent, are growing in economic activity based on the increasing intensity of nighttime lights emitted from the city's core. Second, a majority of cities, 57.79 percent, are declining in population.

**Note: TYPOLOGY 1:** Divides cities into types depending on whether they satisfy a minimum level of light brightness that is pre-defined for the settlement to be considered urban. IDENTIFIED indicates cities that have night-lights data for both periods used in this analysis (2000 and 2010); EMERGING indicates cities that only have night-lights data for the second period; SUBMERGING indicate cities that only have night-lights data for the first period; NOT IDENTIFIED indicates cities that do not have night-lights data for either period. **TYPOLGY 2.** Divides the IDENTIFIED cities into types according to whether they have positive or negative growth in population and NLS brightness. Growth is calculated between 2000 and 2010.

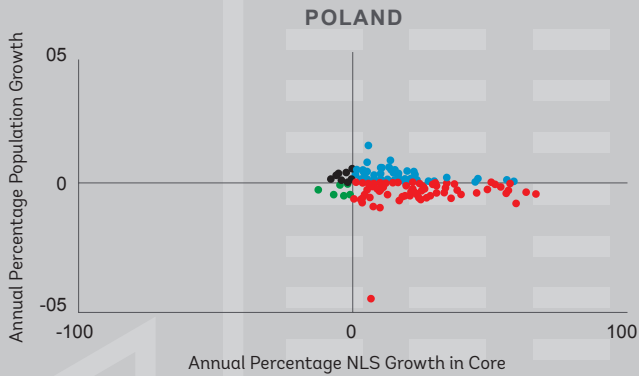
TYPOLOGY 1			
TYPOLGY 1	DESCRIPTION	NUMBER	PERCENTAGE
Identified	City emits enough light in both 2002 & 2010	350	85.57
Emerging	City emits enough light only in 2010	57	13.94
Submerging	City emits enough light only in 2002	0	0.00
Non-Identified	City does not emit enough light in both 2002 & 2010	2	0.49

TYPOLOGY 2			
TYPOLGY 2	DESCRIPTION	NUMBER	PERCENTAGE
Type 1 (Blue)	Growing population & growing economic activity ( <b>thriving core</b> )	68	34.17
Type 2 (Green)	Declining population & declining economic activity ( <b>dimming core</b> )	8	4.02
Type 3 (Black)	Growing population & declining economic activity ( <b>thriving core</b> )	16	8.04
Type 4 (Red)	Declining population & growing economic activity ( <b>dimming core</b> )	107	53.77

	<b>TYPE 1:</b> Growing Population & Growing Economic Activity	<b>TYPE 2:</b> Declining Population & Declining Economic Activity	<b>TYPE 3:</b> Growing Population & Declining Economic Activity	<b>TYPE 4:</b> Declining Population & Growing Economic Activity
Population 2011 (000s)	<b>66.06</b> (212.61)	<b>46.34</b> (35.83)	<b>28.41</b> (11.29)	<b>81.23</b> (136.51)
Average Annual Population Growth (% 1192–2011)	<b>0.26</b> (0.23)	<b>-0.29</b> (0.20)	<b>0.21</b> (0.16)	<b>-0.31</b> (0.49)
Total NLS Value in 2010 (000s)	<b>24.55</b> (102.06)	<b>8.36</b> (6.63)	<b>4.18</b> (2.22)	<b>34.36</b> (113.44)
NLS per Capita (2010)	<b>0.23</b> (0.12)	<b>0.17</b> (0.08)	<b>0.14</b> (0.05)	<b>0.26</b> (0.12)
NLS Growth (% 1996–2010)	<b>110.78</b> (54.40)	<b>33.82</b> (22.24)	<b>36.64</b> (27.82)	<b>121.20</b> (52.27)
Examples of Cities	<b>Warsaw, Gdansk, Bialystok</b>	<b>Przemysl, Jaroslaw, Elbag</b>	<b>Starogard Gdanski, Swinoujscie, Malbork</b>	<b>Krakow, Lodz, Wroclaw, Poznan</b>

