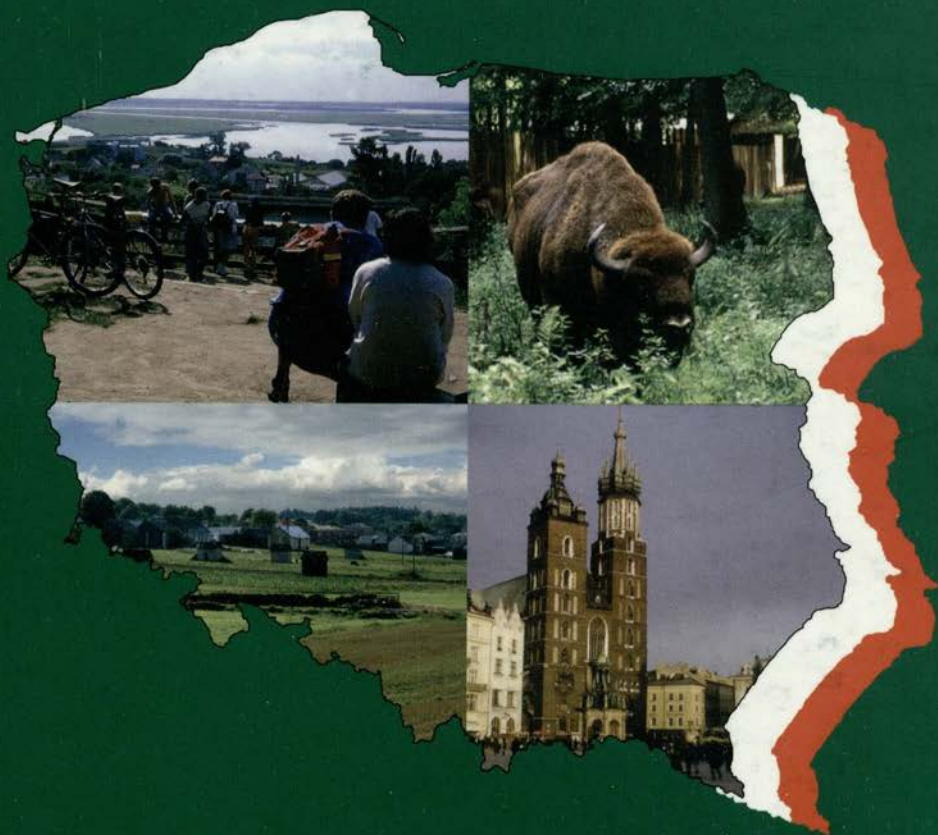


NATURAL AND HUMAN ENVIRONMENT OF POLAND

A geographical overview



POLISH ACADEMY OF SCIENCES
STANISŁAW LEŚCZYCKI INSTITUTE OF GEOGRAPHY
AND SPATIAL ORGANIZATION

POLISH GEOGRAPHICAL SOCIETY

NATURAL AND HUMAN ENVIRONMENT OF POLAND

A geographical overview

Edited by
Marek Degórski



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UNIVERSITY OF SILESIA
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Introduction

The last worldwide meeting of geographers, organized under the auspices of the International Geographical Union, and having the rank of a congress, took place in Poland in 1934, that is – more than 70 years ago. This fact, along with the search for the proper ways of presenting our country to the broader international geographical community, caused that for several years already the idea has been developing among the Polish geographers of the need to organize the congress or a regional conference of the IGU in our country. Such a meeting would constitute the opportunity for presenting the natural and cultural assets of Poland, as well as the results of the broadly conceived geographical investigations, including the diverse effects of the mutual relations man-environment. The initiative in the activity aiming at undertaking of appropriate action by our community with the authorities of the International Geographical Union was started by the Polish Geographical Society. This idea found understanding and support from the National Committee of the Polish Geographers, constituted by the Committee for Geographical Sciences of the Polish Academy of Sciences. A clear support was also extended by the universities as well as by the Institute of Geography and Spatial Organization of the Polish Academy of Sci-

ences. A Working Group was established for organization of a Regional Conference of IGU in Poland. This Working Group was composed of the representatives of the Committee of Geographical Sciences, the National Committee of Polish Geographers, the Institute of Geography and Spatial Organization of the Academy, Polish Geographical Society, Faculty of Geography and Regional Studies of the Warsaw University, Institute of Geography and Spatial Management of the Jagiellonian University in Cracow, and the Faculty of Earth Sciences of the University of Silesia.

One of the tasks that this Working Group formulated for themselves was to prepare, for a widely understood audience from around the world, a set of information on Poland in the perspective of demonstrating the development and the assets of natural environment, as well as the socio-economic sphere. The particular chapters of this information were prepared by the specialists who have been dealing for a long time with the subject matter presented.

We hope that the book we offer you herewith, entitled *“Natural and Human Environment of Poland. A Geographical Overview”* shall entice you to participate in the Regional Conference of the International Geographical Union that the Polish community of geographers wish to organize in the year 2014.

Professor
Andrzej T. Jankowski
President of the Polish Geographical Society

Assoc. Professor
Marek Degórski
Chair of the Working Group
responsible for preparing
IGU Regional Conference in Poland

General overview of Poland's territory

Konrad Ł. Czapiewski

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES

e-mail: konrad@twarda.pan.pl

People and territory

Poland is a country with more than 1000 years of history, a land inseparably associated with the fate of Europe, and the motherland to numerous outstanding "citizens of the world". The surface area of the country is 312,685 sq. kms, which places Poland among the medium-sized countries – the 63rd place in the world and the 9th in Europe. This area is inhabited by the community of more than 38 million.

The capital of Poland is Warsaw (Warszawa) – a dynamically developing urban centre of 1.7 million inhabitants (2.6 million with the suburban zone included). There are in Poland altogether 886 towns, in which 62% of the total population live. The remaining 14.7 million persons live in more than 53,000 villages. Poland ranks 26th in the world and 8th in Europe in terms of the population number. Almost 99% of the citizens of Poland are Poles, who are nowadays among the youngest nations in Europe, with the median age of 35 years. Half of those in the age bracket of 19–24 years are currently studying at the universities.

Numerous known personalities originate from Poland, the great individuals representing religion, politics, science and art. Among the most known ones we should mention such names as Karol Wojtyła (Pope John Paul II), Lech Wałęsa, Maria Skłodowska-Curie, Henryk Sienkiewicz, Adam Mickiewicz, Czesław Miłosz, Nicolaus Copernicus (Mikołaj Kopernik), Frédéric Chopin.

Table 1. Poland is located in Central Europe and borders with seven countries:

Country	Length of border in km
Germany	467
Czech Republic	796
Slovakia	541
Ukraine	535
Belarus	418
Lithuania	104
Russian Federation*	210

* Kaliningrad Oblast exclave

The extreme points of the territory are: 49°00'N in the South (the peak of Opołonek Mt. in Bieszczady Mts.), 54°50'N (the cap of Rozewie on the Baltic Sea) in the North, 14°08'E (a bend of Odra river to the



Photo 1. Baltic Sea coast

West of Cedynia) in the West, and 24°09'E (a bend of Bug river to the East of Strzyżów) in the East. The extent from the North to the South is 649 km, and from the East to the West – 689 km.

Poland is located over the Baltic Sea (Morze Bałtyckie) – the length of the maritime border is 528 km. Poland is considered to be a lowland country – the average altitude is 173 m above the sea level and as much as 75% of the territory is situated below 200 m, while only 9% – higher than 300 m above the sea level. Yet, the south-

ern regions of the country are mountainous, with two important ranges – Sudetes (Sudety) and the Carpathians (Karpaty). The highest elevation is the peak of Rysy (2499 m a.s.l.) in the Tatra Mts. – the mountain chain of Alpine character. The sole depres-



Photo 2. The Valley of the Five Polish Tarns in Tatra Mts.

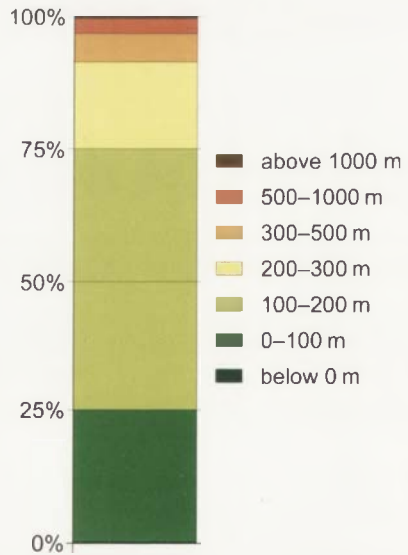


Figure 1. Diagram of surface Poland's relief

sion area is Żuławy, a region located close to the mouth of Vistula (Wisła) river (the lowest point on the territory of Poland: 2.3 m b.s.l.).

The national emblem of Poland is the crowned white eagle, head turned to the right, while the flag consists of two horizontal parallel stripes – white in the upper part and red in the lower part. The official language is Polish, and the national anthem is "Dąbrowski Mazurka", dating from late 18th century.

over to the Jagiellon dynasty, who make out of the country in the second half of the 15th century one of the most powerful states in Europe. In the middle of the 16th century the last of Jagiellons dies without a successor and since that time during 200 years the consecutive kings are chosen through free elections. Despite the fact that at the end of the 18th century the country goes through a significant period of cultural flourishing, bad military and political situation results in the three-stage partition of the country between

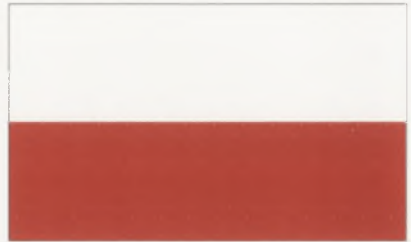


Figure 2. Polish emblem – white eagle; Polish flag

History

The name of Poland ("Polska") is derived from the name of the tribe of Polanie, inhabiting the area of the present-day region of Wielkopolska (Greater Poland). After they had managed in the 10th century to integrate the territory in the basins of Vistula (Wisła) and Oder (Odra) rivers, the name of Poland started to be applied to the entire country. Duke Mieszko I in year 966 adopted Christianity and this date is considered to be the beginning of the proper Polish statehood. In the initial period of Polish history the country was ruled by the Piast dynasty. Since the end of the 14th century the rule passes

Russia, Prussia and Austria. The 19th century is recorded in the history of the nation as the century of slavery, national uprisings, and struggle for the preservation of Polish identity, but also an extraordinary development of Polish arts and sciences. After the First World War Poland returns onto the map of Europe. Yet, on September 1st, 1939, German invasion against Poland marks the beginning of Second World War. This war brings enormous destruction of material wealth (for instance, 85% of buildings are destroyed in Warsaw), death of several Polish inhabitants, as well as essential administrative and political changes, and the associated mass deportations and population resettlements.

The post-war period is connected with the subordination to the Soviet Union and the forced introduction of the centrally managed economy. This brought recurring cases of social unrest, which resulted in 1980 in the establishment of the trade union "Solidarity". Poland constitutes for the other countries of Central-Eastern Europe an example of peaceful change from the communist to the democratic system. At the beginning of 1989 the representatives of the communist authorities and of the opposition sat together at the "Round Table" and decided to carry out free elections. Since 1990 Poles started to learn again the democracy and the free market, which came along with the era of globalization. The delays in development are being still made up, but during fifteen years an enormous change took place in Poland in the economic, social and political domains.

Environment

Despite the overwhelming domination of lowlands the landscape of Poland is differentiated, since it is characterized by the belt-like pattern of geographical regions and a rich relief. The seacoast is mostly flat, formed by accumulation, with steep cliffs appearing in only few places. The belt of the coast-adjacent plains stretches along the Baltic Sea, and to the South of this belt – the lake districts, characterized by the late glacial landscapes. Then, there is the belt of Central Polish Lowland. Along the South of the country there is the belt of mountains and uplands, strongly differentiated in terms of their geology and relief.

Climate in Poland has the intermediary character of the moderate zone, as shaped by the interaction of different air masses,

first of all the polar-oceanic air masses and the polar-continental ones, which brings about frequent weather changes and significant fluctuations in the length of particular seasons of the year.

With respect to land use Poland can be classified as an agricultural-forest country. Agricultural land occupies more than 58% of the total area of Poland, while forests account for 29% of the territory. The areas most valuable from the point of view of nature and culture are subject to legal protection. There are now in Poland 23 national parks accounting altogether for 1% of the total area of the country. The highest value should be attributed to the Forest of Białowieża (Puszcza Białowieska), the last natural fragment of the lowland forest in Europe.



Photo 3. Agricultural land and forest in Polish landscape

Politics and administration

In 1999 a new, three-tier system of territorial division of the country was introduced. According to this new system Poland was divided into 16 voivodships (provinces, in Polish: województwo), 379 counties (in Polish: powiat), 2478 municipalities (communities, communes, in Polish: gmina).



Figure 3. Administrative division (by Andrzej Czerny)

The legal foundations for the political system of the Republic of Poland are laid in the Constitution of 1997. They provide for the three-partite division of power. The law-making power is with the lower chamber of parliament, the executive power – with the Prime Minister, the President and the Government, while the judicial power – with the independent courts and tribunals.

Poland is therefore a republic with the bi-cameral Parliament, whose members are elected through universal voting for four-year terms. The lower chamber of

parliament is composed of 460 MPs, while the Senate – of 100 senators. The President is elected through universal voting for five years since the day of swearing into position.

Poland is a member of numerous international organizations, including United Nations, WTO and OECD. In 1999 Poland entered the structures of NATO, and in 2004 joined the European Union.

The monetary unit used in Poland is Złoty (PLN), divided into 100 Grosz. Similarly as in the majority of the European

Natural and human environment of Poland

Table 2. Administrative division of Poland

No.	Voivodship	Capital	Surface (in sq. km)	Population (in thousand)
1	Dolnośląskie (Lower Silesia)	Wrocław	19 948	2 893
2	Kujawsko-Pomorskie	Bydgoszcz, Toruń	17 970	2 068
3	Lubelskie	Lublin	25 121	2 186
4	Lubuskie	Gorzów Wielkopolski, Zielona Góra	13 989	1 009
5	Łódzkie	Łódź	18 219	2 588
6	Małopolskie	Kraków (Cracow)	15 190	3 260
7	Mazowieckie	Warszawa (Warsaw)	35 559	5 146
8	Opolskie	Opole	9 412	1 052
9	Podkarpackie	Rzeszów	17 844	2 098
10	Podlaskie	Białystok	20 187	1 202
11	Pomorskie (Pomerania)	Gdańsk	18 293	2 194
12	Śląskie (Upper Silesia)	Katowice	12 331	4 701
13	Świętokrzyskie	Kielce	11 708	1 289
14	Warmińsko-Mazurskie	Olsztyn	24 192	1 429
15	Wielkopolskie	Poznań	29 826	3 365
16	Zachodniopomorskie (Western Pomerania)	Szczecin	22 896	1 695
POLAND			312 685	38 174

countries metric system is used in Poland. Distances are measured in metres, liquids in litres, while temperature – in degrees Celsius. Poland is situated in the time zone of Central European Time: GMT + 01:00.

Table 3. Poland ranks high in the majority of country rankings related to the level of socio-economic development

Ranking	Rank of Poland	Number of countries
Human Development Index	36	177
Quality of Life Index	48	111
Index of Economic Freedom	41	155
Gross Domestic Products	24	191

The Independence Day is celebrated in Poland on November 11th in commemoration of the regaining of sovereignty in 1918

after 123 years of partition between Russia, Prussia and Austria. Besides, May 3rd is celebrated as the anniversary of enacting the Constitution of 1791, the second Constitution in the world after the American one, and the very first in Europe.

———— * ————

Summing up, Poland is a country featuring high spatial differentiation in terms of natural, social and economic phenomena. Owing to these differences Poland disposes of a large cultural, tourist, environmental as well as investment potential.

The geological and geomorphological background to present-day environmental changes in Poland

Adam Kotarba

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: kotarba@zg.pan.krakow.pl

Leszek Starkel

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: starkel@zg.pan.krakow.pl

The natural environment of Poland is determined by its the country's location at the geometrical centre of Europe in a transitional area between the Western and Eastern parts of the continent. Poland is a lowland country, with nearly half of the land area below 150 m a.s.l., 9% of it above 300 m a.s.l., and just 3% rising above 500 m a.s.l. The average elevation of the entire territory is 174 m a.s.l. The country is of a circular shape, extending 649 km from north to south, i.e. at a distance of 5°50' between 49°00' and 54°50'N (Fig. 1). Analogous distance in the E–W direction at latitude 52°N is 689 km, i.e. 10°.

Three of Europe's major tectonic units come together in Poland. These are: the

East-European Platform, the West-European Paleozoic Platform, and a fragment of the Alpine orogen in the south. These units differ in lithology, tectonic style, and geological development.

To the north of the Alpides, Poland can be divided into two principal structural units which are separated by the NW–SE orientated Teisseyre-Tornquist Zone, running diagonally across the country (Fig. 2). The eastern unit belongs to the East-European Platform of Precambrian consolidation, the western one is composed of rocks folded during the Caledonian and Variscan orogenies. The East-European Platform is built up of faulted crystalline and metamorphic rocks of Precambrian age

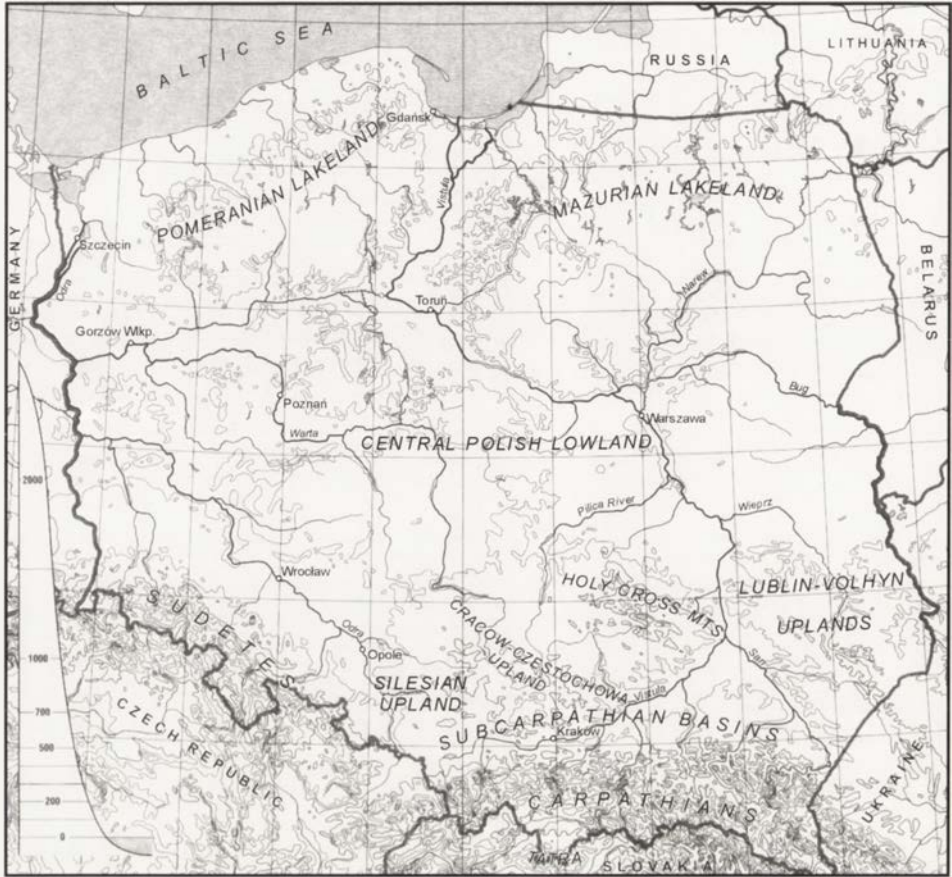


Figure 1. Main geographical units of Poland (acc. to Demart publishing)

which underwent subsequent long-term epeirogenic deformations. The eroded substratum is overlain by younger sedimentary strata of Paleozoic, Mesozoic, and Cenozoic age, the thickness of which ranges from 350 m in the east to more than 3500 m in the west. The youngest strata are Quaternary sediments which constrain the character of the area's contemporary relief.

The western portion of the East-European Platform subsided during the Hercynian orogeny. The main dislocation system,

called the Teisseyre-Tornquist Zone (TTZ), consists of deep-seated faults that strike NW-SE in parallel to the middle course of the Vistula river. This unit is built up of younger rocks, and shows no geomorphic expression.

To the west of the TTZ, the top of the crystalline substratum is situated at greater depths, being overlain by a thick sedimentary cover. In turn, crystalline rocks are exposed at the ground surface in SW Poland, where they became elevated through a system of faults during the Caledonian and Variscan

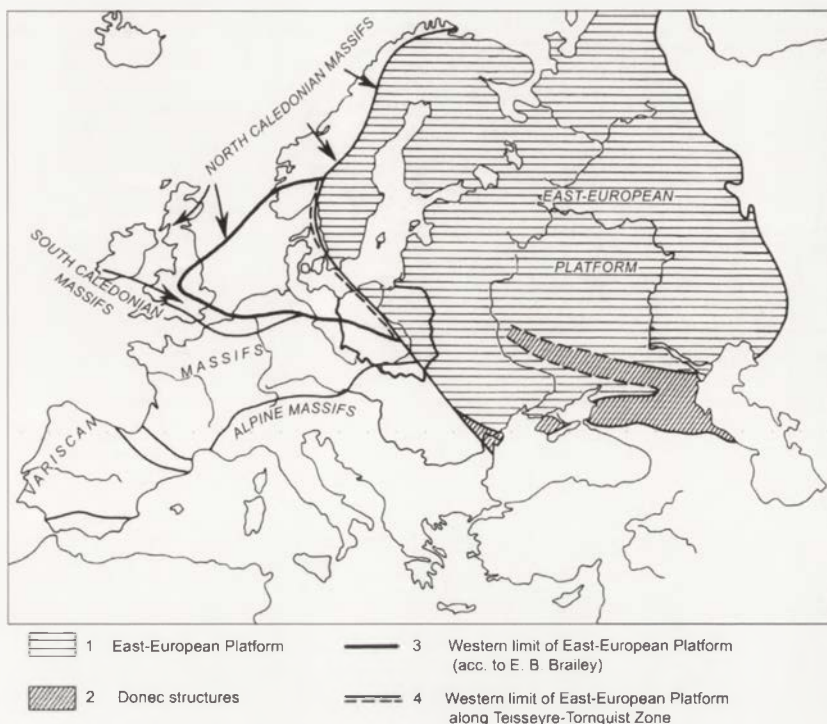


Figure 2. Poland on the background of main tectonic units of Europe (acc. to Stupnicka, 1978)

orogenic movements. The Caledonian-Variscan massifs are composed of very thick geosynclinal Paleozoic rocks which are unconformably overlain by Mesozoic strata. Old structures are exposed in the Sudetes and Fore-Sudetic Block, as well as in the Świętokrzyskie Mts. The Sudetic Block became elevated due to Cenozoic block tectonics. Laramian inversion led to the formation of the Middle-Polish Uplands which belong to the so-called Metacarthian Swell (Nowak, 1927).

Extensive areas comprised between the East-European Platform and the Carpathians and Sudetes represent planated Variscan orogenies, unconformably overlain by Mesozoic strata. Rock complexes were faulted into tectonic blocks that underlie

the upland topography of South Poland. This Paleozoic platform became faulted during the Paleo- and Nealpine movements, leading to tectonic-morphological rejuvenation (Fig. 3).

The southern part of Poland includes the Carpathians and their foredeep, belonging to the Alpine orogen. The Outer Carpathians are a fold-and-thrust belt composed of sandstone-shaly flysch strata. This belt is separated from the Inner Carpathians by the Pieniny Klippen Belt (Birkenmajer, 1986). The Inner Carpathians are composed of relatively small mountain blocks which are built of crystalline and carbonate rocks. The high-mountain Tatra massif is of particular importance. This massif is composed of metamorphic schists cut by

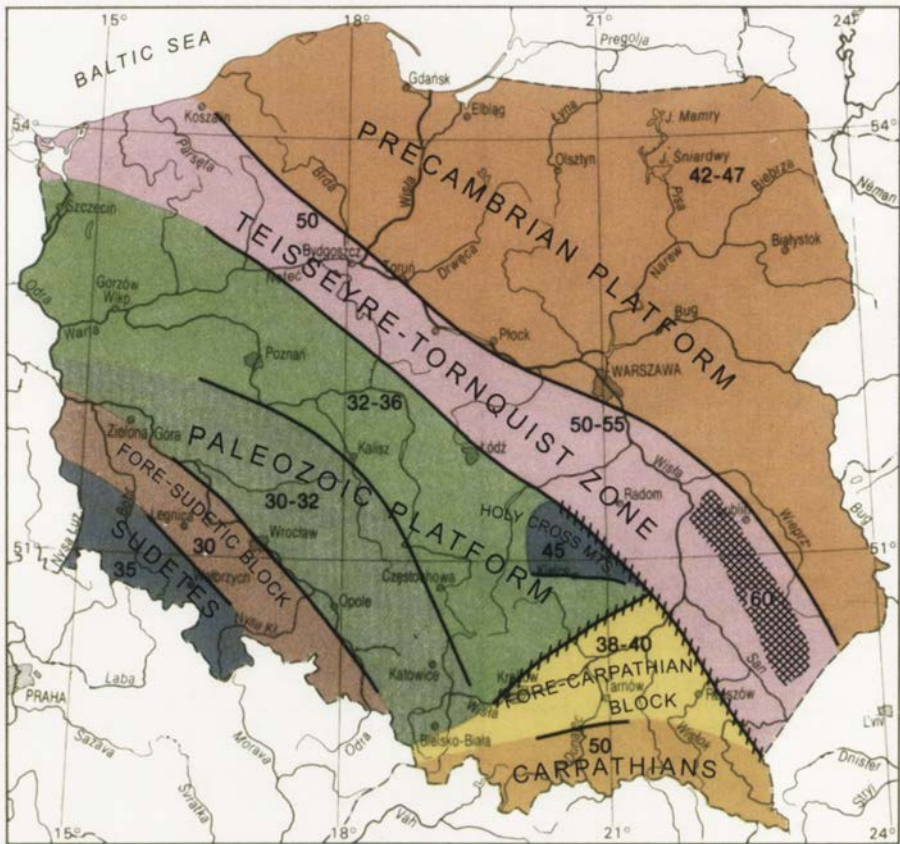


Figure 3. Geotectonic division by deep seismic sounding methods (acc. to A. Guterch, 1997, *Atlas of the Republic of Poland*, table 22.1.7)

a Variscan granitoid intrusion, both of these having been overthrust by folded and sliced Mesozoic strata.

The present-day topography is a result of denudation of tectonically elevated structures. Denudation processes have been active even since the Paleogene (Klimaszewski, 1980; Gilewska, 1988). Alpine orogenic movements, together with

the formation of the Carpathian Foredeep and Metacarpathian Swell, controlled a belt-like, nearly East–West orientation of different geomorphic elements. This pattern became modified and underlined by successive Scandinavian ice-sheet advances and related migration of the periglacial zone in the Middle and Late Pleistocene (Fig. 4).

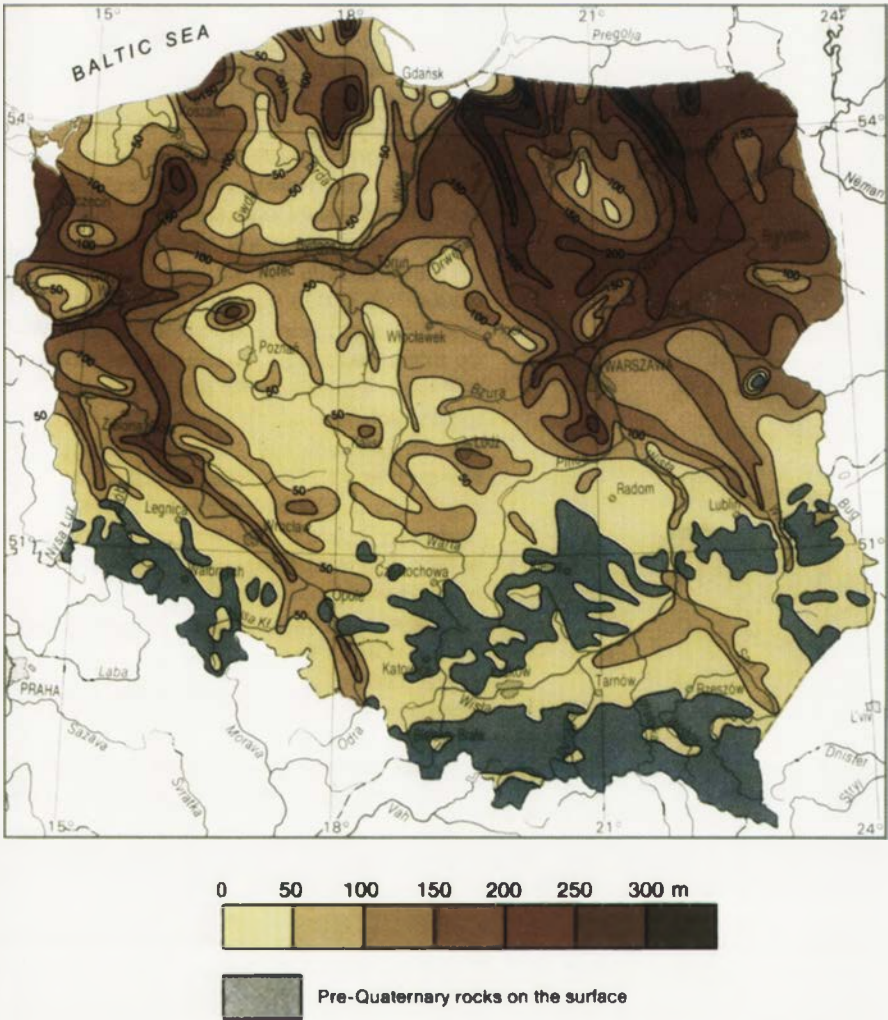


Figure 4. Thickness of Quaternary formations
(acc. to J. Rzechowski, 1997, *Atlas of the Republic of Poland*, table 21.1.2)

Synchronicity between rocks and relief has only been found in areas of accumulative topography, i.e. those which are associated with deglaciation of the last ice sheet and aeolian deposition of dune sands and loesses, as well as plains of fluvial, lacustrine, and mire accumulation.

Uplifted horsts and anticlinoria of the belt of old mountains and uplands bear

traces of Cretaceous-Paleogene planation, as well as of Neogene planation phases, upon which Quaternary phases of erosional dissection, ice-sheet advances, and cryoplanation phenomena became superimposed. Particularly complex, in part epigenetic or exhumed, are the marginal zones of upland areas, at the point of transition into both lowland regions and

the Subcarpathian basins. The Late Neogene and Quaternary uplift of the Carpathian belt led to separation of the more resistant rocks and to the formation of a few piedmont planation surfaces (Starkel, 1987).

The ever-decreasing extents of the last Scandinavian glaciations also controlled the development of a peculiar zonality of Polish landscapes: from fresh, subglacial morphology in the areas covered by the Vistulian ice sheet, through degraded postglacial landscapes originated during the Wartanian, up to periglacially remodelled glacial and glaciﬂuvial covers left by the Odranian and Sanian glaciations (Fig. 5).

Three major physico-geographical units, corresponding to principal geological units of Europe, join in Poland (Kondracki, 1988; Gilewska, 1999). These ones in question have been titled Western Europe outside the Alps, the Carpathians, and the East-European Lowland. Geological evolution has controlled the pattern of morphostructural units (Gilewska, 1999), which in turn constrained differentiation of the entire natural environment, and provided a basis for the physico-geographical subdivision of Poland (Kondracki, 1988).

The concept of belt-like arrangement of orographic characteristics of Poland was introduced by Lencewicz as early as in 1937. After Second World War, another criterion of physico-geographical subdivision was taken into account, namely the degree of postglacial relief transformation of the Polish Lowland. This approach was used when preparing the *General geomorphological map of Poland* (Starkel, 1980).

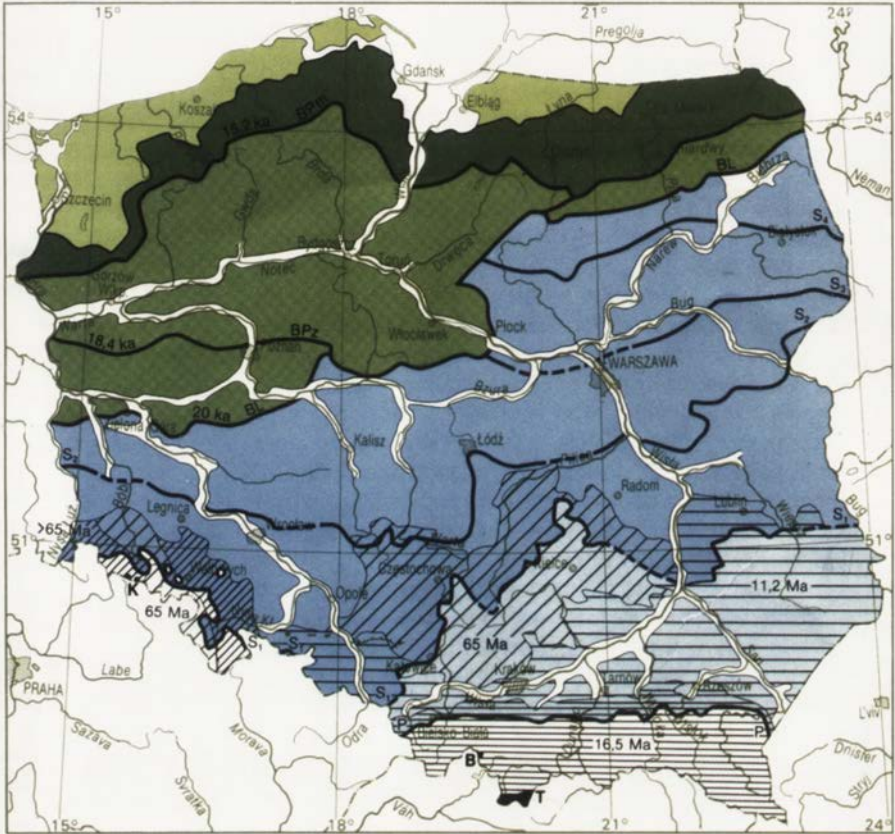
Detailed geomorphological mapping pointed to a different state of preservation of postglacial landforms in areas covered by older glaciations, compared to those of the last glaciation, and provided a basis for distinguishing the young-glacial and old-glacial Polish Lowland (Galon, 1967). Based on this map, Poland became subdivided into five principal morphogenetic zones (Gilewska, 1999):

- a) mountain and sub-mountain basins,
- b) old orogens and uplands,
- c) the old-glacial area,
- d) the young-glacial area,
- e) azonal Quaternary valley bottoms of the Vistula and Odra rivers.



The Polish Carpathians – a young fold-and-thrust belt

The Carpathians are a mountain chain which is a continuation of the Alpine belt, and originated through the same mountain-building processes. The Polish segment of the Carpathians is 300 km long. The southernmost portion of the Polish Carpathians (Central Western Carpathians) includes the high-mountain Tatra massif (peaking at Rysy, 2499 m a.s.l.), which shows typical alpine relief. The valleys of the Tatra Mts. were glaciated at least three times, and display all types of high-Alpine landforms, including glacial cirques and troughs, and assemblages of morainic and glaciﬂuvial landforms. The Central Western Carpathians are separated from the moderately high, flysch-built Beskidy Mts. by the Pieniny Klippen Belt,


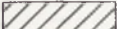
Figure 5. Major morphogenetic zones and absolute age of the relief evolution (acc. to S. Gilewska, 1999, *Atlas of the Republic of Poland*, table 23.2.2)





A. Young mountains and submontane basins fashioned since the:

-  Middle Miocene
-  Upper Miocene

B. Mountains of old folding and uplands fashioned since the:

-  Mesozoic era
-  Early Tertiary and Upper Miocene

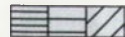


Within A and B

-  formerly glaciated mountains (T — Tatra Mts. B — Babia Gora? K — Karkonosze Mts.)
-  unglaciated/periglacial areas

C. Older moraine landscapes

(P — Southern Polish glaciation — Elster. S — Middle Polish glaciation — Saale. S₁ — maximum stage. S₂ — Warthe stage. S₃ — northern Masovian stage. S₄ — Mława stage)

Areas showing transitional features within the extent of the

-  Southern Polish glaciation
-  Middle Polish glaciation
-  Plains and lakeless morainic plateaus

D. Young moraine landscapes

(B — Northern Polish glaciation — Vistulian. BL — Leszno phase. BPz — Poznan phase. BPr — Pomeranian phase)

-  lake plateaus
-  Baltic Ridge
-  coastal lowlands
-  Azonal Quaternary valley floors

 Inland-ice extent during the different periods

 Assumed inland-ice extent

15,2

Absolute age. Ma — million years, ka — thousand years

composed mostly of carbonate rocks. This belt is one of the major structures of the Carpathian belt.



Photo 1. High-Alpine landforms of the Tatra Mts.
The Valley of the Five Polish Lakes (Tarns)

The flysch Carpathians are dominated by denudational morphology, and their landforms originated through fluvial and slope processes, particularly those related to mass movements. Glacial landforms are confined to isolated, maximally elevated mountain tops. During its maximum extent, the Scandinavian ice sheet reached as far as the northern slope of the Carpathians, hardly modifying their landscape. The slopes and interfluves show traces of periglacial morphogenesis. The belt-like arrangement of geological structures and relief is well-marked. Dominating is the flysch belt, characterized by a sequence of thrusts of generally northern vergence. In the western part, flat overthrusts of flysch rocks prevail, while in the eastern part it is steeply-dipping folds and slices that take over. The area is of the medium-height or low mountain type, and the highest summit at the Polish-Slovak boundary is Babia Góra Mt. (1725 m a.s.l.). The medium-height mountain ranges built up of thickly-bedded flysch sandstone strata display height differences ranging from 500 m to 1000 m (the Beskid Śląski, Beskid

Żywiecki, and Beskid Sądecki Mts.). Lower mountain ranges not exceeding 1000 m a.s.l. are the Beskid Mały, Beskid Średni, Beskid Wyspowy, and Beskid Niski Mts. In the west, these are mostly confined flysch massifs bounded by denudational scarps, and isolated inverse mountains. In contrast, to the east it is Appalachian-type, rectangular mountain ranges that prevail, these being controlled by resistance of the underlying bedrock. The latter are composed of parallel ranges separated by depressions. Intra-montane basins are tectonically-controlled depressions remodelled by fluvial erosion. The northern slope of the Carpathian belt is dissected by a series of parallel river valleys. Two of the rivers in question, the Dunajec and Poprad, have their headwaters in the Central Carpathians. Most of the Outer Western Carpathians are characterized by undulating hilly landscapes, of height differences between 100 m and 250 m, rising up to 500 m a.s.l., and bearing traces of three planated levels that developed upon poorly-resistant shale-sandstone complexes.

The belt of depressions associated with the Carpathian Foredeep basin

The Sub-Carpathian (Oświęcim and Sandomierz) Basins are situated to the north of the Carpathians and originated due to erosion of Carpathian rivers dissecting poorly-resistant Miocene strata which fill the Carpathian Foredeep. The Polish segment of the foredeep is drained by the upper Vistula river, which collects waters supplied by the Carpathian and

upland rivers. It was during the most extensive South-Polish (Sanian) glaciation that glacial and glacialfluvial sediments were deposited. Throughout the Quaternary, the Sub-Carpathian basins have become a natural collector of sediments shed from the eroded Carpathians.

Belt of old mountains and uplands

The Sudetes

The Sudetes (Sudety or Sudetic Mountains) are a large mountain massif included among the block mountains situated on the north-eastern margin of the Bohemian Massif. They are a mountain range 380 km long and 40–60 km wide that were formed during the Caledonian orogeny and uplifted by the Alpine movements. Like the Carpathians, these are medium-height mountains, situated mostly in the forest zone and only locally extending above the upper timber-line. The oldest parts of the Sudetes are composed of metamorphic rocks, like greenschists, keratophyres, marbles, and schists. Gneisses, granites and granitogneisses occur locally. The Karkonosze, Strzegom and Strzelin granitoid massifs were formed during the Variscan orogeny. Alpine folding resulted in faulting and the uplift of the Sudetes. It was at that time that the highest-elevated massif of the Karkonosze (peaking at 1602 m Śnieżka) originated, along with the Sudetic Marginal Fault, more than 200 km long, which bounds the Sudetic block on the NE side, and separates it from the Fore-Sudetic Block.

The relief of the Sudetes is typified by planated ridges, ranges, and mountain

massifs that are separated by large intramontane depressions. This relief bears traces of rejuvenated old topography, characterized by narrow, deeply-cut valleys close to the mountain margin, and an old topography of gentle slopes and broad valleys within the mountains. Traces of one or two Pleistocene glaciations of the cirque-valley type take the form of glacial and glacialfluvial landforms and sediments preserved in the Hrubý Jeseník and Karkonosze mountains (Jahn, 1980).



Photo 2. Dissected mountain front of the Sudetes in the vicinity of Bielawa town, with flattened watershed surfaces in the background

Polish uplands

Topographic differentiation of the upland belt is related to the strike of Central Poland's principal morphostructures. The latter are marked in the topography as low rectangular mountain ridges (the Świętokrzyskie Mts. peaking at Łysica, 611 m a.s.l.) composed of resistant Cambrian and Devonian strata. The main range of the Świętokrzyskie Mts. – the Łysogóry range – is situated at ca. 600 m a.s.l. The uplands, in turn, are typified by undulating topography with numerous

hills, ranges, and escarpments (cuestas) that are underlain by monoclinaly-dipping Paleozoic and Mesozoic rocks of variable resistance to erosion. From the west to the east, the following units are distinguished: the Silesian Upland, up to 400 m a.s.l. high (St. Anna's Mt. – built of basalts – reaches 410 m a.s.l.); the Cracow–Częstochowa Upland, culminating in isolated monadnocks at 504 m a.s.l. (Ogrodzieniec) and 502 m a.s.l. (close to Cracow); and the Kielce Upland in the east. The Lublin–Volhynia Uplands occur between the Vistula River Valley and the eastern frontier of Poland, (at 350–390 m a.s.l.). A peculiar property of these areas is a characteristic rhythm of landscape changes, which is expressed as alternating escarpments built up of more resistant rocks, and depressions cut into less resistant strata.

The uplands were covered by two Pleistocene glaciations which left glacial sediments. The latter include thick sandy and till-sandy covers, mainly preserved within depressions shaped by erosion

and denudation in older structural relief. During the most extensive glaciation, the ice sheet covered the entire upland belt, and old Tertiary topography became buried under sediments, except where minor fragments were free of ice. After deglaciation, exhumation of the pre-existing, pre-Pleistocene landscape took over, and periglacial processes were in progress (Dylik, 1969). The slopes of the main range of the Świętokrzyskie Mts., composed of hard Cambrian quartzites, became covered with typical periglacial block fields, called “gołoborza” in Polish (Łoziński, 1909). Uplands composed of Mesozoic carbonate rocks were being intensely re-modelled by karst processes, resulting in the formation of caves, karst canyons, and other small-scale landforms. The upland areas are mantled by thick loess covers (Maruszczak, 1980), the “gully erosion” of which led to the shaping of numerous assemblages of denudational and erosion-denudational landforms (Maruszczak, 1973).



Photo 3. Ślęza Massif, front range of Sudety Mts.

The Polish Lowland

The landscape of Poland is dominated by lowland areas. The Polish Lowland makes up more than 70% of the country and extends from the foot of old mountains and uplands up to the Baltic coast. This area was remodelled by several advances of the Scandinavian ice sheets. Hypsometric differentiation of the Polish Lowland makes it possible to distinguish three W–E-trending landscape belts: the great valley plains, hilly Baltic lakelands, and the coastline zone. This pattern has been superimposed by the great valleys of the longest rivers of Poland, i.e. the Vistula and Odra rivers and their tributaries. Superposition of these two orographic systems resulted in the formation of the Middle-Polish basins with well-developed terrace systems and plateau-like interfluves, flat outwash plains, and water-gap valleys. High elevation contrasts become visible when the complexes of distinct morainic ridges are in contact with large and deep valleys formed by waters shed from the melting Scandinavian ice sheet. These marginal stream valley trains are called “pradolinas” (*Urstromtal*).



Photo 4. Baltic coast. High cliff in moraine plateau

The Polish Lowland has been subdivided into two regions which show different origin and landscape. The maximum extent of the last (Vistulian) glaciation divides the area into the old-glacial and young-glacial regions. The oldest part of the Polish Lowland comprises postglacial landforms highly transformed by denudation and periglacial processes. Marginal parts of old mountains and uplands bear flat highs of relatively great height differences, controlled by bedrock topography, upon which glacial and glaci-fluvial sediments were deposited.

In the central part of Poland, the old-glacial landscape zone has systems of cross-cutting principal valleys that drain the southern part of the country, trending S–N, as well as those orientated W–E. This fragment of the Central-Polish Lowland, comprising 48% of the country and called the Land of the Great Valleys, is characterized by the presence of broad valleys, much greater in scale than the present-day rivers which dissect the area from east to west. These are the marginal streamways (aforementioned “pradolinas”), which originated during the ice-sheet standstill, when melting waters shed from the ice sheet merged with those derived from the south and flowed farther westward.

Young-glacial relief makes up nearly 30% of the territory of Poland and is characterized by the ubiquitous occurrence of morainic plateaus of either hilly or undulating surfaces, and marginal ice sheet landform associations. The morainic plateaus are dotted by numerous concave landforms, like: subglacial furrows, sandurs, melt-out water trains, valleys, and closed melt-out depressions. The presence of lakes was one of the criteria

used in delimiting the extent of the Vistulian glaciation. Within the W–E-trending, it has been possible to distinguish a 40 to 90 km-wide belt extending throughout North Poland and comprising a western (Pomeranian Lakeland) and eastern (Mazurian Lakeland) part. Plateaus of terminal moraines of the Pomeranian phase of the last glacial stage are up to 300 m a.s.l. high (Wieżyca at 329 m a.s.l., the Wzgórze Szeskie Hills at 309 m a.s.l.). Morainic hills bear numerous closed depressions. Terminal moraines and outwash plains in their foreland form a genetic entity in the landscape. The largest lakeland hills are separated by depressions. The most spectacular and tourist-attractive is the so-called Great Mazurian Lakeland which is a depression composed of a system of morainic ridges and large lakes linked by canals in such a way that they form a levelled area of ca. 310 sq. km.

The northernmost morphogenetic zone is represented by the Baltic coast. This area extends between the Baltic coastline and the lakeland swell, and its width varies from west to east. The zone is very narrow in those places where lakeland morainic ridges are situated close to the sea, whereas broad lowlands dominate close to the mouths of large rivers, i.e. the Odra and the Vistula. The delta of the latter, called the Żuławy region, includes the lowest-situated area of Poland, at 2.3 m b.s.l. The Baltic coast, nearly 500 km long, is differentiated, since its hinterland comprises morainic-dune-lacustrine landscapes. The shore is either flat and composed of marine sands, locally transformed into dune complexes, or represents high cliffs developed on morainic plateaus. Marine bays have become part-

ly cut off by spits, and covered by dunes. The largest dunes attain a height of 56 m along the Łeba Spit.

Quaternary valley bottoms of the Vistula and Odra rivers

The principal criterion used to separate these two valleys is the size of their drainage basins and their youth, i.e. Pleistocene age. The present-day relief of both basins is of different age. Individual segments of the valleys of large river (like the Vistula, Odra or Bug) have different histories of development. The rivers changed their courses, and nearly every large valley has frequently been deepened and aggraded, and even re-eroded, throughout the Quaternary (Starkel, 2001). The longest rivers, the Vistula (1047 km) and Odra (Oder 854 km), originate in mountain ranges in the south of Poland. The second headwater area comprises the uplands, wherefrom medium-sized tributaries of the longest rivers flow, like: the Warta, Pilica, Wieprz and Bug. Finally, the third source area is confined to young-glacial lakelands that gave rise to rivers either belonging to the Vistula and Odra drainage basins, or flowing directly to the Baltic Sea. The Vistula and Odra drainage basins are almost completely (90%) confined to Polish territory.

The Vistula River drainage basin is situated at the boundary of the above mentioned major European tectonic units. The river and its tributaries originate in the flysch Carpathians, then merge together in the Sub-Carpathian basins, only to truncate the belt of uplands via a water gap.

In the Polish Lowland, the middle and lower Vistula River valley runs nearly parallel to the margin of the East-European Platform, i.e. along the Teisseyre-Tornquist Zone (Mojski and Starkel, 1990), dissecting the area covered by a few Pleistocene glaciations and forming alternating widenings and narrowings of the water-gap type.

The headwaters of the Odra are situated in the Sudetes, in the Czech Republic. A short mountainous reach, roughly 50 km long, passes into a low-gradient lowland segment. The latter is composed of a number of W–E – trending, broad-valley reaches that utilize marginal streamways in front of older Scandinavian ice sheets, and N–S-orientated, narrow water gaps. Unlike the Vistula, the Odra is regulated along its entire length.

The mouths of the Vistula and Odra river valleys were modelled during successive advances or retreats of Scandinavian ice sheets. Large ice-sheet lobes entered first into the broad depressions of the pre-Vistula and pre-Odra river valleys, from which they spread laterally, depending on bedrock topography: slower upon convex-upward pre-Quaternary landforms, particularly in upland areas, and faster within pre-glacial valleys and tectonic troughs. During the retreat of the Vistulian ice sheet, terminal depressions were formed in mouth areas of the Vistula and Odra rivers, being preserved by dead ice blocks until the Late Vistulian. Then, the ground surface in front of the ice sheet at the mouths of the Odra and Vistula was situated at 50–80 m and up to 40 m lower than the present-day level, respectively. A vast zone, presently under water, was a land area dissected by rivers. Subse-

quent transgression followed, leading during the Littorina time (ca. 6 ka BP) to the formation of the deltaic plains that accompany the Vistula and Odra river mouths.

Landscapes inherited from the last glaciation

The last glacial stage (the Vistulian) was the last period devoid of forests and typified by intense denudation and aggradation. This stage left its profound imprint on the relief of the entire country and constrained future means of transformation during the Holocene (Dylik, 1953).

The postglacial relief of the Vistulian glaciation includes: glacial and glacial-fluvial accumulative landforms, landforms resulting from sub-glacial erosion and melt-out processes, as well as outwash and marginal streamway (“pradolina”) trains. Periglacial remodelling has resulted in cryogenic structures, solifluction and aeolian covers, small corrasional valleys, and other landforms (Kozarski, 1995; Starkel, 2005).

The postglacial relief left by the Wartanian glaciation became remodelled periglacially to very different degrees. At present, kame plateaus and marginal zones are visible in the topography, while numerous landforms, depending on lithology, were turned into denudational monadnocks and cryopediments. The extensive scale of transformation is also attested to by corrasional valleys and deflation lags (Rotnicki, 1966; Klatkova, 1994).

In the zone covered by the older (Odranian and Sanian) glaciations, the dissection of glacial covers by fluvial valleys

during repeated periglacial conditions was followed by the formation of denudation plains and extensive depressions filled with alluvia, slopewash and colluvial deposits (Fig. 6). The upland margins witnessed exhumation of sub-Quaternary highs from beneath glacial sediments (Gilewska, 1999). The drainage network formed after deglaciation maintained epigenetic valley segments, and covered karst could have developed locally.

The topography of uplands, foothills, and low mountains was modelled by processes dependent on the bedrock lithology. Blockfields were recognized one century ago as indicators of a cold climate, and the term “periglacial” was introduced for the first time by Łoziński (1909). Some highs became covered with block fields, and isolated tors were separated as well. The slopes were mantled by sometimes more than 10 m thick slopewash and solifluction covers (Starkel, 1986).

Aeolian processes led to deposition of loess covers of variable thickness, upon interfluvies, slopes and terrace plains, obliterating the pre-existing topography. As a result, denudational areas devoid of periglacial covers occur side by side in the upland and foothills zone (Maruszczak, 1972).

River valleys hold extensive plains of accumulation terraces, the older of which are frequently covered by loess, while the younger are overlain by Late Vistulian dunes.

Medium-height (ca 800–1800 m a.s.l.) mountains that remained in the cryonival zone for a long time bear numerous traces of periglacial transformation, such as: tors, block fields, cryoplanation terraces, and -upon less-resistant rocks – cryopediments and plains of solifluc-

tion-slopewash accumulation. In the high-mountain part of the Tatras, glacial cirques and troughs were formed (Klimaszewski, 1987).

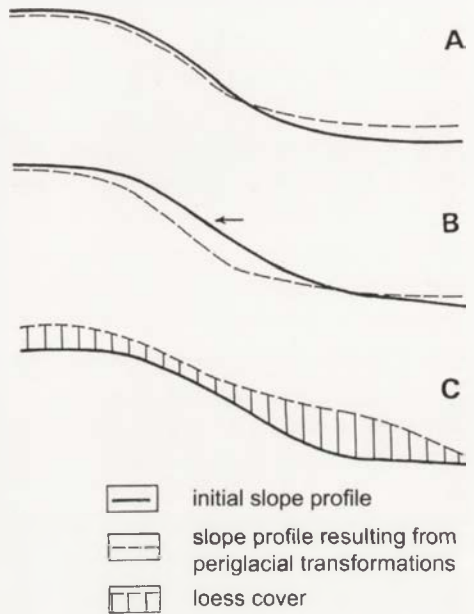


Figure 6. Directions of slope transformation in the periglacial zone of the last cold stage
 A – down-wearing of upper slope section, deposition in lower section
 B – slope lowering and retreat at the base, with formation of a cryopediment transforming into an aggradational plain
 C – older slope covered by loess deposits (thicker at its base)
 (acc. to Starkel, 2005)

Holocene relief transformation

Progressive climatic amelioration in the Late Vistulian led to changes in water circulation and relief-forming processes. Degradation of permafrost, deep infiltration, and succession of forests all slowed down slopewash and deflation processes

in favour of ubiquitous leaching and locally-appearing processes of linear erosion, suffosion, karstification, and mass movements. The braided river pattern became replaced by a meandering one.