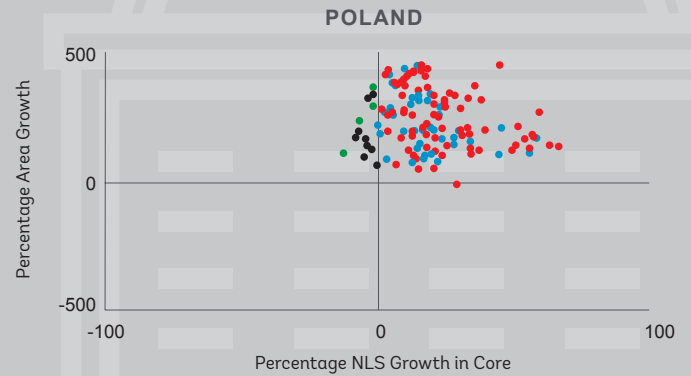
A spatial component added to the **Typology 2** classification provides insight into the interaction between spatial, economic and demographic trends across Poland's urban system. Adding the spatial element reveals that only Gubin, a type 4 city, declined in area in Poland between 2002 and 2010. The remaining identified cities in Poland all increased in area between 2002 and 2010. **Type 1** cities had the highest average area change and **type 4 cities** had the lowest between 2002 and 2010.

### POPULATION AND ECONOMIC DYNAMICS\*



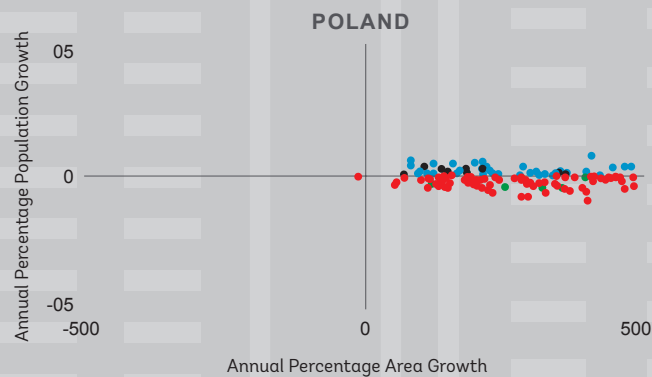
\* Econ growth in NLS growth 2002–2010.  
Population growth in annual avg. 2003–2011.

### SPATIAL AND ECONOMIC DYNAMICS\*



\* Area growth in NLS footprint growth; Econ growth in NLS growth 2002–2010.

### POPULATION AND SPATIAL DYNAMICS\*



\* Area growth is NLS footprint growth;  
Population growth in annual avg. 2003–2011.

■ **Type 1:** Growing population, growing economic activity    ■ **Type 2:** Declining population, declining economic activity

■ **Type 3:** Growing population, declining economic activity    ■ **Type 4:** Declining population, growing economic activity



## CONCLUSIONS

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Poland is undergoing population decline, although at slow rates. Poland's population has decreased by an average of 0.05 percent per year between 2003 and 2011. Projections of Poland's population forecast further decline. Cities with populations between 100 and 500 thousand underwent the highest population decline while cities with population between 20 and 50 thousand inhabitants averaged the highest population growth between 2003 and 2011. In addition to population decline, Poland is slowly deurbanizing. Although the urbanization level only decreased by 0.90 percent between 2003 and 2011, the rural population increased while the urban population decreased by nearly the same magnitude.

Population growth is uneven within agglomerations in Poland. The 15 fastest growing cities in Poland all belong to an agglomeration and 14 out of 15 have less than 30 thousand inhabitants. Three distinct trends can be observed of Poland's agglomeration; two of which suggest suburbanization or sprawling, while the third is suggestive of densification under population loss (*in which population is increasingly concentrating in the city's core and declining in the surrounding areas*).

Despite having many of its cities declining in population, the urban sector in Poland seems to continue being a driver of economic growth. The nighttime lights analysis suggest thriving economic activity in a majority of Poland's cities. As such, in Poland it appears that the population decline of cities is not necessarily linked to economic decline. Furthermore our estimates in terms of overall sectorial contributions of the urban sector to the economy and the urban sector's productivity suggest a better performance than what is observed in other countries in the region.

Spatial analysis results point to a dramatic increase in the urban footprints of Poland's cities. Between 2002 and 2010 99.61 percent of the cities identified grew in footprint. Major cities like Warsaw, Krakow and Lodz experienced dramatic increases in their nighttime light footprints. Although footprint growth may be indicative of sprawl in Poland's cities, built-up areas have only increased by 38.50 percent, which is on par with ECA's average built-up area growth.

The urban development trends observed in Poland, suggest that there is a need to develop a dual approach that can adequately address the divergent trends of growth and decline. This dual approach must address cities that are growing in population while also addressing those cities that are declining in population. The trends observed in this analysis also suggest interesting diverging trends (*suburbanization versus densification*) within Poland's largest agglomerations—any approach must adequately address this shift.

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