In the mountains, morphogenetic zones were shifted upwards, and the glacial zone of the Tatra Mountains became situated in the cryonival and forest zone. The cryonival zone of the Beskidy, the Sudetes and the Świętokrzyskie Mts. became occupied by forest. In Holocene time, the topography shaped during the last glacial stage became preserved (Starkel, 1986; 2005). The trend for slope transformation, and the amplitude to changes, were constrained by both lithology of superficial sediments and slope relief. In relation to the processes that were dominant, it is possible to distinguish slope-modelling proceeding through leaching (the most common situation), or else linear erosion, suffosion or gravitational processes (Starkel, 1977). Areas of minor height differences were characterized, not only by leaching, but also by biogenic accumulation within depressions. Seasonal and long-term changes to hydrological fluvial regimes led to permanent remodelling of river beds and floodplains. An important role in relief transformation was played by more humid periods 200–500 years long in which there was a high frequency of extreme events.

The young-glacial morphology of the Polish Lowland was also modelled by leaching. It was in depressions bearing the still-developing river network only that local erosion or fluvial accumulation did occur. Melt-out depressions and abandoned “pseudolinas” were in turn dominated by either biogenic or lacustrine deposition (Fig. 7).

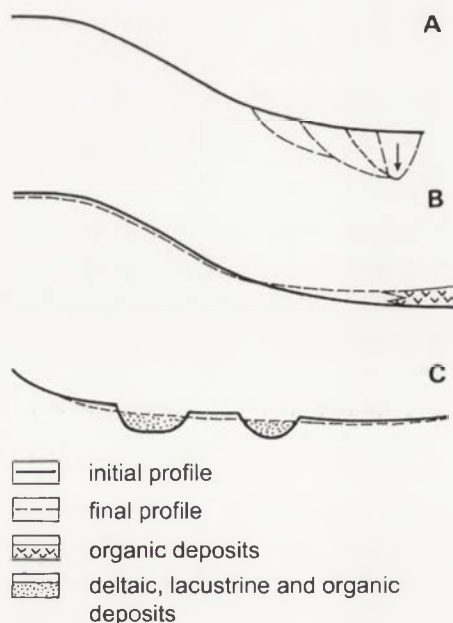


Figure 7. Directions of slope and valley-floor transformation during the Holocene
 A – slope rejuvenated due to lowering of base (deepening of valley)
 B – stable older slope reactivated by soil cultivation (with aggradation on the valley floor)
 C – creation of new longitudinal profile of valley in the young morainic landscape (with filling of dead ice depressions) (acc. to Starkel, 2005)

The period of human impact upon the natural environment

Deforestation began in the Neolithic. This process and subsequent land cultivation led to changes in water and solid-matter circulation within drainage basins. Overland flow, slopewash, and linear erosion became intensified (Rotnicki and Starkel, 1991). The road network upon slopes fostered the development

of gullies in loess-covered areas, shallow mass movements became intensified, and soils devoid of permanent vegetation cover were exposed to aeolian activity. Remobilization of old and formation of new sandy dunes took place at that time. Deforestation of lowland areas led to a raising of the ground water level and hence to mire formation within depressions. Traces of anthropogenic soil erosion were found upon loess-covered areas as early as in the Neolithic. In larger river valleys, human-induced aggradation was registered either in Roman times (1st-3rd centuries AD) or in the 10–11th centuries (Starkel, 2004). The scale of soil degradation frequently exceeds 1 m (Kowalkowski, 1988), whereas the thickness of alluvium and proluvium in loess gullies is usually of between 5 and 10 m.

Temporally- and spatially- differentiated processes of deforestation and land cultivation amplified the importance of superficial secular processes, which were also accompanied by an increase in the frequency of extreme hydro-meteorological phenomena. During extreme events, such as floods or landslides, mutual connection between the entire slope and fluvial systems become re-established, usually producing economically- catastrophic results. Recent changes are tending to slow down denudation upon the slopes, thanks to a transformation of arable land into grasslands and forests on the one hand, and to the deepening of river beds and increased water-level changes due to river regulation, agricultural melioration and a denser road network, on the other.

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Climate and bioclimate of Poland

Krzysztof Błażejczyk

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: k.blaz@twarda.pan.pl

The climate and bioclimate of Poland are influenced by various factors: solar radiation, air circulation, geographical location and local features. The meridional distance of 649 km determines the solar angle and potential duration of sunshine hours at the southern and northern borders of Poland during the winter and summer solstices. In the north, compared with the south, the day is about 1 hour longer on 21st June, and about 1 hour shorter on December 23rd.

Poland is located in temperate warm transitional climate zone. Its territory is crossed by air masses from both the Atlantic Ocean and the heart of the Eurasian landmass. The continental impact increases gradually with a move from west to east.

The climate of Poland also depends on specific, local factors, e.g.: relief, land cover, vegetation, the substratum and the presence of water bodies. The most important feature is relief, which gives rise to differences in the regimes regarding air temperature, global solar radiation and precipitation, between the mountainous (southern) and lowland (central and northern) parts of Poland.

Radiation factors

The highest annual totals for global solar radiation ($K_{glob} > 3800 \text{ MJ m}^{-2}$) are observed in the centre, as well as in the north and north-east. In the west and south-east regions, annual totals of K_{glob} are of less than 3600 MJ m^{-2} (*Atlas klimatu Polski*, 2005). Reduced K_{glob} totals are also noted in the Warsaw agglomeration. On the other hand, increased totals of K_{glob} are registered at the tops of mountains (Bogdańska and Podogrocki, 2000; Fig. 1).

Consideration of the annual course of K_{glob} reveals highest values from May through to July, and lowest ones in December. There is also marked regional differentiation. In the summer, increased totals of K_{glob} are to be noted along the Baltic seashore (in the north of Poland), while K_{glob} totals in the south are significantly lower. The reverse spatial trend is to be observed from October through to March (Fig. 2).

Actual sunshine duration (ASD) is another characteristic that illustrates differentiation in solar factors of climate.

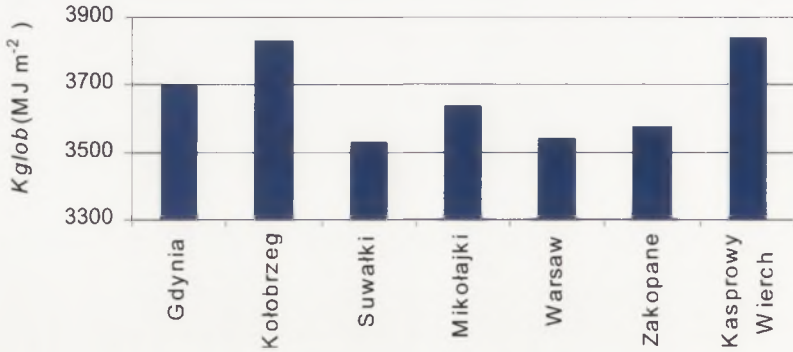


Figure 1. Annual totals of global solar radiation (K_{glob}) at particular sites in Poland, 1961–2000 (acc. to Bogdańska and Podogrocki, 2000)

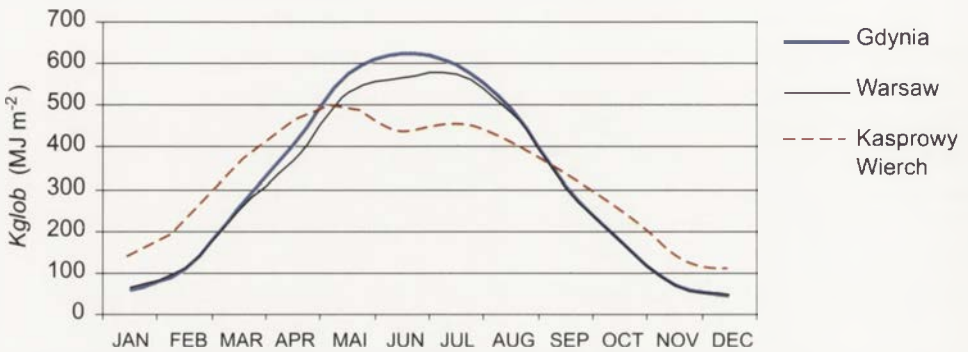


Figure 2. Monthly totals of global solar radiation (K_{glob}) at particular sites in Poland 1961–2000

The highest annual totals of ASD (>1600 hours per year) are noted in northern and central Poland. In the south-east and north-east, the ASD is slightly lower (1560–1580 hpy). At the bottoms of deep, narrow mountain valleys, as well as in large agglomerations, ASD totals are reduced by great horizon shading or by air pollution (Table 1).

Monthly totals of ASD fluctuate from 25–50 hours in December to 180–250 hours in the period May–July. There is also great seasonal differentiation of sunshine duration. In northern and north-eastern

Poland, ASD totals are lowest in the winter and highest in May–June. However, in mountain regions, ASD values are slightly higher than in the rest of Poland in the winter, and considerably lower in the summer (Table 1).

Where the spatial distribution to insolation is concerned, it is northern and eastern Poland that actual and relative figures for sunshine duration assume their highest annual values. However, reduced annual insolation is also observed across the Upper Silesian Plateau (Fig. 3).

Table 1. Mean monthly and annual totals of sunshine duration (hours), 1971–1990

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Ustrka	35.8	63.5	110.3	171.9	249.7	227.2	233.7	235.0	137.9	101.6	43.1	32.2	1641.7
Hel	34.0	55.4	106.4	168.9	254.5	236.0	242.1	228.5	139.7	96.3	40.9	24.6	1627.3
Resko	36.0	54.0	115.0	148.0	205.0	230.0	215.0	200.0	155.0	91.0	35.0	24.0	1508.0
Suwałki	36.6	66.5	113.8	157.8	240.0	230.3	228.3	222.0	134.8	91.8	34.0	25.4	1581.2
Białystok	39.3	57.9	113.1	156.6	237.2	219.5	231.0	228.8	139.2	97.5	38.8	26.0	1584.7
Inowrocław	38.0	56.0	124.0	155.0	213.0	233.0	229.0	217.0	171.0	96.0	39.0	38.0	1599.0
Zamość	50.4	70.6	107.8	148.6	213.9	193.1	224.7	210.8	135.8	120.1	53.3	34.1	1563.2
Cracow	40.7	61.2	91.9	128.1	187.5	184.3	203.2	190.8	116.9	102.4	49.7	34.1	1390.8
Jelenia Góra	61.4	81.7	109.8	135.2	186.7	161.0	182.7	185.9	125.1	125.0	63.2	47.5	1465.2
Kłodzko	53.7	72.4	109.6	149.3	203.8	191.5	210.1	206.8	130.1	118.4	57.3	44.4	1547.4
Krynica Zdrój	56.0	68.0	109.0	140.0	161.0	169.0	188.0	189.0	152.0	118.0	56.0	38.0	1444.0
Iwonicz Zdrój	36.6	58.4	100.6	116.7	166.1	153.5	170.0	174.6	112.9	98.3	41.9	25.3	1254.9
Lesko	65.1	80.6	117.6	129.2	185.5	176.2	197.5	199.2	133.4	118.4	69.0	52.7	1524.6

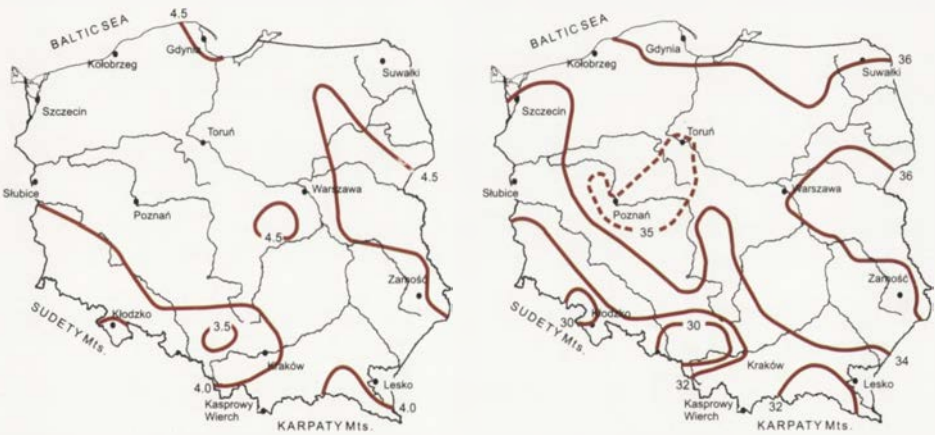


Figure 3. Mean annual daily sunshine duration (hours, left panel) and annual values of relative sunshine duration (per cent, right panel), 1961–1990

Atmospheric circulation

The air masses that reach Poland are formed in several air-pressure centres of the northern hemisphere, i.e. the Iceland low, Azores high, Siberian and near eastern lows. We observe a relative equilibrium of low- and high-pressure situations.

The distribution of air-pressure centres provides for the predominance of westerly and north-westerly circulations. Advection of air masses from the W and NW brings warming, and rainy as well as foggy weather, in the winter. However, in the summer it brings cooling and rains. The less-frequent

air masses coming to Poland are from the east. Marked seasonal differences are to be observed. From April through to August it is advections from the north and north-east that are most frequent, but in the autumn those from the south-east and north-east, and in the winter those from the east and south-east (Table 2).

western Poland (Legnica) the Pm air mass accounts for more than 70% of the days per year, in the east (Zamość) and north-east (Suwałki) that figure is only between 63–64%. Similar differences, but with the opposite geographical gradient are to be observed for the Pk air mass. Analysis in respect of arctic air shows it to be much

Table 2. Frequency (%) of directions of air-mass advection and atmospheric pressure centers over Poland, 1951–2000 (after Lityński's classification)

Period	Direction of advection									Air-pressure center		
	N	NE	E	SE	S	SW	W	NW	O	C	A	O
Jan	12.6	8.2	9.0	11.1	13.6	12.5	10.9	13.1	8.9	34.8	37.9	27.3
Feb	11.2	9.3	12.6	15.0	11.1	8.8	10.4	12.9	8.7	35.3	37.7	27.0
Mar	8.9	5.8	11.6	15.9	9.2	12.8	10.8	14.8	10.2	32.5	42.3	25.1
Apr	11.4	14.5	10.6	10.9	12.2	11.0	8.6	10.7	10.0	33.1	39.6	27.3
May	11.6	14.6	11.4	10.5	10.7	12.3	8.1	10.3	10.6	32.1	38.9	29.0
Jun	14.4	15.4	8.7	6.3	8.4	12.2	11.2	12.8	10.6	32.2	40.1	27.8
Jul	15.7	14.3	8.3	4.6	8.4	12.5	11.3	14.2	10.7	28.3	44.0	27.6
Aug	13.0	12.8	9.7	7.8	10.2	12.2	11.7	10.5	12.0	27.8	42.7	29.5
Sep	11.4	9.9	7.9	9.7	12.7	15.8	9.2	13.9	9.7	32.0	33.9	34.1
Oct	12.7	7.3	7.8	9.9	12.6	14.2	11.7	14.7	9.0	31.3	44.8	23.8
Nov	11.6	6.1	7.4	13.5	15.1	14.8	10.7	13.9	6.8	34.0	37.8	28.2
Dec	11.4	5.5	6.8	8.8	11.9	15.9	12.3	14.9	12.5	34.3	35.2	30.5
YEAR	12.2	10.3	9.3	10.3	11.3	12.9	10.6	13.1	10.0	32.3	39.6	28.1

C – cyclonic, A – anticyclonic, O – non-defined advection and air pressure

Air masses

On more than 60% of the days of the year, Poland is under the influence of the polar maritime air mass (Pm). In turn on 16–20% of days it is covered by an arctic air mass (A). Polar continental air (Pk) is noted on 9–13% of days and subtropical air (S) – on 1–4% of days a year. That said, there are major regional differences as regards the frequency of occurrence of air masses over Poland. For example, while

more frequent in the north of Poland than in the south. Not surprisingly, the subtropical air masses mostly extend over the territory of south-eastern Poland (Table 3).

Air pressure

Mean monthly values of sea-level air pressure (SLP) are relatively similar to one another. In central Poland (Warsaw) these range from 1001 hPa in April to 1005 hPa

Table 3. Frequency (%) of particular air masses at different stations in Poland, 1976–1995

Air mass	Site				
	Koszalin	Suwatki	Toruń	Legnica	Zamość
Arctic	18.8	20.3	18.0	16.1	16.7
Polar-maritime	68.4	62.7	66.7	70.4	64.0
Polar-continental	9.7	13.4	10.9	9.4	13.9
Subtropical	1.4	2.2	2.1	2.4	3.6
Non-defined	1.7	1.4	2.3	1.7	1.8

Source: Więctaw, 2004

in October. However, the possible range of air pressure is wide. The highest SLP to be noted in Warsaw over the period 1965–2000 inclusive was the 1034.7 hPa recorded on 3rd January 1993, as compared with a lowest figure of 960.8 hPa noted for 3rd December 1976. The widest range of possible SLP values characterises the November–March period and the narrowest the summer months (Fig. 4).

The most frequently large dP values are to be observed in north and north-east Poland (Ustka, Toruń – on average 22% of days a year, and almost 40% in December, Suwatki – about 20% per year). In central Poland (Warsaw) and at Silesian Lowland $dP > 8$ hPa characterises 18% of days a year. Unfavourable changes in SLP are less frequent in the Sudety Mts., on the Lublin Upland and in the northern foothills of the Carpathians

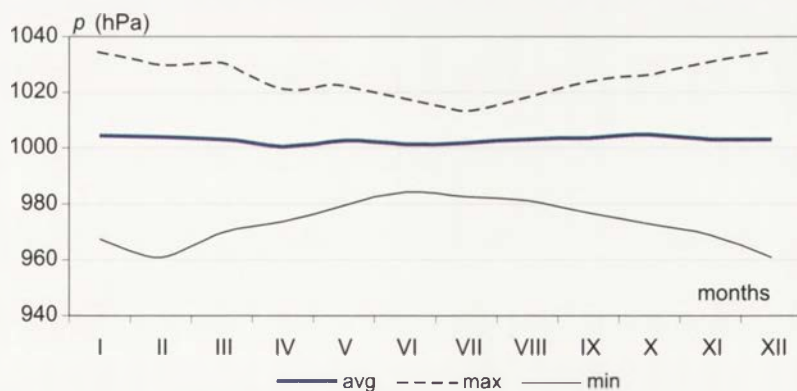


Figure 4. Annual course of mean station air pressure (p), 1966–1998; avg – mean monthly value, max – the highest recorded p value, min – the lowest recorded p value

A very important feature of air pressure is its day-to-day change (dP). At dP above 8 hPa, the changes are felt by humans as a negative stimulus that influences wellbeing.

(about 15% of days a year). In the Tatra Mts. (Zakopane) $dP > 8$ hPa is noted on only about 10% of the days each year, and occasionally in the summer season.

Wind

In relation to the transfer of air masses, westerly winds are the most frequent kind in Poland. In the summer, it is westerly and north-westerly winds that predominate. However, in the winter season, south-westerly and easterly winds are also to be expected. The strongest winds are noted at the seashore, as well as at the tops of mountains. In contrast, the weakest winds are observed in the river valleys, as well as in the mountain basins. It is in the latter locations that the highest frequency of occurrence of calm conditions is to be noted (Fig. 5). Where the annual course to the phenomenon is concerned, the strongest winds are reported at the end of winter and beginning of spring, as well as in the late autumn.

and elevation above sea level. Mean annual air temperature decreases from south-west to north-east. However, in the mountains, the decrease in air temperature depends on elevation (Fig. 6). In the warm half-year, the lowest air temperature (T_a) is observed in the north and the highest in central Poland. The isotherms run E-W. In the cool half-year, the isotherms run N-S and air temperature decreases from west to east, with the lowest T_a characterizing the north-east.

The specific annual courses of T_a in particular regions of Poland give rise to significant differences in temperature amplitudes (dT). The lowest dT is observed at the Baltic seashore (19°C) and the highest in the north-east (23°C) and east (22°C). This illustrates an increase in the continentality of climate in Poland as one moves from west to east (Fig. 6).

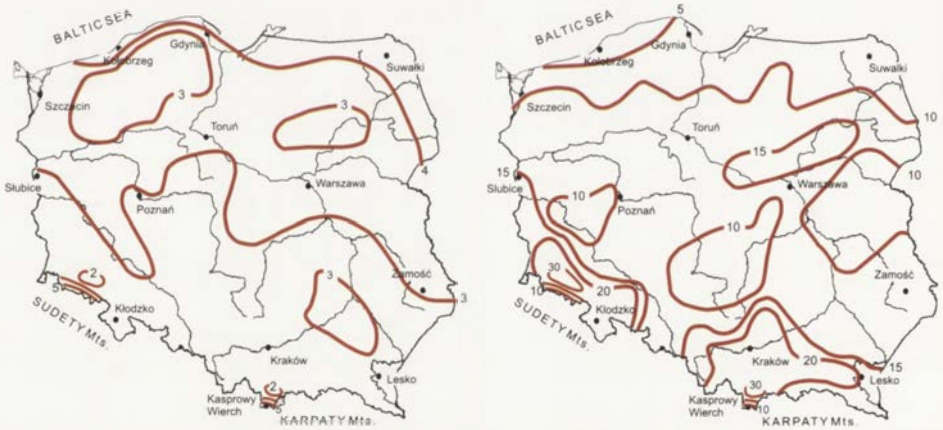


Figure 5. Mean annual wind speed (m/s, left panel) and annual frequency of calms (per cent, right panel), 1961–1990

Air temperature

Thermal conditions are mostly influenced by: air circulation, solar radiation

The areas with the highest air temperature also feature the greatest number of hot days ($T_{max} > 25^\circ\text{C}$). In central Poland, more than 40 days a year are “hot”, with these

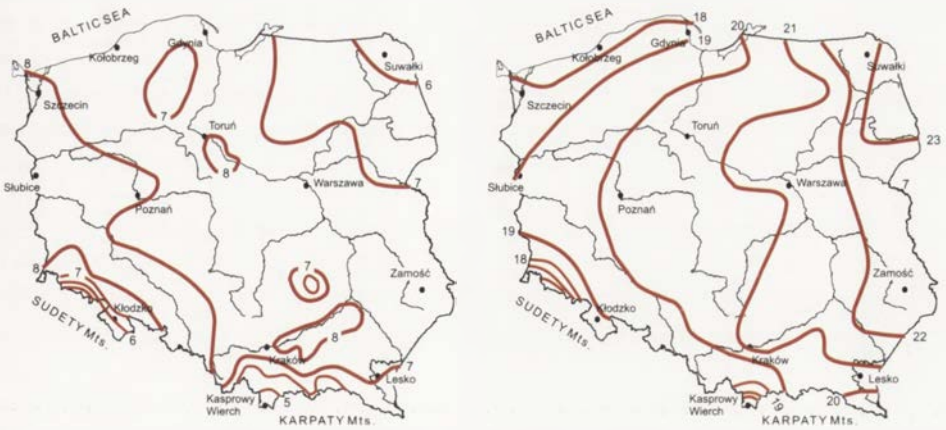


Figure 6. Mean annual air temperature ($^{\circ}\text{C}$, left panel) and annual amplitude of air temperature ($^{\circ}\text{C}$, right panel), 1961–1990 (acc. to Kozłowska-Szczęsna, 1991)

occurring from March through to October, with a maximum in July (13 days a month). At the seashore, the first hot days are observed in April and in the mountains – in May, and the last ones – in September. Frosty days ($T_{\text{max}} < 0^{\circ}\text{C}$) are registered from November through to March, though with the greatest number in January (11–14 days in the month). In the mountains, there are frosty days from October through to April. In general, the number of frosty days increases from west to east, with the greatest number characterizing the north-east and the phenomenon being less frequent at the seashore.

Precipitation

On average, annual totals of precipitation in central and northern Poland are of 500–700 mm. As one moves south, precipitation totals increase to 780 mm in the belt of uplands and to 1100 mm in the mountains (Fig. 7). The typical feature of precipitation (RR) in Poland is the prevalence occurring in the warm-half year.

In southern Poland, warm-period precipitation can be even twice as great as in the cool period (Błażejczyk, 1985). The highest precipitation totals are noted in the summer, when convective rains occur, especially in the uplands and mountains. In the winter, the lowest precipitation totals are



Photo 1. Ski-resort in Jaworzyna Krynicka (Carpathians)

Natural and human environment of Poland

those characteristic of the coast, the mountains and the centre of Poland. The number of days with precipitation ($RR > 0.1$ mm) ranges from 130 a year in central Poland to about 200 in the mountains (Fig. 7). A slight predomination of precipitation days is observed in the cool period as opposed to the warm half-year.

Fog is an atmospheric phenomenon that impacts upon several forms of human activity. In general, fog occurs during 35–50 days a year in northern Poland, 45–85 days in the Carpathians and 115 days in the Cracow agglomeration (Fig. 8). In both winter and summer, a relatively large number of foggy days

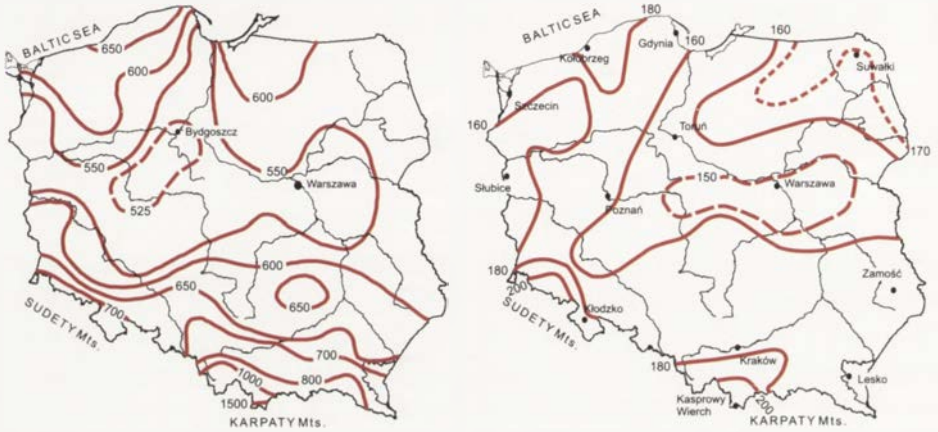


Figure 7. Annual precipitation totals (mm, left panel) and number of days with precipitation (right panel), 1961–1990

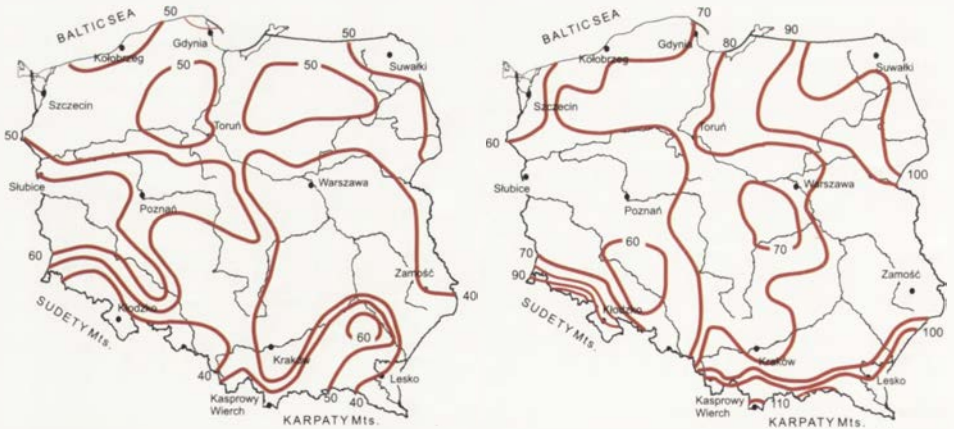


Figure 8. Annual number of days with fog (left panel) and with snow cover (right panel), 1961–1990

is to be noted in north-eastern Poland and on the Małopolska Upland. In the Carpathians, foggy days occur very frequently in the summer, but are very rare in winter.

Snow cover (SC) is observed from November till April (in the mountains from October through to May). In the Tatra Mts. (on Kasprowy Wierch) and in the Karkonosze (at Śnieżka), snow cover is present on 214 and 182 days respectively. Analysis of spatial distribution to snow-cover days reveals an increase from west (60 days a year on average) to north-east (>100 days). The most SC days are noted in January (Fig. 8).

The weather complex

The weather complex is one of the characteristics of the climate. The present paper utilises the weather typology of Woś (1999), based on daily meteorological observations. The most frequent weather types are warm, frosty and light freeze conditions with limited cloudiness and without precipitation. Warm, sunny and non-rainy weather is most frequent (>120 days a year) in Wielkopolska and Lower Silesia, but is relatively rare in the mountains, in north-eastern Poland and in the Kaszubskie Lakeland. The number of days with frosty, sunny and non-rainy weather increases gradually from the south-west to the north-east. A light freeze with sunny and non-rainy weather is most frequently observed in the south-east, in Lower Silesia, the Sudety foothills and central Poland (Kujawy) (Fig. 9).



Figure 9. Annual numbers of days with various weather complexes: warm-sunny-non-rainy (A panel), frosty-sunny-non-rainy (B panel), freezing-sunny-non-rainy (C panel), 1961–1990 (acc. to Woś, 1999)

The bioclimate of Poland

In 1827, bioclimatology was described by Aleksander von Humboldt (1769–1859) as a “complex of atmospheric factors that influence human receptors” (Kozłowska-Szczęśna *et al.*, 1997). However, in 1956, the International Society of Bioclimatology and Biometeorology (ISBB) redefined it as a science encompassing the “direct and non-direct research relationships between geophysical and geochemical environments and living organisms (plant, animals and humans).” Currently we understand bioclimatology as a science that is “studying the influences of fluctuated atmospheric environment on living organisms” (Kozłowska-Szczęśna and Błażejczyk, 2006).

Types of bioclimate

In bioclimatic research, much attention is paid to the impacts of atmospheric stimuli on human beings. On the basis of this assumption, Kozłowska-Szczęśna (1987) has defined several types of bioclimate in Poland, to this end using various norms as regards bioclimatic conditions in the temperate climatic zone. She distinguished 4 principal types of bioclimate: i.e. the strongly stimulative (type 1), moderately stimulative (type 2), mildly stimulative (type 3) or slightly stimulative (type 4). 2 subtypes were defined as well: the forest bioclimate with mild features (subtype A) and the urban bioclimate with loaded features (subtype B; Fig. 10).

Type 1 bioclimates extend along the coastal belt of the Baltic and in mountain areas >750 m above sea level. Strong stimuli also occur around large lakes. Strong

spatial and temporal fluctuations of stimuli are to be observed in this case. Type 2 has the features of both the strongly stimulative bioclimate of the seashore and mountains and the mild bioclimate of lowlands and uplands. A mildly stimulative bioclimate (of type 3) in turn occurs in lakeland areas, upland regions and the foothills of the Carpathians and Sudety Mts. In the deep river valleys, strong stimuli can be expected periodically, while in upland and foothill areas (300–500 m a.s.l.), bioclimatic conditions can be diversified due to slope exposure (in relation to prevailing winds and sun exposure), orography and land cover. The greater part of Poland is coincident with a weakly stimulative bioclimate (type 4) that is typical for lowlands and the sub-Carpathian basin.

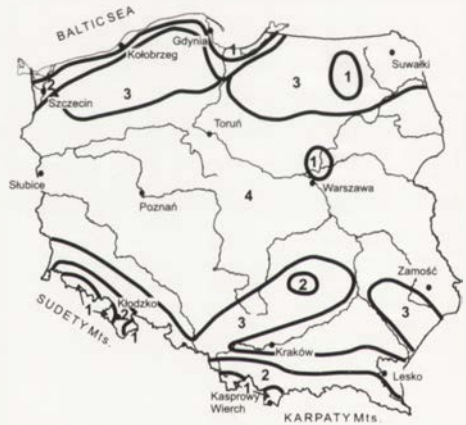


Figure 10. Types of bioclimate in Poland (acc. to Kozłowska-Szczęśna, 1985)

- 1 – strongly stimulative,
- 2 – moderately stimulative,
- 3 – mildly stimulative,
- 4 – weakly stimulative

The two aforementioned subtypes of bioclimate observed in Poland relate first to forests (in subtype A), exerting a posi-

tive influence on human beings, and second to urban areas (subtype B), with the influence on human health and wellbeing tending rather to be negative.



Photo 2. Health resort in Kudowa-Zdrój (Sudety Mts.)

Bioclimatic regions of Poland

Multi-annual meteorological and biometeorological data allow for the identification of eight bioclimatic regions across Poland (Fig. 11). The purpose was served by the results of previous studies carried out by the author and other researchers (Błażejczyk, 1985; 1992a; 2003; Kozłowska-Szczęśna, 1988; 1991; Krawczyk, 1988; 1991; 1993). The regions in question are diversified by several characteristics that can be found in Table 4.

For a detailed analysis of the bioclimatic conditions of Poland, use was made

of recent methods derived from considerations of the human heat balance. These describe in detail and by reference to physiology the influences of ambient conditions on human beings (as recommended by the International Society of Biometeorology, the World Health Organization and the World Meteorological Organization). Bioclimatic characteristics were calculated using the man-environment heat exchange model MENEX 2002 (Błażejczyk, 2004).



Figure 11. Bioclimatic regions of Poland
 I – Coastal, II – Lakeland,
 III – North-eastern, IV – Central,
 V – South-eastern, VI – Upland,
 VII – Sudetic, VIII – Carpathian

Heat stress

The heat stress index (*HSI*) provides an indication of the intensity of thermal-and-hygryc stimuli. A high *HSI* value informs us of a potential health hazard due to marked sultriness, especially among children and the elderly. Sultry days are observed from April through to September (Krawczyk, 2001), and most especially in the

Carpathian region. In the coastal "Seashore" region, fewer than 10% of days are classed as sultry (Table 5).

mer. Seashore and lakeland regions are characterized by the lowest *STI* and relatively low *STI* values are also observed in

Table 4. Essential characteristics of particular bioclimatic regions of Poland

Bioclimatic characteristic	Season	Bioclimatic regions							
		I - Coastal	II - Lakeland	III - North-eastern	IV - Central	V - South-eastern	VI - Upland	VII - Sudetic	VIII - Carpathian
Sunshine duration (hours per day)	W	0.77	0.76	0.79	0.77	0.85	0.75	0.85	0.85
	S	2.45	2.34	2.46	2.37	2.33	2.20	2.06	1.98
Air temperature at 12:00 UTC (°C)	W	2.1	1.2	-0.3	1.9	0.5	2.2	1.6	1.4
	S	18.4	19.4	19.5	21.3	21.1	20.5	18.9	19.4
Precipitation totals (mm)	W	109	105	103	82	109	99	125	127
	S	189	220	250	214	232	273	296	340
Subjective temperature (°C)	W	9.9	9.5	3.4	10.1	11.4	14.0	13.0	13.9
	S	38.7	38.5	35.2	40.1	42.8	42.7	40.7	40.2

Ws – winter season (January-March), S – summer season (June-August)
Source: Błażejczyk, 2004.

Table 5. Frequency (%) of sultriness with various intensity at 12:00 UTC, 1971–1990

Region	Without sultriness	Slight sultriness	Moderate sultriness	Great sultriness	Extreme sultriness	Hazard of overheating
Coastal	74.6	22.0	2.9	0.2	0.1	0.3
Lakeland	57.1	29.9	10.6	1.6	0.4	0.4
Central	49.7	35.0	13.3	1.8	0.3	0.2
South-eastern	35.7	39.5	16.5	5.0	0.9	2.5
Upland	51.4	34.1	13.0	1.2	0.1	0.3
Sudetes	49.6	36.4	11.7	1.8	0.3	0.3
Carpathians	30.1	33.1	23.6	8.8	1.8	2.5

Subjective temperature

Subjective Temperature (*STI*) indicates thermal sensations that arise in man as an effect of the organism's active adaptation to ambient conditions (Błażejczyk, 2003). Mean *STI* values in Poland range from 3–6°C in winter to 35–45°C in sum-

mer. the Sudety Mts. (37–42°C in the summer). In the Carpathians, *STI* is less diversified seasonally: from 10–14°C in winter to 41–44°C in summer. The lowest *STI* is noted at the tops of mountains.

Where regional variation in *STI* is concerned, NE Poland has specific features, *STI* being lower there than in the rest of Poland

in both winter and summer. Low summer *STI* is also noted in the Seashore and Lake-land regions, while figures are highest in the Upland region. In the winter, a relatively high subjective temperature is to be noted over much of the Carpathian region (Fig. 12).

When attention is paid to the frequency of particular ranges of *STI* indicative of the different thermal sensations in human

beings, it is found that most people would be inclined to feel "cool" on 33–47% of all days in the year. On 17–25% of days, "comfortable" or "warm" sensations occur. 6–12% of days are conceived of as "hot", while extreme, "very hot", days account for 1–2% of the annual total at the seashore, or as many as 6–7% of days in the central part of the country (Table 6).

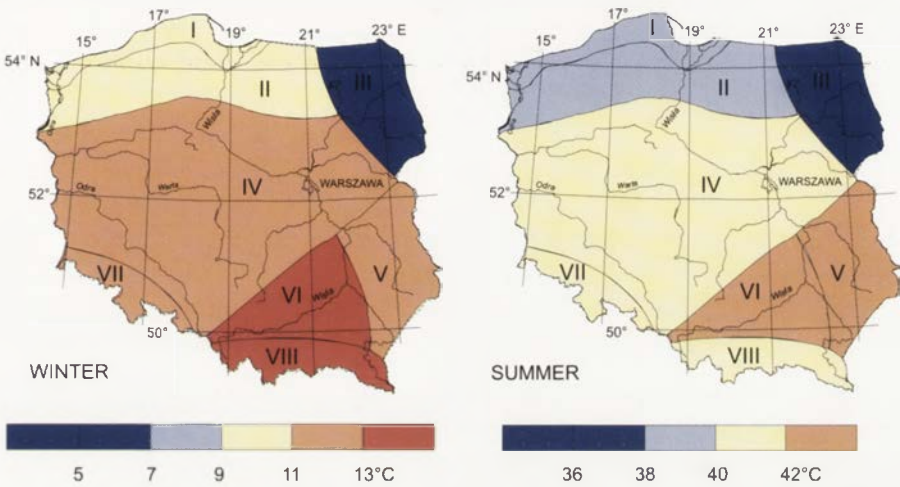


Figure 12. Mean values of subjective temperature (*STI*, °C) at 12:00 UTC during winter and summer

Table 6. Frequency (%) of various thermal sensations in man, 1971–1990

Site	Cold	Cool	Comfortable	Warm	Hot	Very hot	Cold	Cool	Comfortable	Warm	Hot	Very hot
	Year						July					
Łeba	7.4	47.0	16.9	20.2	6.5	2.0	0.0	6.1	26.3	39.0	21.6	6.9
Potoczyn Zdrój	6.0	45.6	17.9	18.6	7.2	4.7	0.0	3.4	26.9	35.7	19.2	14.8
Inowrocław	5.2	42.7	16.8	18.7	10.0	6.7	0.0	0.9	24.3	29.2	23.7	21.9
Nałęczów	6.1	41.1	16.7	19.2	10.6	6.4	0.0	1.4	21.3	30.6	24.0	22.6
Wieliczka	3.5	39.3	19.5	21.9	10.8	5.2	0.0	1.3	22.8	34.7	24.7	16.5
Polanica Zdrój	4.1	42.0	19.4	20.3	9.4	4.8	0.0	1.5	30.3	28.9	21.6	17.7
Muszyna	3.6	39.3	19.8	20.8	10.7	5.8	0.0	0.6	24.0	34.0	21.5	19.8

Fluctuations and changes in climate

Several studies have dealt with recent fluctuations and changes in climate. Well-known are the changes in air temperature (T_a). Trends for T_a observed in the case of Poland are similar to those noted in Central Europe as a whole (Kozuchowski *et al.* 1994, Kozuchowski and Żmudzka, 2002; Niedźwiedz *et al.*, 1994; Trepńska, 1997; Żmudzka 2005). Discussion in the present study will be concerned with variability in other characteristics of climate and bioclimate.

Kozłowska-Szczęśna and Podogrocki (1995) obtained a trend for actual sunshine duration (ASD) in Warsaw over the period 1903–1990. This shows a general decrease in ASD of 78 minutes per year. However, in particular decades, the comparable data also assumed positive values (Fig. 13).

Fluctuations in air circulation in southern Poland can be illustrated by three indices: zonal (P), meridional (S) and cyclicity (C) (Błażejczyk *et al.*, 2004). The variation is greatest in the case of the zonality index. A mean annual value for the P index of 116.3 points to the very major influence of Atlantic air masses. The greatest intensity of western circulation was observed in the periods 1911–1917, 1923–1934, 1943–1951 and 1983–1993. Relatively low variability was noted where the S index was concerned, its highest values being those for 1920–1940. Negative S values indicative of northerly circulation were noted frequently before 1920, in the years 1940–1949 and after 1980. In the case of the C index, a negative secular value (-52.3) shows that anticyclonic circulation dominated in southern Poland. A domination of cyclonic circulation was only observed in the years 1963–1976. Similar characteristics were also found for northern Poland (Bąkowska,

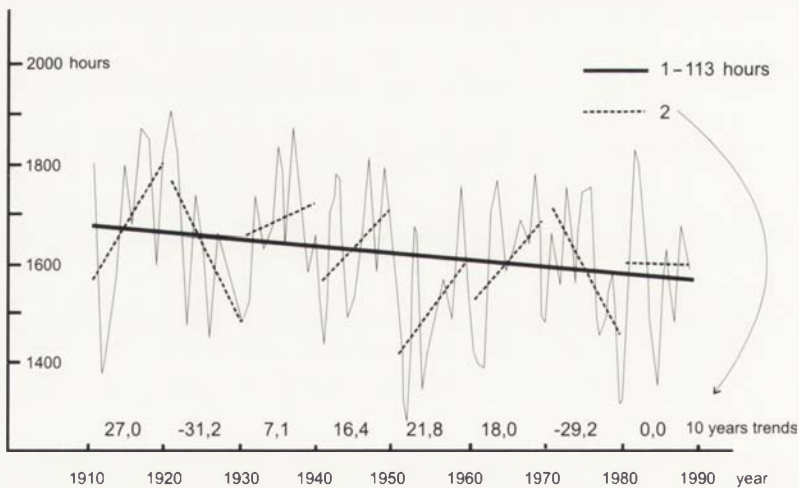


Figure 13. Trends of actual sunshine duration at the Warsaw-Bielany meteorological station, 1903–1990; 1 – 100-year trend, 2 – 10-year trend (acc. to Kozłowska-Szczęśna and Podogrocki, 1995)

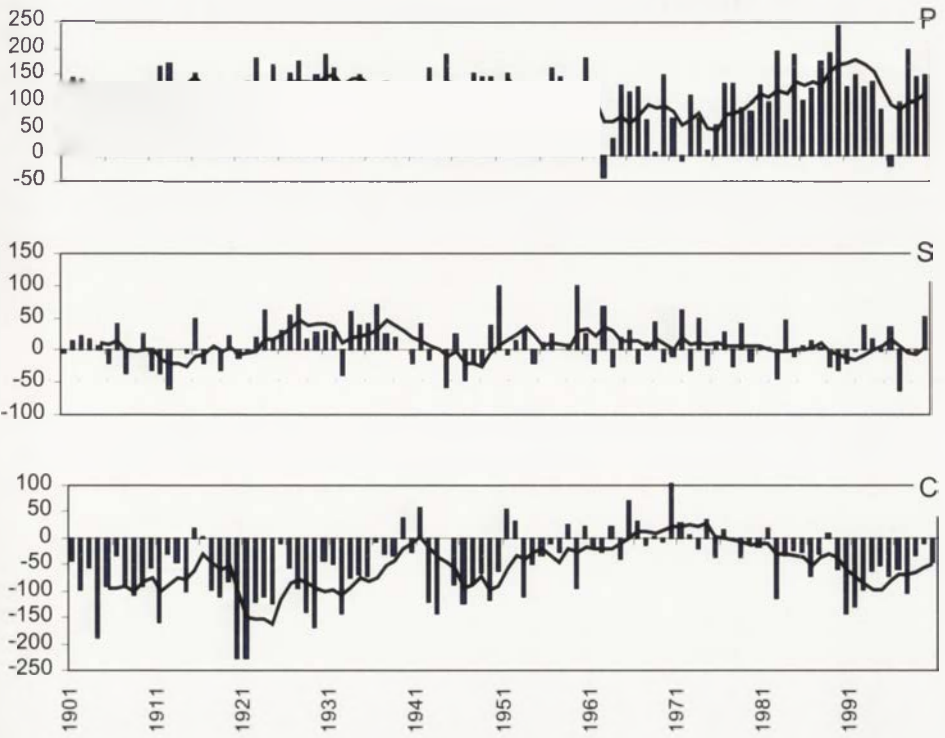


Figure 14. Annual values of zonal (P), meridional (S) and cyclonicity (C) circulation indices in southern Poland, 1901–2000; line indicates 5-year moving averages

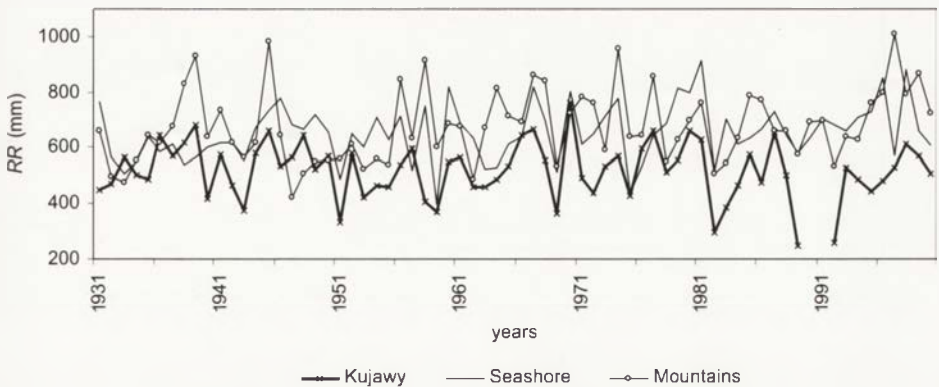


Figure 15. Fluctuations in annual precipitation totals (RR) in several regions of Poland, 1931–2000

2005). In general, it is only with the P index that a significant, upward secular trend is noted. The greatest changes in air circulation were observed in the last 3 decades of the 20th century, the main aspects to these changes being: (1) an intensification of a westerly circulation, (2) a decrease in the frequency of occurrence of low-pressure centers, and (3) an increase in north-easterly circulation (Fig. 14).

Błażejczyk *et al.* (2005) observed 70 years of trends in precipitation (RR) in several regions of Poland. At Kujawy (central Poland), a slight decrease in precipitation is noted (-3.4 mm per 10 years); the trend does not attain statistical significance at the 90% probability level. In comparison, at the seashore and in the mountains, the

trends for RR were statistically significant at the 95% level, their respective values being +13.5 mm and +17.0 mm per 10 years (Fig. 15).

Variability in sensible climate is illustrated by changes in two indices: of subjective temperature (STI) and of predicted clothing insulation (Iclp). Mean annual STI values show a slight positive secular trend of 2.24°C. However, for Iclp, a slight negative trend was obtained (-0.11 clo per 100 years). Both trends point to a gradual intensification of heat stress in southern Poland (Fig. 16). The trends in question achieve statistical significance for most months and for the year (Błażejczyk *et al.*, 2004).

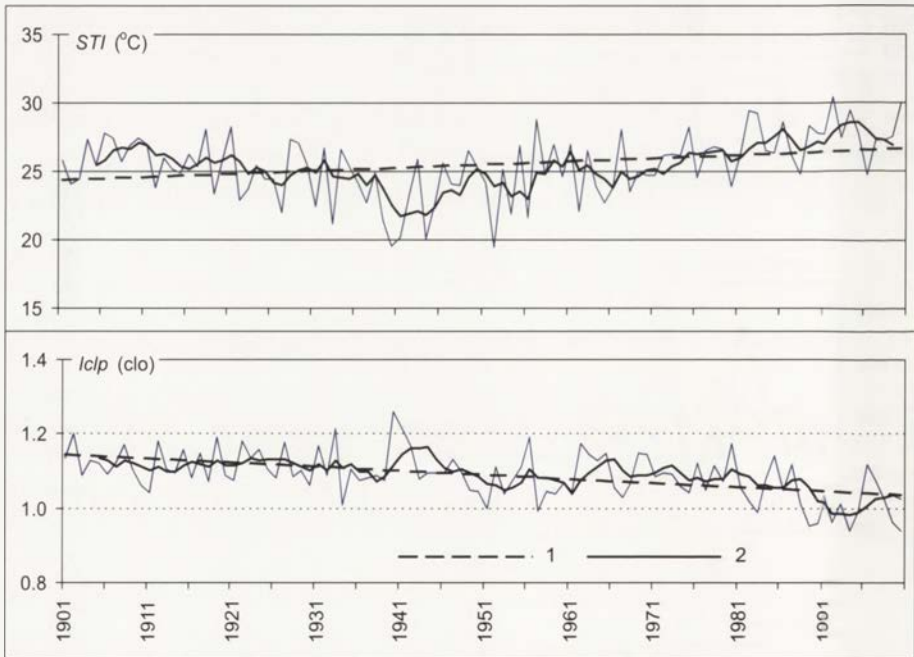


Figure 16. Mean annual values of the subjective temperature index (STI) and predicted clothing insulation index (Iclp) in Cracow, 1901–2000; 1 – trend line, 2 – 5-year moving averages

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Hydrographic conditions

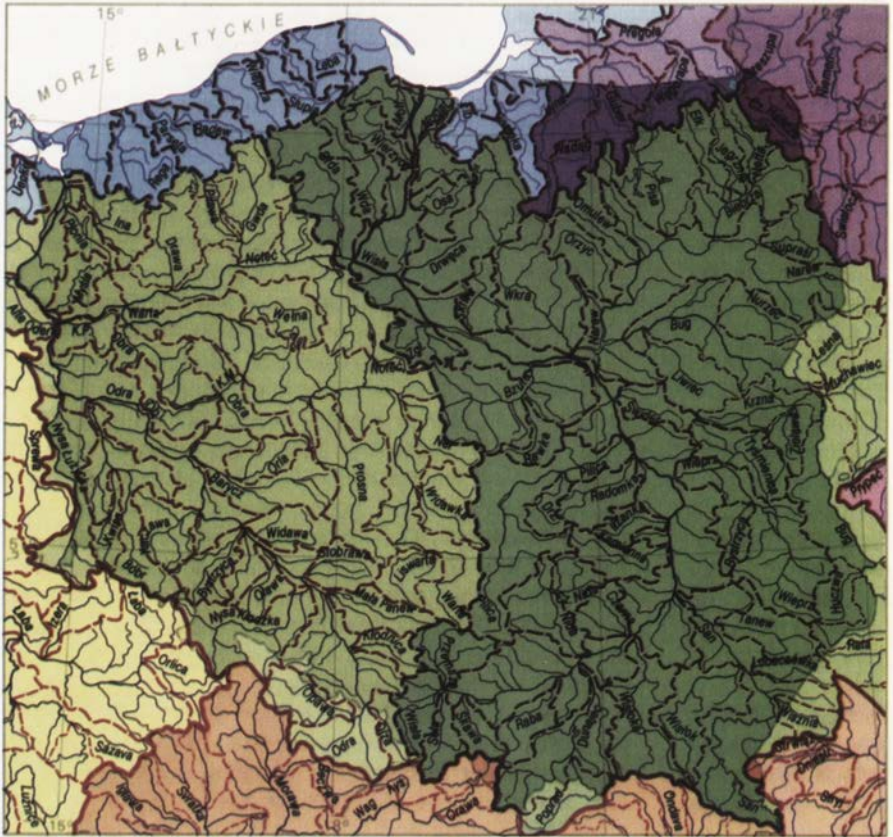
Andrzej T. Jankowski
Faculty of Earth Sciences
UNIVERSITY OF SILESIA
e-mail: ajank@us.edu.pl

Mariusz Rzętata
Faculty of Earth Sciences
UNIVERSITY OF SILESIA
e-mail: mrz@ultra.cto.us.edu.pl

Poland and adjoining areas are numbered among those poor in water resources. In terms of the abundance of water possessed by European countries, Poland is located in the third group of ten countries with mean annual precipitation equal to about 600 mm, evaporation amounting to about 425 mm and mean water runoff reaching about 180 mm per year. Converting into absolute values, the supply from atmospheric precipitation is of about 187 km³ of water (with about 5 km³ of additional inflow from rivers entering from foreign countries). Where outgoings are concerned, different forms of evaporation predominate, together accounting for about 133 km³ of water. Runoff represents near 59 km³ of water. Therefore, the most important sources by which demands for water in Poland are met are surface and underground waters, and permanent sur-

face water storage is estimated at about 37 km³, cf. ground retention equal to 76 km³. A key item in the country's water balance comprises the intake of water meeting the needs of the national economy and population, estimated at over 11 km³, including almost 8 km³ of water for production purposes and more than 2 km³ for the operations of the water-pipeline network, and about 1 km³ providing irrigation in agriculture and forestry and topping up fish ponds.

The vast majority (99.7% or 311,821 km²) of Polish territory lies within the drainage basin of the Baltic Sea, to which belong the catchments of the Vistula, Oder and some other, smaller rivers (Fig. 1). The remaining fragment of Poland (about 0.3% of the area or 856 km²) is within the Black Sea drainage basin (specifically the catchment of the upper Strwiąż in the Dniestr



Baltic Sea catchment area (311 821 km²)

Black Sea catchment area (616 km²)

- Vistula River
- Oder River
- Coastal rivers
- Pregel River
- Neman River

- Danube River
- Dnepr River
- Dnepr River

North Sea catchment area (240 km²)

- Elbe River

- Watershed of sea catchment areas
- Watersheds of river basins (above 1000 sq. km.) (of the 1st, 2nd, 3rd, 4th, and 5th order)

(311 821 km²) Area within the boundaries of Poland)

- | | |
|----------------------------|------------------------|
| Cz. Hańcza — Czarna Hańcza | K.P. — Kanał Postomski |
| Cz. Nida — Czarna Nida | Kys. — Kysuce |
| Drz. — Drzewiczka | Molł. — Molława |
| Elb. — Elbląg | Ob. — Obrzyca |
| K.M. — Kanał Mołński | Zgl. — Zgłowiączka |

Figure 1. Major river basins
(acc. to A. Czerny, 1993, *Atlas of the Republic of Poland*, table 32.1.2)

Basin and the upper course of the Orawa and Skaliczanka in the Danube Basin), cf. else that of the North Sea (catchments of the upper courses of the Iżera and Orlica within the Elbe Basin). The Massif of Śnieżnik in the Eastern Sudetes Mts. on the border between Poland and the Czech Republic boasts the so-called Trójmorski Wierch ($50^{\circ} 09' N$, $16^{\circ} 47' E$), at which the watersheds of the three above-mentioned drainage areas converge.

Underground waters

On Polish territory, the recognized resources of underground water are characterized by the retention of about 76 km^3 , and occur in Quaternary deposits and in the formations of older substrata. Within the total amount of water flowing out from the area of Poland (about 59 km^3), ground runoff accounts for almost 33–34 km^3 when pumped water discharges are added in. The areas of the largest water resources and most favourable hydrogeological parameters are considered to be the main reservoirs of underground water, and these are of key economic importance.

The widest distribution is of waters in Quaternary deposits, originating mainly from the periods of glaciation. More Quaternary aquifers occur in northern Poland, where glacial deposits attain greater thicknesses, having been covered by ice-sheets more frequently than areas in the south of the country. Only of marginal importance on the national scale are the waters accumulated in alluvial fans in the Sudetes and Carpathians in the south of Poland, or else accumulated in river-valley alluvia.

The underground waters present in formations of older substrata relate to geological structure and are mainly identified with the Tertiary, Cretaceous, Jurassic, Triassic and Carboniferous formations. The Tertiary and Cretaceous deposits together with more superficially located Quaternary deposits are a place of the abundant water present in depressions. These are generally associated with the central part of the Central Polish Lowland (specifically the Wielkopolski, Łódź and Mazowiecki Basins), as well as in part with the uplands (in the cases of the Nida and Lublin Basins). The latter kind of underground water also includes that in Cretaceous deposits (the Lublin Upland), Jurassic deposits (the Cracow-Częstochowa Upland) or Triassic and Carboniferous deposits (the Silesian Upland). In the Tatra Mts., underground water is present in the area's Triassic, Jurassic and Cretaceous deposits, as well as in Tertiary and Cretaceous deposits in the remaining part of the Carpathians. In the Sudetes, underground waters are associated with the Paleozoic as well as Mesozoic deposits. The tectonics and lithology of deposits from the geological substratum of Poland ensure that the underground water table is under pressure in many regions. In some cases there are very extensive zones of piezometric pressure, as, for example, in the Mazowiecka and Łódź Lowlands. The largest region with artesian and subartesian waters is the Mazowiecka Lowland. This is a wide plain with a depression in the central part called the Warsaw Basin, which largely coincides with the Mazowiecki Basin where tectonics are concerned. This basin is filled by Mesozoic deposits and alternating permeable and impermeable Tertiary deposits, in which artesian waters occur at a depth of about 200 meters.

Underground waters are usually characterized by mineralization which does not exceed 1 g per dm³ however, there are many places in which the mineral waters present have contents of between several tens and even several hundred grams of salt per dm³ of water. The problem of the salinity of underground waters remains a relevant one, especially in zones of the underground exploitation of hard coal in Upper Silesia. In that region, the pumped-out drainage waters with very high levels of mineralization brought to the surface are then discharged into surface waters. In general, however, the presence of mineral waters has been favourable, supporting the development of health resorts. Among recognized mineral sources across Poland, it is acidic waters that predominate in the Sudetes, while the Carpathians also have acidic waters, as well as brines and waters containing sulphide. It is mostly brines that are noted from central and northern Poland. In addition, there are many places in which mineral springs of different hydrochemical types occur, these being ferruginous at Nałęczów (51° 17' N, 22° 13' E), of the sulphate-calcium type at Cracow Swoszowice (49° 59' N, 19° 57' E), and with sulphide present in Horyniec (50° 12' N, 23° 22' E).

Recently the subject of detailed investigations and ongoing interest are the thermal waters, Poland being among the group of countries with the Europe's greatest resources of geothermal energy. In some regions, these are already being made extensive use of for municipal purposes as renewable heat energy sources at geothermal heat stations. Examples here include Mszczonów (51° 59' N, 20° 31' E), Bańska (49° 23' N, 19° 59' E), Biały Dunajec (49° 22' N, 20° 01' E), and Pyrzyce

(53° 08' N, 14° 53' E). The waters in question also find a use at recreational and health resorts, e.g. in Zakopane (49° 18' N, 19° 57' E), Ciechocinek (52° 53' N, 18° 47' E) and Łądek Zdrój (50° 21' N, 16° 52' E).

Rivers and canals

The contemporary arrangement of the river network is the result of many geomorphological-geological processes mostly occurring over the last two million years of relief development on the Central Polish Lowland. This period was characterized by climatic fluctuations occurring in the Pleistocene, and of course with the attendant glacial and interglacial processes. The Holocene brought a stabilization of the river system. The land gradient in Poland, sloping down towards the north-west, ensures a near-meridional course of Poland's rivers, as well as the asymmetrical nature of their catchments. The parallel directions of river flow occurring in some places are a consequence of the presence of marginal/proglacial valleys – during the glaciations these provided parallel drainage channels for huge masses of water deriving from the melting ice-sheet (along its frontal part). These met up with waters of rivers inflowing from the south towards the ice sheet present in the north.

Polish rivers usually commence at springs located in the mountainous areas of the south, i.e. the Carpathians and Sudetes in particular (Fig. 2, Tab. 1). Further spring zones are in the Central Polish Uplands, and in the Lakelands of the northern part of the country. Lowlands located in central Poland mostly function as transit areas for rivers, only to a lesser extent serving as alimentation areas.

Table 1. The more important rivers in Poland

Rivers	Receiving water	Catchment area [km ²]		Length [km]		Average flow [m ³ /s]
		in total	including in Poland	in total	including in Poland	
Wisła (Vistula)	Baltic Sea	194 424	168 699	1 047	1 047	1 080
Przemsza	Vistula	2 122	2 122	88	88	20
Dunajec	Vistula	6 804	4 852	247	247	85
Son	Vistula	16 861	14 390	443	443	127
Wieprz	Vistula	10 415	10 415	303	303	37
Pilica	Vistula	9 273	9 273	319	319	48
Narew	Vistula	75 175	53 873	484	448	324
Bug	Narew	39 420	19 284	772	587	158
Drwęca	Vistula	5 344	5 344	207	207	30
Pasłęka	Vistula Lagoon	2 294	2 294	169	169	19
Odra (Oder)	Baltic Sea	118 861	106 056	854	742	575
Nysa Kłodzka	Odra (Oder)	4 566	3 744	182	182	38
Nysa Łużycka	Odra (Oder)	4 297	2 197	252	198	31
Warta	Odra (Oder)	54 529	54 529	808	808	220
Noteć	Warta	17 330	17 330	388	388	80
Paręta	Baltic Sea	3 151	3 151	127	127	29

The arrangement of parallel relief belts with mountains in the south of the country, and successive belts of basins, uplands, lowlands, lakelands and coastland further north, ensures that the courses of rivers feature gaps, as well as waterfalls in the mountains. The most famous gorge in Poland is that taken by the Dunajec as it flows through the Pieniny Mts. (49° 24' N, 20° 22' E), the river creating a valley of steep slopes more than 8 km long with seven very sharp curves (Photo 1). This is therefore a rafting route enjoying major popularity on the national and European scales. Less well-known, but also very attractive, is the Small Polish Gap on the Vistula (51° 10' N, 21° 47' E) (Photo 2) or the gap the river passes through near Fordon at Bydgoszcz (53° 11' N, 18° 12' E). Waterfalls, in turn, mostly occur in the south of Poland and are mainly predisposed by the

tectonics of the deposits forming mountain fold or horst structures. The most attractive waterfall in the Carpathians is considered to be Siklawa (49° 13' N, 20° 03' E) in the Tatra Mts., while Sudety Mts. waterfalls



Photo 1. Part of the Dunajec gap through Pieniny Mts. in Carpathians

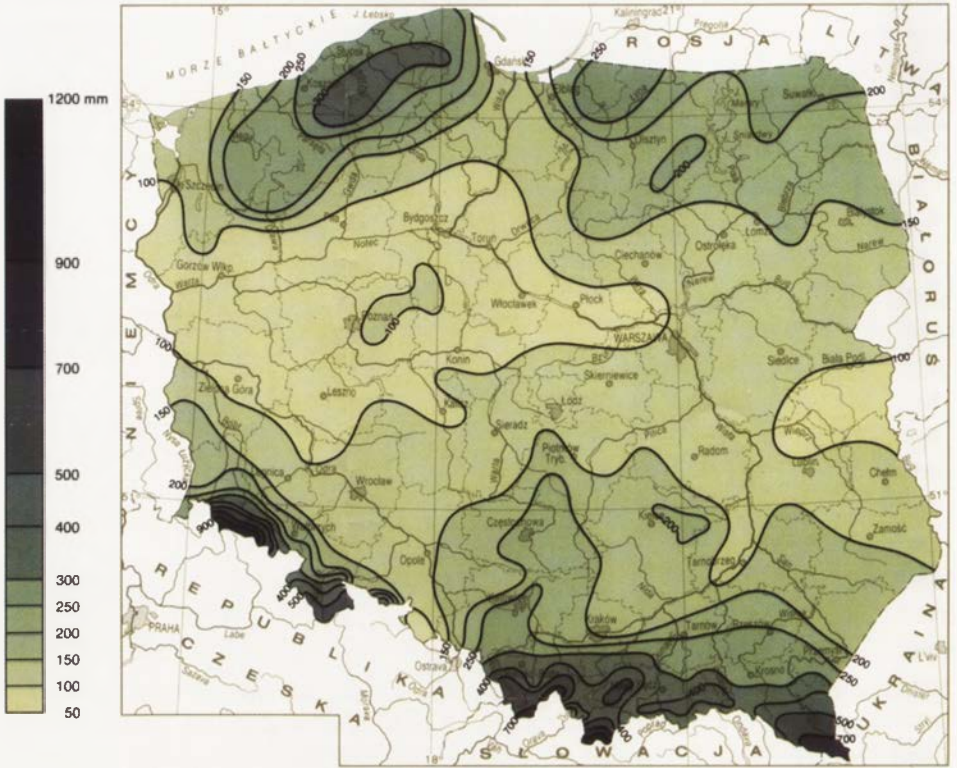


Figure 2. Average runoff
(acc. to M. Gutry-Korycka, 1995, *Atlas of the Republic of Poland*, table 32.8.2)



Photo 2. Vistula near Kazimierz Dolny in Lubelskie voivodship

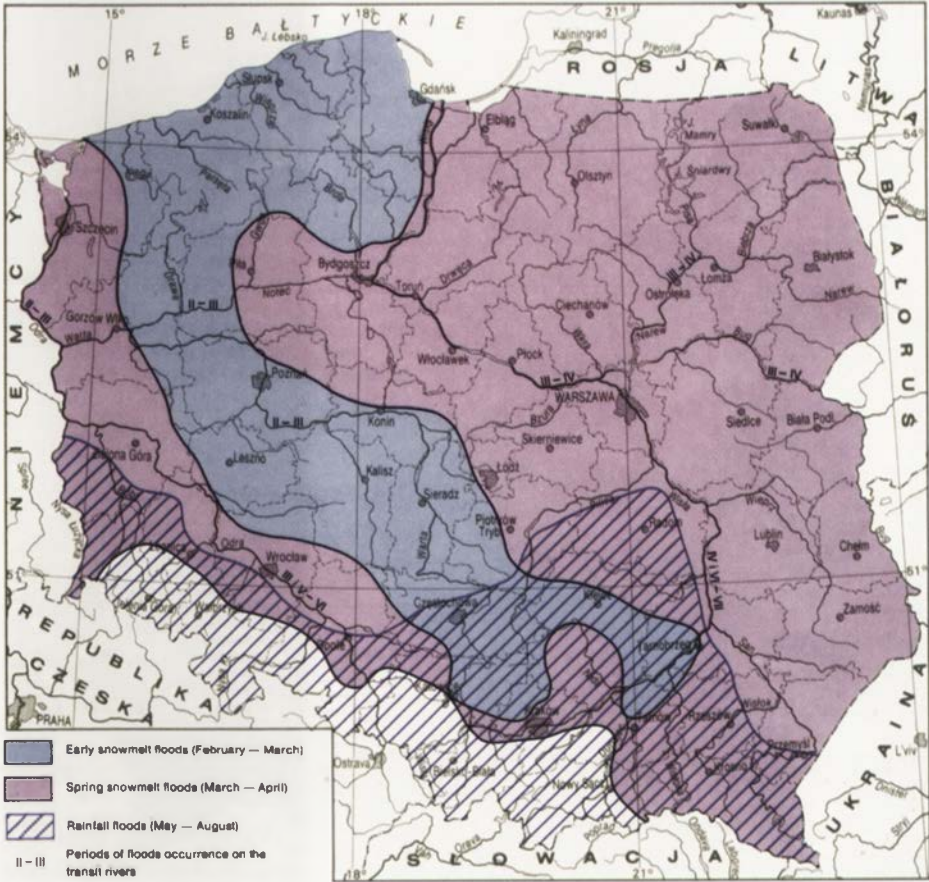


Figure 3. Typical periods of floods occurrence
(acc. to Biernat B., 1994, *Atlas of the Republic of Poland*, table 32.3.5)

include Szklarka (50° 50' N, 15° 53' E) and Kamieńczyk (50° 49' N, 15° 30' E) in the Karkonosze Mts., and Wilczka (50° 14' N, 16° 46' E) on the Śnieżnik Massif (Photo 3). Also picturesque in nature is the small waterfall at the borderland between the Roztocze hills and Sandomierz Basin, i.e. in the borderland zone between major fold and plate geological structures of Europe.

The flows of the main rivers in Poland are very varied but increase steadily from mountains in the south of the country towards river mouths on the Baltic Sea coast

(Table 1). In the upper section of the Vistula and Oder these usually amount to not more than a few tens of m^3/s , cf. 500 m^3/s in the cases of the Oder mouth, and c. 1000 m^3/s in the case of the Vistula mouth. Maximum flows – in high-water stages induced by summer rainfall or at the time of the spring thaw (Fig. 3) – are many times greater (as for example in 1934, 1947, 1960 and 1997). The largest flood over recent years was that coinciding with the high-water stage of July 1997, which followed unusually intensive atmospheric

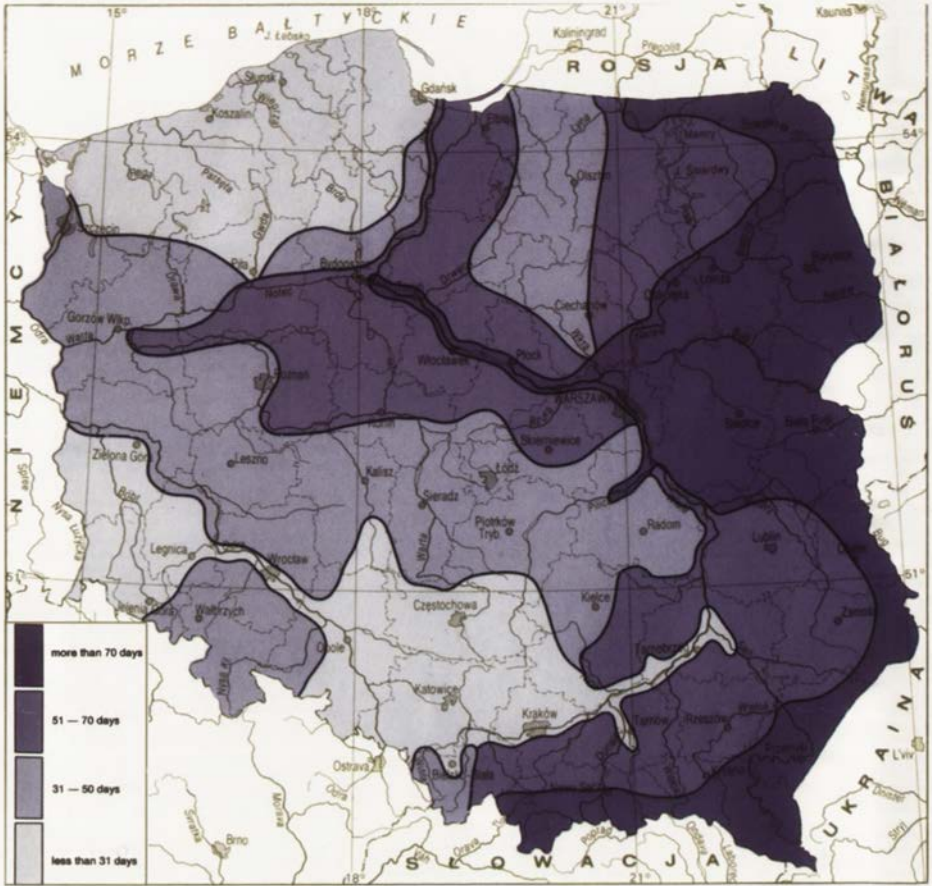


Figure 4. Duration of ice phenomena
(acc. to Gotek J., 1994, *Atlas of the Republic of Poland*, table 32.4.3)

precipitation over the territories of the Czech Republic and southern Poland. During low-water stages, rivers are mainly supplied by underground water. The lowest flows most often occur in summer-autumn periods, as against precipitation deficits and during winter, when negative temperatures predominate.

Ice phenomena (Fig. 4) are usually present in rivers between November and March, though ice cover persists for varying lengths of time (up to 60 days on the Vistula and up to 40 on the Oder). To be

considered unusual is the fact that some sections of tributaries of the Oder (e.g. the Ruda and Kłodnica) and the Vistula (e.g. the Przemsza) have no frozen water at all, something that is associated with contamination by industrial and municipal wastewaters, as well as saline mine-waters and thermal pollution (from power plants).

In general, Poland's rivers are subject to different anthropogenic influences over virtually their entire lengths. Significant fluctuations of water stages necessitat-



Photo 3. Wilczka waterfall in Sudetes

ing flood control activity combined with the requirements of economic (mainly transport-related) uses to justify work beginning in the 19th century on channel-regulation and the establishment of many reservoirs. The latter serve in flood control, water supply, recreation, energetic and indirectly also navigation. The proper functioning of navigation is also supported by numerous canals, which provide for connections between neighbouring drainage basins.

Among the many canals present on Polish territory is the very attractive Augustów Canal ($53^{\circ} 54' N$, $23^{\circ} 16' E$), built in the early part of the 19th century, enjoying monumental status from 1968 on and presently an important tour-

ist attraction. Of similar importance is the Ostróda-Elbląg Canal ($54^{\circ} 04' N$, $19^{\circ} 29' E$) put into use in 1850 as an engineering monument unique on the European scale. The main attractions of navigation along the Ostróda-Elbląg Canal (apart from weirs and safety gates) are some sluices and slide-bar inclined planes, serving the translocation of floating units. Also of navigational importance is the Bydgoszcz Canal ($53^{\circ} 08' N$, $17^{\circ} 47' E$), a channel 25 km long that connects the river systems of the Oder and Vistula. Also designated for navigation are the: Noteć ($53^{\circ} 08' N$, $17^{\circ} 51' E$), Gliwice ($50^{\circ} 22' N$, $18^{\circ} 25' E$), Ślesina ($52^{\circ} 24' N$, $18^{\circ} 21' E$), Łączany ($49^{\circ} 58' N$, $19^{\circ} 41' E$) and Żerań ($52^{\circ} 23' N$, $21^{\circ} 02' E$) Canals. A waterway of major economic importance is the Gliwice Canal (Photo 4) connecting the Oder with the inland port in Gliwice, which assumed the functions of the Kłodnica Canal (built in the years 1792–1822) in 1938. There are also canals defined as melioration canals, which mainly serve in the regulation of water relations, as in the case of the Wieprz–Krzna Canal.



Photo 4. Gliwice Canal in Upper Silesia

Lakes and reservoirs

Lakes in Poland occupy some thousand km², translating into something like a 1% share of Poland. Some lakes have functioned in the landscape for in excess of ten thousand years, while others have a significantly shorter history, being identified with lasting fluvial or slope processes, etc. It is supposed that the a majority of lakes on Polish territory have been in exist-

ence for not longer than 2000 years. The advanced stage of development of the majority of lake bowls ensures that small lakes of up to 5 ha are abundant in the landscape of Poland, whereas the areas of the largest lakes amount to between ten or so km² to more than one hundred km² in the cases of Mamry (104 km²) and Śniardwy Lakes, (114 km²).

The genesis of the majority of lakes in Poland (Tables 2 and 3) is connected

Table 2. The largest lakes in Poland

Lakes	Geographical coordinates		Area [km ²]	Maximum depth [m]
	Latitude	Longitude		
Śniardwy	53° 45' N	21° 43' E	113.8	23.4
Mamry	54° 10' N	21° 42' E	104.4	43.8
Łebsko	52° 51' N	14° 24' E	71.4	6.3
Dąbie	53° 26' N	15° 40' E	56.0	4.2
Miedwie	53° 17' N	14° 53' E	35.3	43.8
Jeziorak	53° 41' N	19° 37' E	34.6	12.0
Niegocin	54° 00' N	21° 47' E	26.0	39.7
Gardno	54° 39' N	17° 07' E	24.7	2.6
Jamno	54° 16' N	16° 09' E	22.4	3.9
Wigry	54° 02' N	23° 07' E	21.9	73.0
Gopło	52° 35' N	18° 21' E	21.8	16.6

Table 3. The deepest lakes in Poland

Lakes	Geographical coordinates		Area [km ²]	Maximum depth [m]
	Latitude	Longitude		
Hańcza	54° 15' N	22° 48' E	3.1	108.5
Drawsko	53° 36' N	16° 10' E	19.6	79.7
Wielki Staw	49° 12' N	20° 02' E	0.3	79.3
Czarny Staw	49° 11' N	20° 04' E	0.2	76.4
Wigry	54° 02' N	23° 07' E	21.9	73.0
Wdzydze	53° 58' N	17° 54' E	15	68.7
Wuśniki	53° 58' N	20° 06' E	1.2	68.0
Babięty Wielkie	53° 43' N	21° 07' E	2.5	65.0
Morzycko	52° 51' N	14° 24' E	3.4	60.0
Trześcińskie	52° 21' N	15° 18' E	1.9	58.8
Pitakno	53° 47' N	21° 09' E	2.6	56.6

with the period of the Pleistocene glaciations (Photo 5 and 6) or processes occurring in the Holocene. The largest number of lakes are of postglacial origin (bring glacial channel lakes, moraine lakes or thaw lakes). These are present within the area encompassed by the last glaciation (in the Lakelands of Pomerania, Mazury and Wielkopolska). There are decidedly fewer lakes in the zone of the old glacial landscape. Lakes in postglacial kettles also occur in the higher parts of the Tatra and Sudety Mts., which underwent glaciation in local places during each successive glacial period. Of another genetic type are the coastal lakes, which exist as a consequence of the evolutionary process by which the alluvial shores of the Baltic Sea accumulated. There are also many ox-bow lakes and meander lakes, which accompany river channels in the majority of valleys across Poland. Karst lakes occur in the Lublin part of the Polesie region. The remaining genetic types of lake are met with only relatively rarely and have an irregular distribution on Polish territory. Among such lakes are naturally-dammed reservoirs, such as the Duszatyn Lakes ($49^{\circ} 19' N, 22^{\circ} 07' E$) in the Bieszczady



Photo 6. Glacial lake Morskie Oko in Tatra Mts.

Mts., which formed when a landslide took place at the beginning of the 20th century. Another example is that of the relict, postglacial Dąbie Lake ($53^{\circ} 26' N, 15^{\circ} 40' E$) or lakes in the Morasko Reserve ($52^{\circ} 29' N, 16^{\circ} 53' E$) near Poznań, which originated in craters left following meteorite impacts.

The last couple of centuries, and especially the last few decades, have seen a large number of artificial lakes (reservoirs) created in Poland, their genesis reflecting direct or indirect effects of human activity (Fig. 5 and Table 4). There are dam (Photo 7), weir and post-exploitation reservoirs and flooded areas occurring in subsiding terrain or collapse depressions, as well as ponds, basins of different kind, settlement tanks, etc. The number of artificial lakes and their total water area



Photo 5. Mikołajskie Lake in Mazury Lakeland

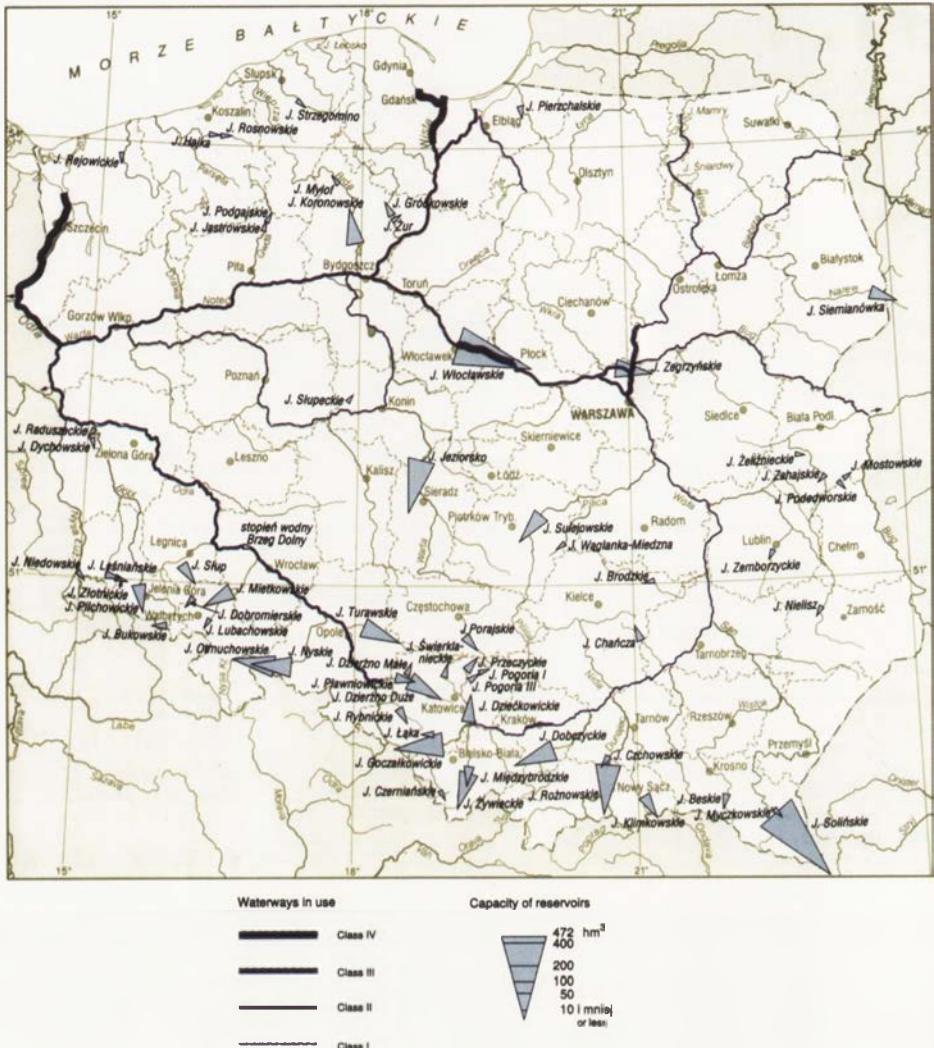


Figure 5. Waterways and retention reservoirs
(acc. to: Z. Babiński, 1994, *Atlas of the Republic of Poland*, table 91.1.1)

within the limits of some regions of Poland permits the identification of whole regions of artificial lakes. Such a situation applies to the Mużakowski Arch on the south-western border of Poland, as well as the Silesian Upland and Oświęcim Basins in the south. Independently of the areas characterized by large concentrations of artificial

lakes, it is possible to identify many reservoirs built in the valleys of larger rivers – eleven such have capacities in excess of 100 hm³ and areas of more than 10 km². The largest of all (the Włocławek Reservoir) covers no less than 70 km².

Where usage is concerned the lakes and reservoirs of Poland resemble one

Table 4. The largest artificial reservoirs in Poland

Reservoirs	Geographical coordinates		Brought into use	Total capacity [hm ³]	Maximum area [km ²]
	Latitude	Longitude			
Solina	49° 20' N	22° 27' E	1968	472	21
Włocławek	52° 36' N	19° 23' E	1970	408	70
Czorsztyn	49° 26' N	20° 16' E	1997	232	12
Jeziorsko	51° 47' N	18° 40' E	1990	203	42
Rożnów	49° 43' N	20° 42' E	1941	169	16
Goczałkowice	49° 56' N	18° 51' E	1956	167	32
Dabczyce	53° 14' N	16° 12' E	1986	125	11
Otmuchów	50° 28' N	17° 06' E	1933	124	20
Nysa	50° 27' N	17° 16' E	1972	114	20
Turawa	50° 43' N	18° 08' E	1948	106	21
Tresna	49° 43' N	19° 12' E	1967	100	10

another in mostly having a multifunctional character. Together with their immediate surroundings they discharge important natural and landscape functions, e.g. as places where birds breed and nest and as shapers of local climate. A relatively large number of reservoirs serve water-storage functions, meeting the needs of industry and the municipal economy, and rarely

also agriculture. The majority of lake bowls serve flood-control tasks and are of tourist and recreational significance. The standing waters put to uses connected with fish farming are also very usual. Another kind of standing water management relates to the production of electricity through the use of objects damming or retaining water for generation and (or) cooling. Their transport



Photo 7. Czorsztyn water reservoir in Pieniny Mts. (Carpathians)

importance is insignificant, within the range of people and means of transport, although they indirectly serve functions connected with transport (the supply with water of navigation routes). Similarly, the winning of mineral resources from lake bowls is of rather marginal significance. To be distinguished within the group of remaining economic functions are: fire fighting, military or defensive, industrial (in relation to settlement tanks of different water types), municipal (to determine the role of reservoirs at purifying stations), etc.

The location of Poland in the zone of a warm temperate climate has impacts on many of the processes occurring in the waters of lakes and reservoirs. In terms of their thermal conditions and dynamics these are mostly dimictic lakes with two periods of whole circulation of the water mass and two stagnation periods i.e. summer anothermy and winter catothermy. Flat water reservoirs are characterized by polymixia and the more frequent occurrence of homothermal cycling. The period of occurrence of ice cover on lakes and reservoirs varies between c. 60 days in south-western Poland and more than 100 days in the far north-east. The icing of bodies of water in the mountains lasts even 160 days per year. The number of the meromictic lakes whose waters never undergo total mixing down to the bottom, is also insignificant. One such lakes in Poland is Czarne Lake in the Drawsko Primeval Forest (53° 10' N, 16° 00' E). The greatest environmental problem in standing waters is an uncontrolled increase in water fertility. Over the last ten years, there has been a significantly increased percentage of eutrophic lakes, and a declining number of oligotrophic and dystrophic lakes. It is

worth mentioning that Poland has very specific – although not numerous – bodies of water defined as acidotrophic, siderotrophic, and even halinotrophic. Natural and anthropogenic transformations of a trophic nature in Polish lakes are documented in lake deposits (usually organic, limy or siliceous). Of greatest importance in the evaluation of environmental conditions in the last glacial and the Holocene are investigations on well-preserved laminated bottom deposits of Gościqz Lake (52° 35' N, 19° 20' E), where thicknesses amount to almost 18 meters in the deepest parts of the bowl, and the maximum age of the deposits is estimated at more than 12,000 years (Photo 8).



Photo 8. Gościqz Lake in central Poland

The baltic sea

The Baltic Sea covers an area of 413,000 km², has a maximum depth of 459 m and average depth of 52 m. It is a mid-continental, flat, shelf sea in northern Europe, which connects through the

system of sounds (the Sound, Small and Large Belts, Kattegat and Skagerrak) with the Atlantic Ocean. Poland is one of nine states located by the Baltic Sea. It occupies the southern coast (Photo 9) with the Gulfs of Gdańsk and Pomerania, the Szczecin and Vistula Lagoons, the islands of Wolin and partially Uznam, and also the Hel Peninsula and Vistula Bar. Located along the Polish coast of the Baltic Sea are some very important port cities like Gdańsk, Szczecin, Gdynia and Świnoujście.



Photo 9. Southern coast of the Baltic Sea

The genesis of the Baltic Sea extends back about 12,000 years, when the last ice-sheets retreated from the territory of the land defined as Fennoscandia. A lack of connection with the North Sea and the occurrence of waters at a lower level than today are typical for the Baltic Ice Lake formed at the frontal part of the retiring ice-sheet. An inflow of water caused the level of the lake water to rise, putting in place the connection with the North Sea and the Yoldia Sea. Around 8000 years ago, the process of glacial ablation led to the unloading and rising up of the Scandinavian Peninsula. The result was the breaking of the connection with the North Sea and the creation of the Ancylus Lake.

After the final melting of the continental ice-sheet (about 5500 years ago), the water level underwent a lowering and the Ancylus Lake obtained a connection with the ocean resulting in its transformation into the Litorina Sea. The present stage of the Baltic Sea's development is defined as the Mya Sea, whose main feature is a flattening of the reservoir and the possibility of its being transformed into a freshwater lake over geological time.

At present, the salinity of the Baltic Sea is differentiated spatially, amounting to between 2–5‰ in the Gulfs of Bothnia and of Finland and some 20–30‰ in the system of sounds separating the Baltic from the North Sea. The relatively low level of salinity is influenced by the inflow of fresh water, as well as by hindered exchange of waters with the open sea. The temperatures of surface waters varies across a wide range from about 0°C to more than 20°C. Ice processes do not take in the central parts of the basin, but rather the gulfs and coastal zones occupied by ice between one month and in excess of 4 months. Within the Baltic Sea, short and steep waves occur. While they are capable of reaching 10–12 metres in height, they do not usually reach 2–3 m. The waters of the Baltic are characterized by the presence of an interesting vegetation (e.g. of sea lettuce, deep-sea tangle, fucus and red algae) and a relatively poor fauna (with, for example, seals, common porpoises, cod, mackerel, herring, salmon, flounder and sprats). An unquestionable hazard for plant and animal development and any pro-ecological use of the Baltic Sea waters is the ongoing pollution of this body of water.

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Soil cover

Marek Degórski

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: m.degor@twarda.pan.pl

General characteristics

Soil cover in Poland is mainly developed from glacial, glaciofluvial and fluvial sediments dating back to the Pleistocene and Holocene. This reflects the presence of ice cover over almost 95% of what is today Poland, at the time of greatest extent of the ice-sheet associated with the Scandinavian glaciation. In the interglacial periods, the lowland and upland parts of the country were covered in a thick layer of glacial, glaciofluvial and fluvial sediments, whose thicknesses reached 250 m in places (Rühle, 1973). Only in the upland areas (as well as the mountains) did some of the older geological sediments remain in part exposed, albeit with the effects of glacial accumulation processes linked with mountain glaciers also being present to a limited extent in the Tatra and Karkonosze ranges.

The onset of the development of today's soil cover in Poland is thus linked with the period of deglaciation and the appearance of vegetation formations. As the ice-sheet melted, the area before it – charac-

terized by periglacial conditions – generated structural and cryogenic soils, which evolved over time as the climate changed and plant cover developed. The present soil cover of Poland is associated with the country's geographical location in the Central European zone of the sub-Boreal belt, in which the climate is temperate, with features transitional between the oceanic and continental. The influence of the oceanic air masses from over the Atlantic becomes less and less distinct as one moves further east. The original Late Holocene vegetation that developed in climatic conditions similar to those existing today created multi-species broadleaved forests (mainly oak-lime-hornbeam forest and oak woods) in fertile habitats, as well as coniferous forest at nutrient-poor sites. Besides the direct impacts of climatic conditions – and the biotic factors associated with them – local conditions also played and continue to play a certain role in the generation of soil cover. These reflect the impact of ground- and precipitation waters, or else are linked with properties of the rock mantle and the allochthonous flows of matter and energy.

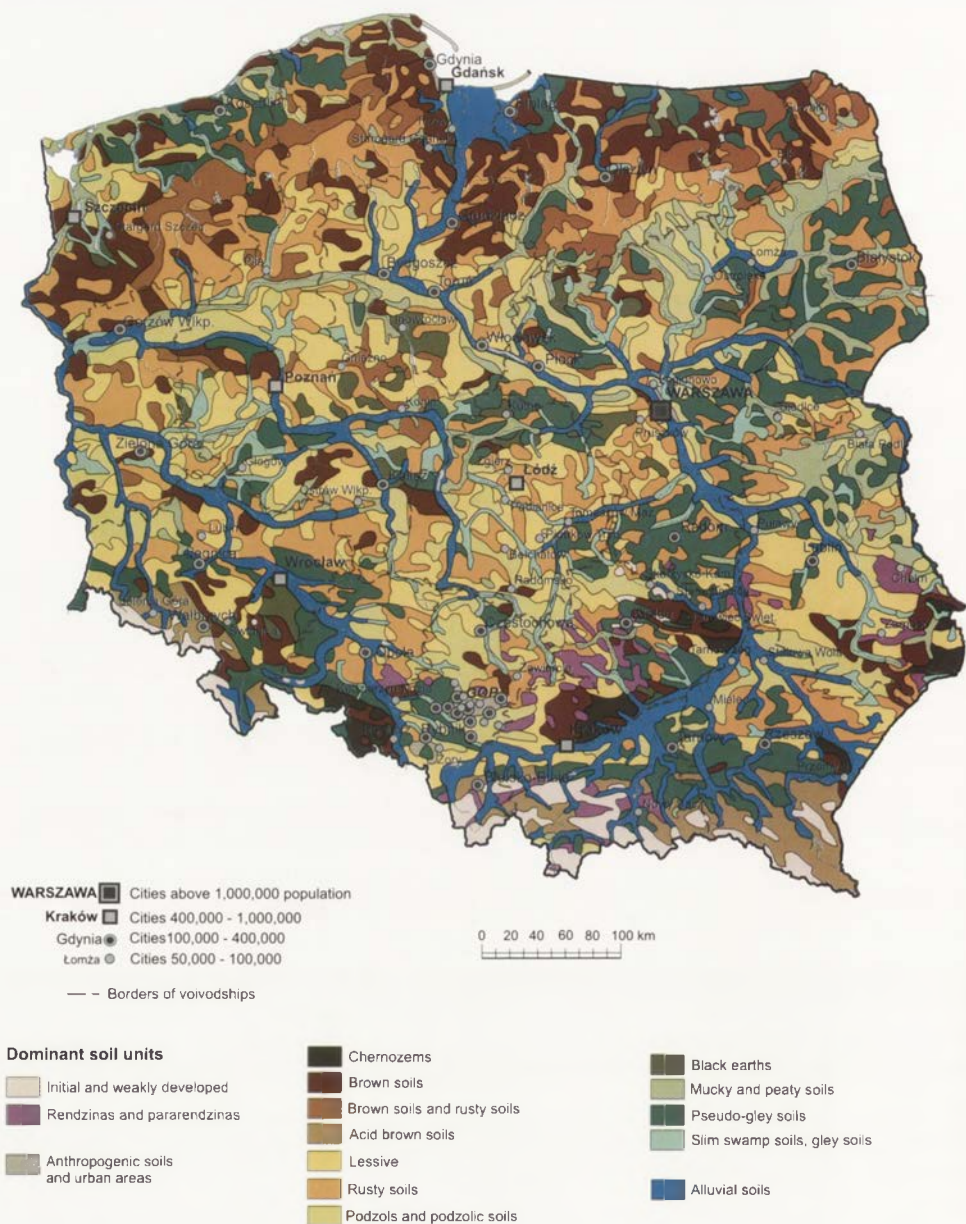


Figure 1. Soils by genetic classification
 (acc. to S. Białosz, 1994, *Atlas of the Republic of Poland*, table 41.1, simplified)

It is for this reason that the contemporary soil cover comprises zonal, extrazonal and intrazonal soils, as well as azonal ones. In line with the genesis and properties of pedons, Poland makes use of the taxonomic categorization of soils devised by the Polish Soil Science Society (*Systematyka Gleb Polski*, 1989). A classification of Poland's forest soils has also been devised (Kowalkowski *et al.*, 2000).

Zonal soils

Corresponding to the climatic conditions and plant cover, the main zonal soils in Poland are brown earths (brown and lessive) – which account for some 51.5% of Poland, and podzolic earths (podzols, podzolic soils and rusty soils), whose share of the total approaches 26%.

Brown earths have developed on heavier lithological formations like clay and silt soils. These offer potential habitat for broadleaved and mixed forests. However, in line with the high level of soil fertility, the forests once growing on brown earths have long since been cut down to make way for cultivated fields. Today, brown soils overgrown with oak-lime-hornbeam or oak stands can only be met with in protected areas, most notably the more or less primeval Białowieża Forest within the Białowieża National Park.

The taxonomic differentiation to the brown earths in Poland provides a basis for the identification here of the true brown soils, the acid brown soils and the lessive soils. The main factors determining whether these given types of soil do or do not occur is the type of substratum from which they have been shaped, as well as the

associated issue of the vegetation present, which has a major influence on such factors as the level of biological activity in a given ecosystem. The presence of typical brown soils (*Eutric Cambisols*)¹ is related to fertile boulder clays and the basal clays of ground moraine, on which the typical forms of oak-lime-hornbeam forest and oak woodland (or more rarely mixed/broadleaved forest) have been shaped. Similar in morphological terms to the true brown soils, the acid brown soils (*Dystric Cambisols*) have mostly arisen from acid rocks like granite, gneiss, coarse-grained sandstones and non-carbonate silts. They thus mainly occur in mountain areas – in the lower montane forest zone, as well as in the lowlands where silica-rich rocks are present. When set against the true brown soils, these are seen to have more limited silt and clay fractions and are of acid reaction throughout their profiles.

In the Polish Lowland, the commonest kinds of parent rock for the lessive soils (*Albic Luvisols*) are the basal clays of ground moraine and sand covered moraine clays. In turn, the southern part of the country has loess or loess-like formations. The characteristic feature of these soils is a duality to granular composition down the soil profile, the boundary most often located some 40–70 cm below the surface. The bilayer structure may arise in various ways, but is most often associated with the cryogenic processes ongoing in the periglacial environment, and above all with the functioning of the zone of regelation, i.e. the cyclical freezing and thawing of the ground. There is a so-called "sandification" of lithological material in the

¹ Given in parenthesis are the names of soils adopted internationally on the basis of the WRB (1998) classification.

active zone. The two layers may also arise from the overlaying of glaciofluvial or fluvial processes upon glacial formation. The very process of leaching via which fawn-coloured lessive soils arise may proceed spontaneously or may (most often) overlap with some already existing duality to the granulometric composition of lithological material (Bednarek *et al.*, 2004). The pedogenic process entailing the transfer of undecomposed colloids from the surface zone of the profile (Et horizon) down to the textural (Bt) horizon leads to the impoverishment of the upper part (as compared with the middle part) where the colloidal silt fraction is concerned. The similar ecological properties of these soils ensures that, irrespective of the genesis of a profile of dual nature (and in reflection of the difficulties with precise field identification of the two aforesaid morphogenetic variants – i.e. that conditioned pedogenically or through a combination of morphodynamic and pedogenic factors), the two are treated together under the Polish soil systematics. On account of the varied colloid content in the different genetic horizons, plowe soils are characterized by marked differentiation of colours. The Et horizon poor in colloids is characterized by a fawn colour, explaining why these soils were formerly identified with podzolic soils (notwithstanding the fact that they arise through the operation of entirely different pedogenic processes). Furthermore, from the point of view of biological properties and natural fertility, they are closer to brown earths than podzolic earths ones (Bednarek *et al.*, 2004).

A second group of zonal soils assigned the rank of order taxonomically are the aforementioned podzolic earths, whose

occurrence is linked with lighter lithological material (Degórski, 2002). They are shaped on poor sands of varying genesis, though most often aeolian and glaciofluvial, i.e. ones covering the terraces of proglacial channels, areas of outwash plains and building dunes, be these coastal or inland. In mountainous areas, the parent rock of the zonal podzolic earths are the wastes from acid crystalline rocks, as well as non-carbonate conglomerates and coarse-grained sandstones (Bednarek *et al.*, 2004). They are classed as poor soils, so their natural vegetation is mainly of coniferous or mixed/coniferous forests, only more rarely mixed forests.

Consideration of the course of the pedogenic processes and soil properties of podzolic earths allow for the identification of three types of soil in Poland, i.e. podzolic soils, podzols and rusty soils. Like that of brown earths, the spatial distribution of podzolic earths is determined by the type of substratum from which the given soil type was developed, as well as the vegetation associated with it.

Podzols (*Densic Podzols*) are characterized by a very high degree of podzolization of soils and by a strongly cemented illuvial (B) horizon or "hardpan". It is usual for the soil profile to be characterized by the presence of the eluvial (E) horizon directly below the organic horizon, which is to say that a well-developed humus (A) horizon is lacking. The best of these soils are developed from quartzite Tertiary sands, as well as the aeolian sands of older coastal dunes. They occupy around 2% of Poland and are almost always overgrown by Scots pine or spruce forest. Their limited resources and other properties make them unsuitable for cultivation.



Photo 1. Podzol (*Densic Podzols*) formed with dune sand on the Baltic coast



Photo 2. Podzolic soil (*Haplic podzols*) in Białowieża Forest

The podzolic soil (*Haplic Podzols*) are most often shaped from loose quartzite glaciofluvial and fluvial sands, often characterized by aeolian remodelling (Degórski, 2002). These soils mainly occur on the surfaces of outwash plains, as well as on both coastal and inland dunes. They cover about 10% of Poland and are very largely forest soils. The characteristic feature of the profile in these podzolic soils is a grey-white eluvial (E) horizon whose colour reflects the bleached quartz grains, and a yellow-brown or rusty-brown illuvial (Bhfe) horizon, whose colour derives from iron oxides, as well as organic-iron-aluminium compounds.

Rusty soils (*Dystric Arenosols*) are shaped from the most fertile sandy formations (e.g. the poor clayey sands), which are characterized by a greater content of dusty and loamy fractions, as well as the presence of aluminosilicates, and hence have physical and chemical properties superior to those of the other types of podzolic earths shaped from loose sands (Bednarek *et al.*, 2004). Their genesis is linked with the development within sandy formations of immobile complexes of humus with sesquioxides, mainly of aluminium and iron. Together with certain amounts of free oxides of Fe and Al, these form rusty coatings around quartz grains (Degórski, 2002). Some authors link the



Photo 3. Fossil podzolic soil (*Haplic podzols*) on Hel Peninsula (coast of Baltic Sea)

main genesis of these soils with the periglacial environment and the cryogenic processes ongoing there (Kowalkowski, 2001). They account for c. 14% of Poland, and resemble other types of podzolic earths in not presenting any more major value where farming is concerned. For this reason, they are mainly now overgrown with forest, though it is possible to come across some small complexes of rusty soil that are used agriculturally. However, it should be stressed that there are many regions of Poland currently under forest that give clear indications of former use in farming (Bednarek *et al.*, 2004).

Extrazonal soils

In Poland, extrazonal soils account for just a little over 1% of the total. They comprise chernozems first and foremost, as well as a very limited cover of cinnamon and grey-cinnamon soils.

The *chernozems* (*Charnozems*) are soils mainly found in the sub-zone of the dry warm temperate climate where features are clearly continental. The natural vegetation by whose agency chernozems arise is of forest-steppe, while the rock from which they are developed is exclusively loess. In line with both the changes in climatic conditions ongoing in Europe and progressing erosion, the area of Poland occupied by these kinds of soils is declining. In fact, they are not capable of developing in the Poland of today, as the prevailing climatic and vegetational conditions are at variance with those required (i.e. those of steppe). A feature characteristic of the chernozems is a humus layer in excess of 40–50 cm thick and sometimes exceeding 1 m. Being among the most fertile of all soils in Poland, the chernozems are almost entirely given over



Photo 4. Relic soil developed in periglacial conditions in Karkonosze Mts. (Sudetes)

to agricultural use. Their main centre of occurrence is in the south, in the Lublin Upland, as well as in the Małopolska region and the sub-Carpathians, plus the Sudety Mountain Foreland.

Cinnamon soils (*Calcariic Cambisols*) and grey-cinnamon soils (*Chromic Cambisols*) are present on the slopes of elevations or large river valleys, in places where there is a high level of insolation and xerothermic vegetation is present. These are zonal soils in the Mediterranean zone, while in Poland they are present extra-zonally and of course only locally, as conditioned by the hydrothermal conditions. In line with their limited areas of occurrence, they are not of economic significance – all the more so since, in line with the presence on them of unique xerothermic grassland communities, they are nearly always located within protected areas.

Intrazonal soils

Intrazonal soils represent about 24.5% by area of those occurring in Poland, and hence determine the overall diversity to the soil cover in different geographical regions and nationwide. In spite of their arising in climatic conditions analogous to those for the zonal soils, they differ from them in having pedogenic processes very much dependent on local conditions, above all the impact of precipitation and groundwater, a regolith different from that typical in our climatic zone (which is to say the sialic), or else the allochthonous enrichment of habitats.

A group of soils arising under the dominant influence of water in the pedogenic process are the hydrogenic and semi-hydrogenic soils. In turn, a group of soils developed on mantle rock other than the sialic are formed by the rendzinas and vertisols, while the soils shaped from

allochthonous or allochthonously-augmented material are alluvial soils and saline soils.

The hydrogenic soils cover some 7.8% of Poland. They comprise hydromorphic soils or half-bog soils, of which more than half are peaty or peaty-muck soils (Bednarek *et al.*, 2004). Their spatial distribution is uneven, in reflection of the large area of lakes and wetlands in the young-glacial landscape of northern Poland, as well as the more maritime type of climate in this part of the country than in the south, and most especially the south-east. The peaty soils (*Histosols*) arise under a wide range of hydrological, ecological and edaphic circumstances (Tobolski, 2003). Via the agency of groundwater of varying degrees of mineralization, it is fen soils that arise. Only where the peat relies solely on nutrient-poor precipitation waters does the characteristic peat of raised bogs begin to accumulate. Also distinguished are the soils of transitional peatlands, whose genesis links up with a water economy with features intermediate between those characterizing fen and raised bog. However, among Poland's peat soils it is those of the fens and transitional peatlands that are absolute dominants, accounting for more than 96% of the total (Ilnicki, 2002). Equally, in connection with the steady trend towards a lowering of the water table that is to be observed in Poland – alongside the deliberate drainage of soil, the hydromorphic soils are experiencing steady transformation into half-bog soils. When transformed, peaty soils become peaty-muck soils.

Semi-hydrogenic soils account for some 2.5% of the total area of soil in Poland. They arose in environments in

which lithological material is of limited permeability or the water table high. They include the gley soils (*Gleysols*) developing where the water table is high, the pseudogley soils on largely-impermeable rocks, through the agency of stagnant precipitation water and the gley podzolic soils, whose profiles are characteristically bilayered, with an upper part featuring podzolization and a lower part gleying. Then there are the black-coloured meadow black earths (*Mollic Gleysols*) arising in habitats with obstructed drainage. These soils, whose share of all soils in Poland exceeds 1%, are among the most important for cultivation in the country, on account of their high fertility. They occur patchily, in areas of ground moraine in which infiltration is obstructed and the groundwater coming in is markedly mineralized and the parent rock is rich in clay minerals, so that clay-humus complexes are given rise to. The characteristic black colour reflects the high content of humus. A sub-type here comprises the muck soils (*Arenic Gleysols*), which have arisen on lighter rocks – mainly in loose sands – and hence cannot rival even the poorest meadow black earths in terms of fertility.

All of the aforementioned semi-hydrogenic soils are of irregular occurrence across the country, being present where local conditions favour their emergence. The types other than meadow black earths are in the main still under vegetation cover.

Among the intrazonal soils whose genesis is linked with a non-sialic regolith from the parent rock are the rendzinas (*Rendzic Leptisols*), which are developed from limestone (in the case of carbonate rendzinas), or from gypsum formations (in the case of sulphate rendzinas). Their presence is

very largely confined to the south – in the upland belt and some of the mountain chains like the Świętokrzyskie, the Beskidy, the Pieniny and the Tatra Mountains. These are mainly fertile soils, if ones that are very hard to cultivate. Their share in the overall soil cover of Poland stands at around 0.9%.

Another specific kind of superficial rock from which intrazonal soils have arisen is the calcium carbonate-rich alluvia left behind by ice-marginal lakes. It is from this parent rock that the smolnitsa (*Pelli-Grumic Vertisols*) have arisen, their morphological nature recalling *czarne ziemie* in the morphological sense. They are characterized by top-down gleying, and above all by the capacity of the soil material to experience changes in volume reflecting the level of humidity. In drought conditions there is a well-pronounced cracking and transfer of organic matter from the surface to the interior (Prusinkiewicz, 2001). These are fertile soils whose occurrence is linked with the areas of the large ice-marginal lakes present here as the ice sheet underwent deglaciation in the northern part of what is today Poland.

The most important inland soils developing from allochthonous material, or else allochthonously on the basis of the enrichment of habitats are associated with alluvial and saline soils.

Alluvial soils (*Fluvisols*) have been shaped from river sediments containing both mineral and organic sedimentary material. The natural vegetation taking part in their pedogenesis is riparian forest. These soils are fertile, and so have been much used in agriculture. The occurrence of alluvial soils is obviously then linked with the valleys of the large rivers, though the

greatest complex of all is in the Vistula Delta area. Overall, the alluvial soils account for around 5% of all Poland's soils.

Only accounting for a much smaller share of overall Polish soil cover, and being local in character, are the saline soils arising with the constant involvement of salty groundwater. The presence of chlorides in the soil solution ensures that it is a vegetation in which halophytes are well represented that participates in the pedogenesis. The occurrence of saline soils is also linked with exposures of rock salt in the Kujawy area, as well as gypsums in the Nida Trough.

Non-zonal soils

Non-zonal soils are first and foremost characterized by the lack of a well-developed profile, which is to say that they are soils in the initial stage of development. Thus included among them are the initial soils, as well as the weakly-developed ones. Such soils account for around 2% by area of overall Polish soil cover.

Among the initial soils, the main types present in Poland are the lithosols (*Lithic Leptosols*), which is to say the shallow soils generated from the regolith of rock massifs in the mountains, as well as the regosols (*Regosols*), i.e. the initial soils developed from loose rocks in conditions in which the rates of morphodynamic processes (degradation and aggradation) exceed those of the pedogenic processes, as in coastal areas, on dunes, etc.

As lithosols develop, they pass into a further stage of their evolution known as the ranker (*Umbric Leptosol*). These have most often developed on the quartz-silicate rocks of the Carpathian or Sudety mountain massifs. In turn, the analogous



Photo 5. Ranker (*Umbric Leptosols*)
in Sudetes

developmental stage for the regosol is the arenosol (*Ochric Arenosol*). Developed from loose material, these differ from the regosol in the great thickness of the humus horizon.

Also included among the non-zonal soils are those arising through anthropogenic factors. Among these, the largest share is that taken by the hortisols (*Hortic*), i.e. those developing under the long-term impact of agrotechnical measures and most often occurring in the vicinity of the large agglomerations. The so-called urbisols cover land that has long been built up, and are present in parks, squares and cemeteries; while the industriosols are the soils of areas in which industries – above

all extractive industries – have developed markedly. Poland's largest shares of urbisols and industriosols are to be found within the soil cover of Upper Silesia.

The threats to and sanitary state of Poland's soil cover

On account of their multifunctional – both ecological and economic (Degórski, 2003) – nature in the environment, and the major role they play as indicators of the state thereof (Degórski, 2005), soils are among the environmental components arousing the greatest public concern. From the point of view of quality of life, an interest is expressed not only in the edaphic value of soil cover, but also in the natural and anthropogenic threats that first and foremost involve the sanitary state of soil.

A negative factor limiting the edaphic value of soils is the potential threat posed to them by erosion, as well as contamination by heavy metals. A potential threat posed to agricultural soils by aeolian (wind) erosion extends over some 86,300 km² of the country, which is to say some 27.6% of all farmland, while 10.3% faces a moderate or severe threat (*Ochrona Środowiska* 2005). The most serious situation when it comes to the potential threat posed by wind erosion is noted in the central and south-eastern regions of the country, in which soils are shaped from formations of high dust-content, i.e. loesses or rocks of glacial accumulation often transformed by way of periglacial processes.

There is also a serious potential threat posed to agricultural and forest land by erosion due to the surface runoff of water.

Some 89,100 km² of Poland is subject to this phenomenon, or 28.5% of the overall area of agricultural or forest land. 14.7% faces a moderate or severe threat (*Ochrona Środowiska*, 2005). Where the areas in agricultural or forest use are concerned, the largest shares potentially erodable by water are present in the young-glacial, upland and mountain regions, i.e. those areas in which there are major differences in the elevation of the terrain and steep slopes.

An undoubtedly positive attribute of Poland's soil cover is its very good sanitary state. The contents in soils of the main heavy metals (i.e. lead, zinc, copper, nickel and cadmium) are very low, ensuring that almost 98–99% of the total area of agricultural and forest land falls within contamination groups 0 or I, i.e. those whose soils have nothing more than natural background contents of heavy metals. In turn, soils suffering from level IV or V contamination with heavy metals are of very local occurrence, being confined to the vicinities of plants processing ores of the coloured metals (*Ochrona Środowiska*, 2005).

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Poland's flora and fauna

Jan Marek Matuszkiewicz

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: jan.mat@twarda.pan.pl

The historical conditioning of Poland's living world

The Polish state as confined within its 1945 borders may be said to occupy a position at more or less the geometric centre of the European continent (Fig. 1). Here, the contemporary climate today is a temperate one with features regarded as transitional between the oceanic and the continental. Together with the climate and vegetation present through the Holocene period, the present climate has conditioned the set of natural types of vegetation and associated biocoenoses that occur. As almost all of the country was under ice-sheets at one point or another during the last glaciation, the vegetational history in the region is indeed a rather short one. That said, the last major glaciation (known as the Vistulian) extended over "just" 1/3 of present-day Poland, not unnaturally in the northern part of the country, and most especially the north-west. Nevertheless, while it is true to say that the whole country was not actually under ice that last time, a polar desert was anyway in place, and this remained even after the ice retreated.

Only with time was tundra vegetation able to take hold, giving way subsequently to a sparse woodland in which Scots pine *Pinus sylvestris* and birches *Betula* played the main role. It was this kind of situation that was holding sway as what we refer to as the Pleistocene was followed by the Holocene. A more precise history of Poland's vegetation may be sought through consideration of a representative example.

Thus, more or less in the centre of Poland, in the Vistula Valley downstream of Warsaw lies Gościąg Lake, in the vicinity of both Płock and Włocławek. When studied, the lake was found to contain layered sediments of an exceptionally regular, undisturbed nature. Annual layers to the sediments could therefore be counted, and palynological analysis carried out. This has allowed the floristic composition of the vegetation nearer to or further away from the lake in particular years to be determined.

The Gościąg Lake area was subject to the Vistulian glaciation, the lake itself forming as the ice-sheets retreated. Thus, the deepest-lying sediments dating back to the later Pleistocene are dominated by

the pollen of such tundra species as *Betula nana*, *Juniperus communis*, *Carex sp.*, *Artemisia sp.* and others). The pollen of pine, and of birches of the tree habit (as opposed to dwarf species) were rather quick to appear. After that, the further history of the Holocene may be divided into 7 periods (Ralska-Jasiewiczowa *et al.*, 1998), as presented in Table 1.

were in essence due mainly to human impacts. In this respect, the proportions between species noted from the palynological analysis make it clear that far-reaching changes in vegetation (entailing the conversion of forests into fields and meadows) were taking place in Central Poland in the late Roman era. There was then something of a resurgence of for-

Table 1. Holocene changes in the vegetation of central Poland on the basis of palynological analyses of sediments from Lake Gościqz (as compiled from the data by M. Ralska-Jasiewiczowa *et al.*, 1998)

Age cal BP	Age BC/AD	Duration [years]	Main species	Selected accompanying species	Human impact
11 530–10 530	9 580–8 580 BC	1 000	<i>Pinus sylvestris</i> , <i>Betula sp.</i>	<i>Populus tremula</i> , <i>Salix sp.</i> , <i>Ulmus sp.</i> , <i>Filipendula sp.</i>	None
10 530–9 850	8 580–7 900 BC	680	<i>Pinus sylvestris</i> , <i>Betula sp.</i> , <i>Corylus avellana</i>	<i>Populus tremula</i> , <i>Ulmus sp.</i> , <i>Quercus sp.</i>	None
9 850–8 130	7 900–6 180 BC	1 720	<i>Corylus avellana</i> , <i>Alnus sp.</i> , <i>Pinus sylvestris</i> , <i>Betula sp.</i>	<i>Ulmus sp.</i> , <i>Quercus sp.</i> , <i>Tilia sp.</i> , <i>Fraxinus excelsior</i>	Very minor
8 130–5 900	6 180–3 950 BC	2 230	<i>Alnus sp.</i> , <i>Pinus sylvestris</i> , <i>Betula sp.</i> , <i>Corylus avellana</i> , <i>Quercus sp.</i> , <i>Ulmus sp.</i>	<i>Fraxinus excelsior</i> , <i>Tilia sp.</i> , <i>Populus tremula</i> , <i>Pteridium aquilinum</i> , <i>Calluna vulgaris</i>	Minor
5 900–3 750	3 950–1 800 BC	2 150	<i>Quercus sp.</i> , <i>Alnus sp.</i> , <i>Corylus avellana</i> , <i>Pinus sylvestris</i> , <i>Betula sp.</i>	<i>Fraxinus excelsior</i> , <i>Tilia sp.</i> , <i>Ulmus sp.</i> , <i>Calluna vulgaris</i>	Moderate
3 750–1 075	1 800 BC–875 AD	2 675	<i>Pinus sylvestris</i> , <i>Betula sp.</i> , <i>Alnus sp.</i> , <i>Quercus sp.</i> , <i>Carpinus betulus</i>	<i>Corylus avellana</i> , <i>Fraxinus excelsior</i> , <i>Tilia sp.</i> , <i>Ulmus sp.</i> , <i>Gramineae</i> , <i>Calluna vulgaris</i>	Variable, major in some periods
1 075– -35	875–1 985 AD	1 110	<i>Pinus sylvestris</i> , <i>Betula sp.</i> , <i>Alnus sp.</i> , <i>Quercus sp.</i> , <i>Gramineae</i> , <i>Secale cereale</i>	<i>Carpinus betulus</i> , <i>Corylus avellana</i> , <i>Ulmus sp.</i> , <i>Populus tremula</i> , <i>Salix sp.</i> , <i>Calluna vulgaris</i>	Growing, from moderate to very great

The palynological analysis gives us reason to believe that the main set of flora native to Central Poland was already in place around 3500 years ago. It was then that hornbeam (*Carpinus betulus*) spread in, ensuring the presence of all the most important species forming natural communities today. Most subsequent changes

est following the period of the "migration of peoples". After that, in connection with the arrival of new tribes (the Slavs), a process of synanthropization of vegetation *inter alia* involving a decline in forest cover began to get underway, and was to continue uninterrupted, leaving aside some minor fluctuations.

It needs to be borne in mind that this scenario for vegetational history does not hold fully true for all of Poland. More than 2000 years ago, for example, the north-west experienced the onset of an expansion of beech (*Fagus sylvatica*), while spruce (*Picea abies*) – which is not present in natural conditions in Central Poland – experienced alterations in range in the north-east and south.

The main types of natural or anthropogenic plant community

In general terms, the types of natural vegetation recognised from Poland are mostly within the limits of the broadleaved and mixed forest formations. It is assumed that the primary vegetation (i.e. that present before humankind ushered in intensive change) consisted largely of forest communities. Likewise, non-forest types are the exception rather than the rule when

the so-called potential natural vegetation of Poland is considered, with a view to the current trends in vegetational dynamics being described (Matuszkiewicz *et al.*, 1995). They are confined to such special situations as the high mountains, the coast or some kinds of wet peatland.

While the natural vegetation types obviously represent a very important means of characterizing the living world, it has to be recalled that human activity has in fact made these a rarity, it being far more common to come across vegetation more or less subject to weaker or stronger human influences.

The natural forest communities of Poland are represented by 59 basic types termed "associations" (Matuszkiewicz, 2001). Among these, the ones of greatest significance from the point of view of area (potentially) occupied are the broadleaved oak-hornbeam forests (Photo 1) whose stands mainly comprise the oaks *Quercus robur* and *Q. petraea*, hornbeam (*Carpinus betulus*) and lime (*Tilia cordata*), with an admixture



Photo 1. Oak-hornbeam forest

of other species like *Acer platanoides* and *Fraxinus excelsior*, and more rarely *Ulmus glabra*, *Ulmus minor*, *Betula pendula* and *Populus tremula*, and in some regions also *Fagus sylvatica*, *Abies alba* or *Picea abies*. A wide variety of herbaceous plants are also to be met with in these forests. A feature of nearly all of these, as well as of the trees and shrubs in the other layers, is the loss of the assimilatory apparatus (i.e. leaves) during winter. Thus, the period of spring prior to the development of oak and hornbeam leaves is characterised by the luxuriant development of ground-cover "geophyte" species, i.e. those that have over-wintered below ground as bulbs, corms, rhizomes, tubers, etc. Only a relatively short time later, most of these species have ended their annual cycle and effectively "disappeared" once more. Their place is then taken by others, such that the woodlands in question change their species composition from season to season in a manner quite visible to the observer. Some of the differences are large enough to justify the identification of three regionally-developed associations, i.e. *Stellario-Carpinetum*, *Galio-Carpinetum* and *Tilio-Carpinetum*. Indeed, the oak-lime-hornbeam forests form a vegetation type typical of Central Europe as a whole, extending from the Atlantic through to the edge of the Urals. However, they tend to be best-developed and most widespread in Poland – the centre of their range. This was therefore the type of forest most often met with across the lowlands (i.e. most of Poland), but also in some of the uplands and even the lower-level parts of the mountains (to something like 500 m a.s.l.). They were almost always present in the more-fertile eutrophic or mesotrophic habitats. However, the attractiveness of this kind of habitat from the agricultural point

of view ensured that strong pressure was exerted on the communities it sustained from the earliest times. The result has been deforestation of much of the area originally occupied by oak-lime-hornbeam forest, and its replacement by agricultural land, be this arable fields or meadows. Even where forests remained in place or have been restored, these are very often not the natural associations expected, since forestry was long enamoured with conifers like Scots pine and spruce. As a result, even fertile habitats still under tree cover are only in their small minority supporting fragments of forest community of more or less natural features today.

Nonetheless, a certain amount of oak-lime-hornbeam forest has been maintained, and can be met with in each larger region of the country. There are even certain limited areas (like that of the famous Białowieża Primeval Forest in the east) in which the communities are locally both widespread and diverse.

In the west, and in mountainous areas between 500 and 1000 m a.s.l., the oak-lime-hornbeam forests are partially or (at elevation) wholly replaced by types in which beech (*Fagus sylvatica*) plays the dominant role (Photo 2). In these circumstances, it may often be the sole species forming the stand. Nevertheless, the spectrum of beech forests from the point of view of habitat is diverse, taking in fresh habitats ranging from the eutrophic to the moderately oligotrophic (nutrient-poor). In each case, this type of vegetation needs to be seen first and foremost as Atlantic in character, meaning that its easternmost limits are reached in Poland. Also Atlantic in nature are the acidophilous oak-beech-birch forests confined to western Poland.



Photo 2. Beech forest

Lowland parts of Poland also naturally supported coniferous (first and foremost Scots pine) forests (Photo 3), which were present on the nutrient-poor sands mostly put in place through glaciation. Where the habitat was slightly richer, the pedunculate oak (*Quercus robur*) was also present in the stand, while in the north-east of Poland stands generally had and have an admixture of spruce (*Picea abies*). In the communities in question, mosses play a major role, as do such dwarf shrubs of the heather family as bilberry (*Vaccinium myrtillus*), cowberry (*V. vitis-idaea*), heather itself (*Calluna vulgaris*), etc. While forests with Scots pine occupy oligotrophic habitats, these vary markedly from the very dry through to the fresh, the wet or even the boggy. Such a gradient is thus associated with a whole series of different plant associations, i.e. *Cladonio-Pinetum*, *Leucobryo-Pinetum*, *Peucedano-Pinetum*, *Molinio-Pinetum*, *Empetro-Pinetum* and *Vaccinio uliginosi-Pinetum*.

Pine forest habitats are not of interest to farmers today, and that explains why a great part of them are currently under forest communities and subject to forestry management. Pine forest is representative of the boreo-continental type of vegetation, for which Poland constitutes an extreme western outmost. Still more boreo-continental in nature are the spruce forests present rather rarely in north-eastern Poland.

The valleys of the larger and smaller rivers and streams are habitat for different kinds of wet and marshy forests represented by a whole series of associations. The main species forming stands here are: alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and several species of elm (*Ulmus*), and more rarely poplars (*Populus alba* and *P. nigra*) and willows (*Salix alba*, *S. fragilis*), or birch (*Betula pubescens*).

The vegetation of the Sudety and Carpathian Mountains is configured into altitudinal zones. The foothills zone



Photo 3. Pine forest

extends up to 500 m a.s.l. or so, and is home to the oak-hornbeam forests and other communities present in the lowland, albeit in a specific form. Extending above these is beech (often beech + fir) forest characterizing altitudes to 1000 m a.s.l. in the Sudety Mts. and 1100–1200 m a.s.l. in the Carpathians. Above that – to altitudes around 1250 m a.s.l. in the Sudety Mts. and 1350–1550 m in Carpathians – is the zone of spruce forest which forms the treeline in most Polish mountain chains. The treeline is actually present at differing altitudes in particular ranges, tending to correspond more or less with the isotherm for mean annual temperature equal to +2°C. Beyond that is sub-alpine vegetation dominated by the dwarf mountain pine (*Pinus mugo*)

with its shrub habit, and then high mountain meadows and the rocky summital zone.

Forest communities together occupy more than 30% of Poland, though only a fraction of the total is near-natural in character. Indeed, a great many forests are in the nature of “tree farms”, mainly with conifers and much of the time with just two species thereof (Scots pine and Norway spruce). Away from forests, the territory of Poland is very much dominated by agrocoenoses, though these are not always the simplified structures one might expect, since many are spatially and typologically complex configurations in which communities of annual herbs (otherwise known as “weeds”) co-occur with the cultivated species, along with communities of perennial herbs and shrubs in field-boundary areas. Also linked spatially with the agrocoenoses are the ruderal communities associated with extensively-used areas (the areas around buildings and along roads and pieces of land laid fallow). Being intimately associated with human activities, the agrocoenoses are mainly composed of anthropophytes, i.e. species that came in along with people.

To be considered between the natural communities (mainly of forest) and the manmade segetal and ruderal ones are the many and varied semi-natural communities, mostly made up of native species but present on account of ongoing human activity of a more or less intensive nature. The most important group of semi-natural communities are those of grassland, meadows and pasture, as well as various kinds of reedswamp. Communities of this kind range from the sandy grass-

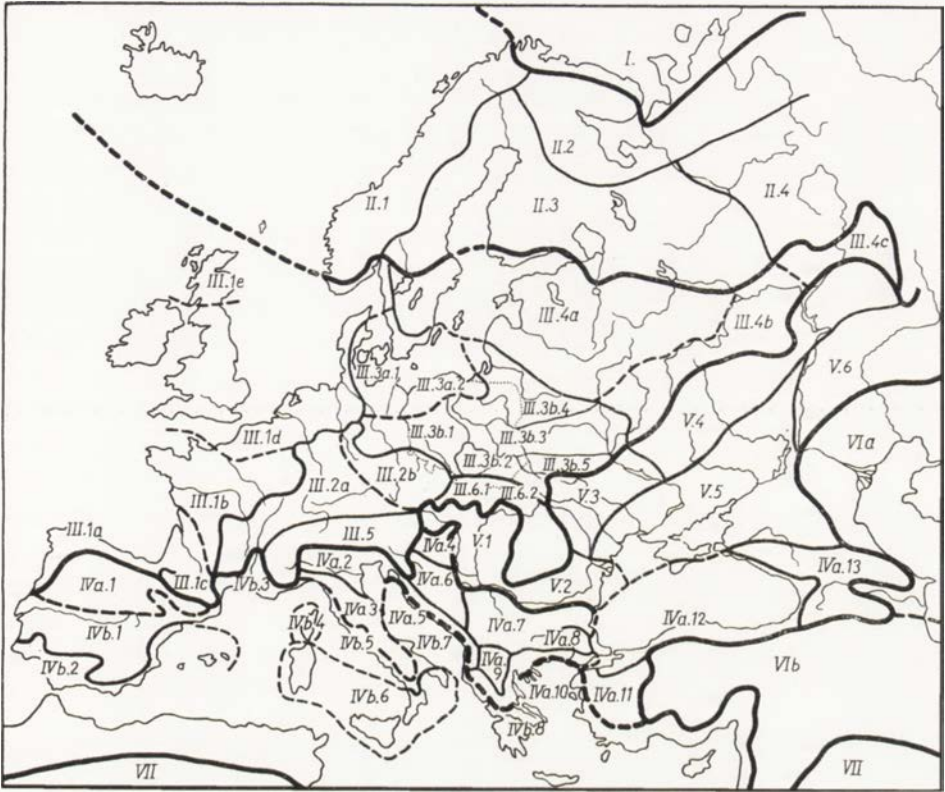


Figure 1. Location of Poland as set against the geobotanical division of Europe (acc. to Matuszkiewicz, 1993). I – Arctic Area, II – Boreal Euro-Siberian Area, III – Area of European Broadleaved and Mixed Forests, IV – Mediterranean Area, V – Euro-Siberian Steppe Area, VI – Irano-Turanian Area, VII – Saharo-Sindian Area. Poland is entirely located within Area III

lands of class *Sedo-Scleranthetea*, via the fresh and wet mown meadows of class *Molinio-Arrhenatheretea*, and the sedgeland of class *Scheuchzerio-Caricetea nigrae*, through to the marshland and aquatic reedswamp communities of class *Phragmitetea*. Notwithstanding their to some extent “artificial” status, these communities have many prized (often protected) native plant species associated with them, and are indeed effective carriers of biodiversity in general.

The diversity of plant communities, or what we owe to a location in the centre of a continent

A glance at a map of the division of Europe into geobotanical regions (Fig. 1) makes it clear that Poland is about at the centre of a large region known as the Area of European Broadleaved and Mixed Forests which extends from the Atlantic in the west through to the Ural Mts. in the east. Such a location ensures that the

vegetation of Poland includes community types representative of many distant regions.

Thus, alongside many communities that are Central European in character (like the aforesaid hornbeam forests), Poland – or at least some parts of it – can also boast:

- sub-Atlantic-type communities, e.g. of lowland beech forest or poor oak-beech woodland;
- markedly continental communities, such as different type of pine forest;
- Boreal-type communities, as represented by the spruce forests of north-eastern Poland;
- communities associated with Eastern Europe's forest-steppe zone, like some of the light oak woodlands and meadow-steppe communities;
- certain near-Mediterranean communities.

Altogether, Poland has some 366 plant associations, i.e. defined typological units characterizing plant communities (phytocoenoses). These associations are very diverse in terms of their key features. Alongside those rich in floristic composition, with patches supporting in excess of 100 species for example, there are those comprising just a couple of species – or in extreme cases even just one. There are reported to be most associations of a species-poor nature: c. 100 with 1–10 species in a patch and a further 100+ with 11–20. Only 14 of the communities can be regarded as truly rich in species (with more than 50 in an average patch).

The list of plant communities referred to above includes both the natural and the anthropogenic; communities destroyed by human activity, neutral in the face of it or very much dependent on it. On the basis

of the analyses of the list of associations that has been conducted, it can be stated that:

- more than 25% of associations are closely linked with specific human impacts,
- around 55% of the natural or semi-natural associations are largely independent of human activity,
- almost 20 % are natural associations very much confined by human activity.

The associations of vegetation also differ very markedly when it comes to their frequency of occurrence in Poland. While around 12% of the total can be thought of as common, and while a further 5% are at least common over certain more sizeable regions of the country, as many as 37% can only be considered of moderately frequent occurrence (plus another 23% that are moderately common in given regions). Beyond these are as many as 22% of the total array of associations that are represented by a genuinely small number of sites in the country.

Poland's biological diversity at the species level

The latest data suggest that some 60,108 species of living organism have been reported from Poland (Andrzejewski and Weigle, 2003). These belong to the two over-arching systematic groups sometimes termed "Super-Kingdoms", i.e. *Procarvota* (comprising bacteria and blue-greens) – 1945 species and *Eucaryota* (comprising plants, animals, fungi and protists) – 58,163 species. The latter includes the Plant Kingdom (*Vegetabilia*) with its 16,720 species, and the Animal

Kingdom (*Animalia*) with 35,368 (see Fig. 2). However, the division lines between these main groups of organism are not unequivocal, some taxa being included in one or the other main group in relation to the particular context of a particular study. For example, the group of algae takes in both taxa of the Plant Kingdom (*Vegetabilia*) and blue-green algae (*Cyanophyta*), which are conventionally assigned to the prokaryote group *Procaryota*.

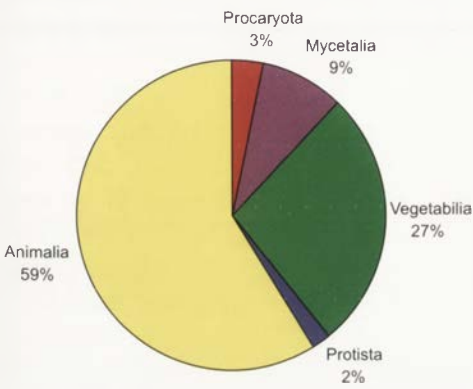


Figure 2. Shares taken by the living world's main systematic groups where Poland's biological diversity at the species level is concerned.

A characterization of the Polish flora

The flora (i.e. the combined set of plant taxa) of Poland comprises more than 20,000 species (Table 2), if lichens and blue-green algae are included (Andrzejewski and Weigle, 2003). This represents in excess of 1/20 of the world flora.

A decided majority of the flora is in the form of lower plants, mainly algae (Fig. 3). The higher vascular plants (*Lycophytina*, *Sphenophytina*, *Pterophytina*, *Pinophytina* and *Angiospermae*) are represented by just 2935 species, or 14.6% of the national flo-

ra. Poland's vascular-plant flora represents more or less 1% of the analogous world flora.

Table 2. The systematic diversity of the Polish flora and its role in the world flora

Systematic group	No. of species in Poland	% of the world flora
Lichens (<i>Lichenes</i>) included within the Kingdom Fungi (<i>Mycetalia</i>)	1 738	12.9
Algae (including blue-greens)	14 497	42.7
<i>Cyanophyta</i>	1 647	82.4
<i>Rhodophyta</i>	220	4.0
<i>Euglenophyta</i>	650	81.3
<i>Dinophyta</i>	400	20.0
<i>Bacillariophyceae</i>	3 100	31.0
<i>Chlorophyta</i>	4 170	47.8
<i>Telomophyta</i>	3 870	1.3
<i>Marchantiophyta</i>	234	3.3
<i>Anthocerotophyta</i>	4	1.2
<i>Bryophyta</i>	697	8.7
<i>Lycophytina</i>	13	1.4
<i>Sphenophytina</i>	10	66.7
<i>Pterophytina</i>	52	0.5
<i>Pinophytina</i> *	10	1.7
<i>Pinophytina</i> **	16	2.7
<i>Angiospermae</i> *	2 405	0.9
<i>Angiospermae</i> **	2 844	1.1
ALL PLANTS	20 105	5.8

Among the almost 3000 species of vascular plant, around 2500 are native, while almost 500 are anthropophytes now naturalised "for good". Beyond that is a certain number of (500+) species of cultivated plant.

Where certain species enter a new environment in an abrupt and "aggressive" manner the term "invasive" is applied. Poland currently has several tens of invasive

species, mostly of North American origin. While some of these do not actually induce more significant changes in the phytocoenoses they encroach upon, others certainly can bring about changes. An example of the latter case would be the small balsam (*Impatiens parviflora*), which is now spreading into broadleaved and mixed forests across the country.

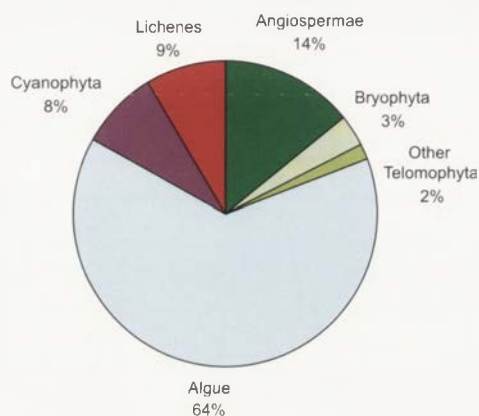


Figure 3. Share of the Polish fauna taken by members of the main systemata groups

When set against other European countries, Poland might be said to have a moderately rich flora – as a reflection of the location mid-way between the floristically-rich areas of the south and the impoverished flora of the Arctic regions. Doubtless the flora would be richer if current climatic conditions were slightly more favourable, and above all if whatever wealth of species this area possessed in the Tertiary had not been erased entirely with the repeated advances and retreats of the ice-sheets during the Pleistocene. Unlike North America, Europe has mountain ranges running east-west, which made it impossible for the floras of northern and

central Europe to “escape” south as the ice sheets advanced, and then to return north in the inter-glacial periods.

Faunal richness

In Poland, the Animal Kingdom (*Animalia*) extends to more than 35,000 documented species, though experts maintain that the true number could exceed 47,000 (R. Andrzejewski and A. Weigle 2003). Among the recognised species, some 31,000+ – or as much as 80% of the fauna – are arthropods (*Arthropoda*). All other phyla (18 in total) are much less well-represented. There are 1253 kinds of nematode (*Nematoda*), 852 species of flatworm (*Platyhelminthes*), 545 spp of rotifer (*Rotifera*), 314 spp of annelid (*Annelida*) and some 666–706 species of chordate (*Chordata*). The biggest group among the latter comprises the birds. Poland’s share of the avifauna worldwide might be considered relatively large, while its role as regards the global diversity of fish, amphibia and especially reptiles is very limited.

Overall, the Polish fauna is determined by:

- a temperate-zone location for which broadleaved and mixed forests were the main original constituents of the landscape,
- a mainly “inland” character of the country, which is also largely lowland,
- the predominantly “open” nature of the area where migrations (especially E-W migrations) are concerned,
- a marked degree of anthropogenic transformation of fauna, plant cover and associated biotopes in comparison with the original situation, if with numerous fragments in a near-natural condition still preserved.

Table 3. Richness of Poland's chordate fauna (*Chordata*)

Systematic group	No. of species in the Polish fauna	% share of world fauna accounted for
Tunicates (<i>Tunicata</i>)	4	0.2
Jawless fishes (<i>Agnatha</i>)	4	8.0
Other fishes (<i>Actinopterygii</i>)	89–129	0.5
Amphibians (<i>Amphibia</i>)	18	0.5
Reptiles (<i>Reptilia</i>)	9	0.1
Birds (<i>Aves</i>)	435	4.8
Mammals (<i>Mammalia</i>)	105	2.3

Characterization of a selected faunal group – the mammals

105 wild-living species of mammal have been reported from Poland, these representing 8 Orders. In terms of numbers of species, the best-represented of these are the rodents (Order *Rodentia*) with 38 species, and the bats (*Chiroptera*) with 22. The theriofauna includes both native species and those of alien origin brought in by human agency, as well as species favoured by and associated with human activity, and those harmed by it. There are species of very limited range and widespread ones; species that are rare and even endangered, common species and invasive aliens. Furthermore, the relationships in question have changed down the years. A series of examples might be useful at this stage.

The rodents include many common species, most especially those associated with human activity, like mice, voles and rats. There are nevertheless rodents (and rodent-like lagomorphs) whose numbers and ranges have changed markedly in recent years. For example, the hare (*Lepus*

europaeus) has been a very common species of forest and field, but has declined considerably in recent years.

Generally associated with steppe areas, the suslik (*Spermophilus suslicus*) has long had a Polish range confined to the Lublin area of the south-east. However, during the 1950s its population declined steadily, with a confinement of the area occupied, notwithstanding the strict protection extended to the species. Unfortunately, the suslik may disappear from Poland altogether, even though it would not seem to be under any particular anthropopressure.

A large rodent, the alpine marmot (*Marmota marmota*), is present in the upper parts of the Tatra Mts. The natural range of this species is perforce limited, since its sub-alpine and alpine habitat exists in just a few places. Away from the Tatras it is only present in the Alps. In the first half of the 19th century, this was a species close to extinction, on account of its fat being prized in folk medicine. It persisted thanks to the strict protection afforded it as early as in the 19th century. However, its population in the Tatras remains so small (at just 150–200) that its extinction at any time remains a genuine threat.

A characteristic element of the primaeval terrestrial-aquatic fauna in the forest zone is the beaver (*Castor fiber*), another species once on the verge of being eradicated from post-War Poland. In this case, however, efforts at reintroducing it under strict protection have been fully successful, allowing the population across the country to rebuild. Today, it is the large (rather than small) numbers that may be giving cause for concern, since damage

is inevitably being done to agriculture, forestry and hydrotechnical installations. The removal of the protected species status is now being considered in this case.

There are currently 8 species of large hoofed herbivore. Very widespread are the roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*) and red deer (*Cervus elaphus*), as typical representatives of Europe's forest fauna. Their populations are roughly speaking stable, and have long been subject to sustainable hunting.

Another characteristic faunal element in the forests of the Holarctic is the moose or European elk (*Alces alces*). Here was another species whose population emerged from the Second World War in a decimated state. Indeed, the only remaining stronghold for moose at that time was in the Biebrza Marshes. Once again, however, an all-out reintroduction campaign has allowed the numbers to rebuild successfully.

The chamois (*Rupicapra rupicapra*) resembles the marmot in being confined to the very limited area of the upper elevations of the Tatra Mountains, and in having been subject to protection for a long time now. This has not saved the population from the very real threat of extinction, however.

Introduced ungulates from southern Europe are the fallow deer (*Dama dama*) and mouflon (*Ovis ammon musimon*), game animals which have both been in Poland for around 200 years now, and are present in several different parts of the country.

The one-time "king of the forest" in the primaeval landscape of Poland (and elsewhere) was the European bison (*Bison bonasus*) (Photo 4). Prized by hunters,

it became a great rarity as time passed, ultimately becoming confined in the 18th and 19th centuries to the Białowieża Forest. It was preserved as a target for hunts engaged in by the Kings of Poland-Lithuania, and later the rulers of Imperial Russia. When this old order was cast aside by the First World War, the bison population plummeted to extinction. Since this was the only wild population left anywhere in the world, a complex reintroduction effort had to be launched using individuals remaining in private menageries and zoos. Again, though, the success has been sufficient to ensure that Poland now boasts several free-living herds of European bison, albeit as elements of a rather inbred population. Another great bovine of Europe's forests – the aurochs (*Bos primigenius*) was not so lucky, the death of the last individual not far from Warsaw in the 17th century marking the extinction of the species as a whole. Also extinct is the wild forest horse known as the tarpan (*Equus gmelini*) (Pgoto 5). In truth, the last two species did not so much disappear as become incorporated into rather closely-related livestock species.



Photo 4. European bison (*Bison bonasus*)

Poland's greatest carnivore is the brown bear (*Ursus arctos*), which is present in small numbers in the Carpathians.

The population is maintaining itself well under protection, while those of the wolf (*Canis lupus*) and lynx (*Lynx lynx*) – hunted until not so long ago (indeed with the aim of eradication in the case of the wolf until around 40 years ago) – are likewise now under protection and showing more favourable trends. The fox (*Vulpes vulpes*) is a widespread and common predator, while its distant relative the raccoon-dog (*Nyctereutes procyonoides*) was introduced in countries to the east and has spread into Poland. Other smaller carnivores include the badger (*Meles meles*), polecat (*Mustela putorius*), pine and beech martens (*Martes martes* and *M. foina*), stoat (*Mustela erminea*) and weasel (*M. nivalis*).



Photo 5. Tarpan (*Equus gmelini*)

It was only in the 1930s that Poland lost the European mink (*Mustela lutreola*), while only rather later did that escaped species from fur-farms the American mink (*M. vison*) appear. The latter species is now exerting a serious impact on riparian biocoenoses, limiting numbers of water-birds and hindering the reintroduction of its native cousin.

A beautiful amphibious carnivore is the otter (*Lutra lutra*), which enjoys protection and is gradually recovering in numbers.

Finally, the waters of the southern Baltic Sea were traditionally inhabited by two marine mammals: the porpoise (*Phocoena phocoena*) and the grey seal (*Halichoerus grypus*). Both remained relatively common up to the 1930s, only to decline subsequently to the point where the porpoise is met with only occasionally, while the grey seal has abandoned its old colonies along the Polish coast (though individuals are now being seen here more and more frequently once again).

Poland's most precious items of animate nature

As they have developed and progressed, human beings have come a long way from the stage at which they were still a constituent part of nature. As a result, areas like Central Europe have had their original environment changed out of all recognition. It is for this reason that exceptional attention is today paid to any fragments of the environment in which the degree of transformation is relatively limited and at least some testimony to the original conditions is given.

It has only been relatively recently that we have become aware of just how important an aspect the diversity of nature is, and therefore – as a society – taken action to protect that diversity. It is the twists of fate, as well as the courageous actions of those who long ago began to realise the need for nature conservation, that we owe the number of natural objects in which the vegetation and fauna appear in a natural state to this day. The objects in question may now be decisive where the retention of biological diversity and preservation

of natural ecosystems are concerned. It needs to be stressed at this point just how unique what we have under management in Poland is, on the European scale – what we would class as the exceptional “treasures of Polish nature”.

The Białowieża Forest – a forest complex of primeval characteristics exceptional in Europe

The complex twists and turns of history have bequeathed to us something very exceptional – a large, contiguous complex of lowland forest of a natural character presenting a series of primaevial features. The area in question is the renowned Białowieża Primeval Forest, and its importance lies first and foremost in:

- the persistence of forest in the same places over a very long period of time,
- the compact nature of the complex and relatively more limited anthropopressure being imposed here, as opposed to on other forests across the European lowland,
- the floristic and faunistic richness, considerable habitat diversity and development of whole complex landscapes in a near-natural state,
- the relatively long period of full protection and good level of scientific understanding of the greater part of the Forest lying within the Białowieski National Park.

Anyone wishing to know what the broadleaved forests of Central Europe looked like in their original state should visit the Białowieski National Park, with its stands of complex age structure in which trees several hundred years old fall and provide a gap for specimens of the younger generation.

Lowland river valleys remaining untransformed – ecological corridors still subject to spontaneous natural processes

Something else of exceptional value that Poland has to offer Europe from the natural point of view is the relatively-untransformed lowland river-valley, of which there are several well-known examples in the shape of the Vistula, lower Bug, Narew and Biebrza. Being backward in their development, the regions in which these valleys lie have not done much to regulate them, allowing something that might once have been treated as negative to be seen as a virtue and highly-valuable feature from our contemporary viewpoint.

The unregulated valleys of the large rivers in question do support much-changed, far-from-natural vegetation (deprived of the true riparian forest), but are nevertheless very specific landscapes in which the share of spontaneous vegetation representative of early successional stages is particularly large. The course of a braided and meandering river (most especially the middle course of the Vistula) offers nesting grounds for many species of wading bird that require stretches of sandy beach separated from the “mainland”. A considerable portion of all Europe’s resources of this kind of habitat are to be found along Poland’s unregulated Vistula river.

In turn, the peatlands along the undrained river valleys (of the Biebrza and Upper Narew in particular) play a huge role, with their mire and sedgeland habitats. These environments and their specific vegetation types are important breeding grounds and living areas for a host of animal species, above all birds. The late-spring view of hundreds

of lekking male ruffs (*Philomachus pugnax*) alongside a range of other migrating waterbirds that the Biebrza and Narew National Parks can afford offer an insight into just what kind of damage has been done to nature among all those other regulated rivers and drained marshes in almost the whole of the rest of Europe.

The living world in traditionally-managed agricultural areas

Also to be viewed as precious where biodiversity conservation is concerned are the plant communities adapted to defined forms of land use. Foremost among these in Poland are the weed communities of fields still subject to traditional forms of cultivation. On account of changes in those methods, the communities in question are now disappearing steadily in Poland (having to a very large extent gone already from other European countries). Indeed, Poland itself has already lost communities of the weeds of flax cultivation. Nevertheless many of the other communities of this type are still hanging on in some regions, thereby attesting to ways in which humanity once co-existed with nature.

A plant cover and fauna not only subject to degradation and downward trends

The several centuries of more intensive economic development have certainly imposed many changes where this part of Europe's flora and fauna are concerned, and in general the result has been the disappearance of many natural

and semi-natural biocoenoses, as well as homogenization of landscapes, a reduced distinctiveness of regional floras and faunas and the extinction of species. Together with the loss of specific, rare or relict communities, the overall effect has been a decline in biological diversity. Where all these negative processes are concerned, the last few post-War decades can be said to have made their own especially distinct mark. The relevant analyses and negative assessments of the processes referred to have already appeared and are beyond a shadow of doubt in the minds of both specialists and ever wider ranks of society. Yet recent years cannot be said to have brought nothing but bad news – i.e. ongoing degradation. Positive trends have also been noted – to offer some hope for the future. Perhaps the most important change involves the growing public awareness of the importance of the natural environment and of society's responsibility for nature in the country.

Further favourable changes where flora and fauna are concerned include:

- the marked increase in the number and extent of National Parks, Nature Reserves and other protected areas,
- a new approach in forestry that takes much more account of the need to restore forests (and indeed the landscape as a whole) to a more natural state,
- the continuing increase in the area of Poland under forest,
- an abatement of the pollution of the atmosphere and surface waters,
- the combining of efforts to protect selected species and ecosystem types EU-wide (above all via the network of NATURA 2000 protected areas).

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Areas of particularly valuable natural features enjoying legal protection

Bożena Degórska

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: bodego@twarda.pan.pl

Particular features of Polish natural space

Polish territory is characterized by two features favourable to biodiversity: a relatively diverse natural environment and rather more limited anthropogenic transformations than have taken place in Western European countries. Poland can also boast the presence of both plants and animals, and types of ecosystem, that are rare or even endangered overall. The high biodiversity reflects the overlap of many of many factors of a geological, morphogenetic, climatic, hydrographic and pedogenetic nature, as well as those connected with land-use. The diversity of the landscape is mainly associated with the location of Poland at the point of contact between the geology of Western Europe with its mosaic-like structure, and the Eastern European Platform. However, it also reflects the prolonged presence of the Scandinavian ice-sheet over what is now Poland, its legacy being a well-preserved system of progla-

cial channels, as well as, in the northern part of the country at least, a very much diversified lakeland landscape making reference to the extent of the Vistulian glaciation. Connected with (but extending beyond) this is a further specific feature of Poland, namely its E-W beltlike distribution of relief, beginning in the far south with the belt of mountains, which gives way to the Pre-Carpathian basins and then to a line of uplands. To the north of those are the old-glacial plains and then the young-glacial lakelands. Last – and furthest north – is the coastal belt along the shore of the Baltic Sea. Yet further features of relevance to the matter in hand include the location of Poland at the centre of Europe, the diversity of biotopes, the lack of any significant geographical barriers between the aforesaid coast and mountains in the far north and south respectively and the overlapping oceanic and climatic climates. All of these factors combine together to ensure the penetration of Polish territory (and inter-digitation thereupon) of geographi-

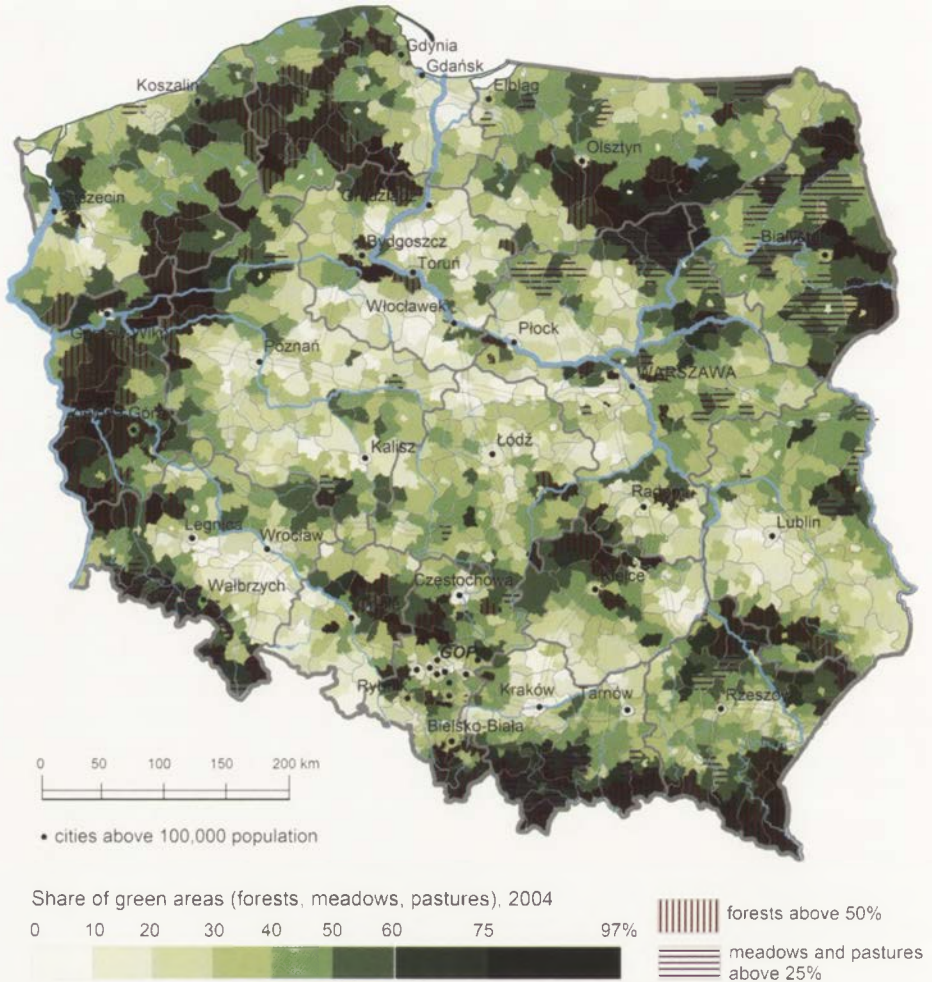


Figure 1. Share of green areas (forests, meadows, pastures) by gminas (communities), 2004 (by Bożena Degórska and Przemysław Śleszyński)

cal elements of vegetation representative of sub-Atlantic, continental, sub-meridional and boreal communities, as well as the presence here of range limits of many species of significance in forming habitats, and hence of entire plant communities of importance (after Matuszkiewicz, 1999). Overall, then, Poland has high biological diversity occurring at the ecosystemic, landscape, species and genetic levels.

Also to be mentioned as key features determining the particularly valuable attributes of Poland in the overall European context are: the occurrence of large forest complexes (Fig. 1), the limited degree to which the country's valley landscapes have been modified, and the abundance and diversity of peatland ecosystems (Fig. 2). The latter type of ecosystem occupies 4% of the country as a whole (Jasnowski,



Figure 2. Occurrence of largest peat deposits
(acc. to S. Żurek, 1994, *Atlas of the Republic of Poland*, table 42.4.3)

1978). 89% of this is fen, but there are also some transitional peatlands and raised bogs (Jasnowski, 1975). Their distribution is uneven, with the main area of occurrence being the north, plus Polesie in the east and south-east (Fig. 2). Peatlands are particularly associated with the belt of young-glacial lakelands, there being 36 per 100 km² on average there, as compared with the national average figure of 15 per 100 km² (Żurek, 1987).

Away from the mountains, the areas of most natural landscape are in the north-

east – in reflection of the presence there of so much forest, as well as meadow or pastureland (Fig. 1). Overall, this part of the country has been dubbed – with good reason – the “Green Lungs of Poland”. This functional region has no less than 47% of its area under the aforementioned kinds of land-use (Degórska, 2002), albeit with an even higher figure for forest cover in the western part (Fig. 1).

A very major contribution made by Poland to Europe-wide and global natural heritage reflects the occurrence in the

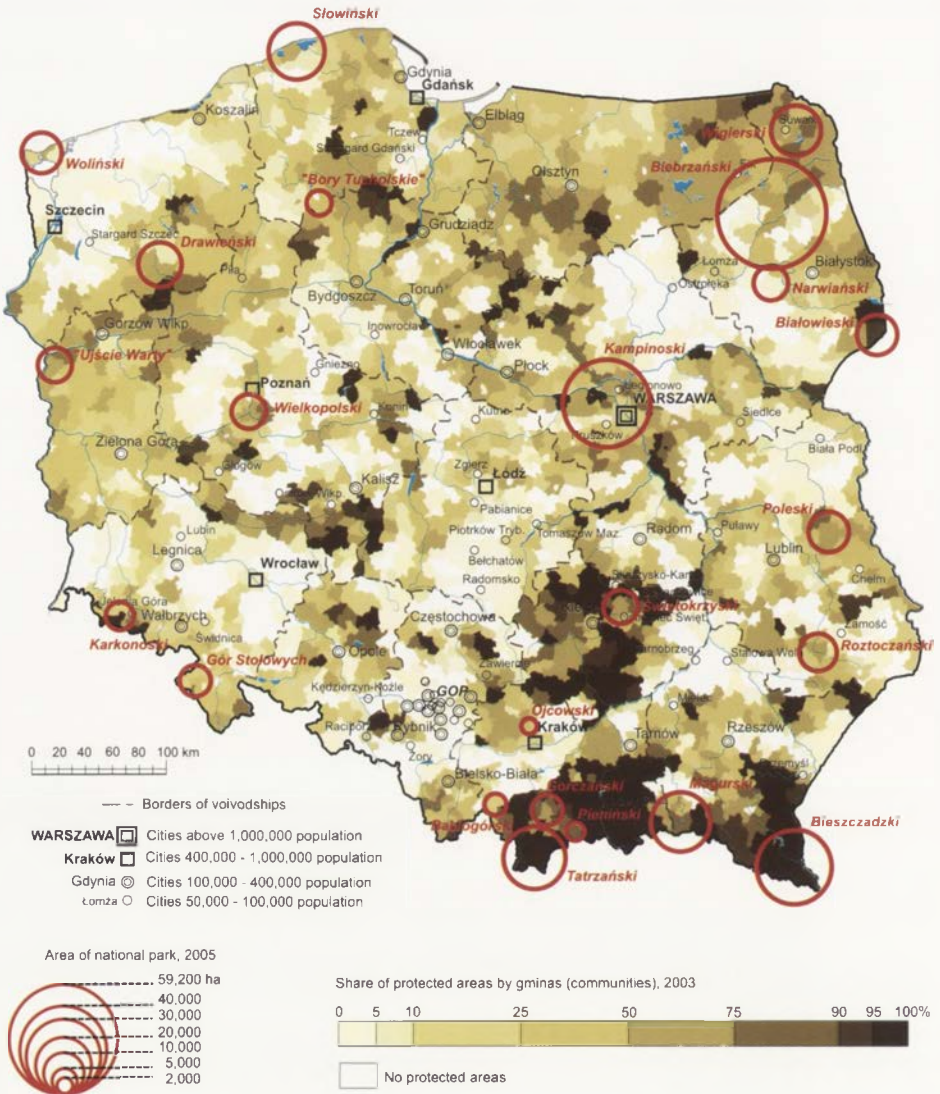


Figure 3. Protected areas (by Przemysław Śleszyński)

north-eastern part of the country of large contiguous complexes of near-natural/little-modified forest complexes, including some regarded as the last fragments of primeval forest in the lowland part of

Europe (Photo 1). Apart from the most valuable fragment of all – the Polish part of the Białowieża (Belovezhskaya) Forest, there are also a number of other residual examples of the kind of wild forest known

as *puszcza*, notably Puszcza Augustowska, Knyszyńska, Romincka, Bukowa, Piska, Biała, Kampinoska, Nadnotecka, Solska, Niepołomicka, Świętokrzyska, Sandomierska, Sudecka and Karpacka. Most of these can at least boast large contiguous areas of forest that have been subject to the same use on a more or less permanent basis. A further particularly valuable natural feature of Poland is the degree to which river valleys remain in a natural state, with very long stretches not subject to regulation. The most valuable of all the river valleys – in most cases following the courses established by the glacial meltwaters – are the Biebrza Valley, the valleys of the Upper and Lower Narew, the Lower Warta Valley, Bug Valley and the middle section of the Vistula – Poland’s largest watercourse widely dubbed the “Queen of Polish Rivers”. The valleys of the Biebrza, Noteć, Tyśmienica, Krzna and Odra also play host to Poland’s largest peatlands (Fig. 2).

As has been noted, Poland’s natural space – transformed to only a relatively limited degree away from the most highly-urbanized regions – constitutes a Polish contribution to world and European natural heritage. The preservation down to the present day of many valuable natural areas has been favoured by the still-extensive nature of much of the country’s agriculture, most especially in the north east. A second major factor is the limited spread of the more environmentally-burdensome industries (above all the extractive industries) which remain concentrated in a rather small number of areas of the south and south-west. Furthermore, the natural heritage has remained in a good state, defended against degradation through the

establishment of what is now a very well-developed system of nature protection.

The protection of Poland’s most precious habitats and landscapes

Nature conservation goes back a long way in Poland. As early as in the 11th century, King Bolesław Chrobry introduced a ban on the hunting of the beaver (*Castor fiber*), in addition providing that its places of habitation be protected. In turn, the mid-14th-century period under King Kazimierz the Great saw the first bases for the legal protection of forest resources put in place (Denisiuk, 1977).

It was in the late 19th and early 20th centuries that a start was made to the establishment of nature reserves for conservation purposes. The Pamiątka Pieniacka NR in the Podole region of what had traditionally been Polish lands was established in 1886. The first reserve on what is still Polish territory today was the Baranowiec NR, set up in 1903 in the Beskid Sądecki range of hills (Denisiuk, 1977).

The story of the National Parks in turn stretches back to 1932, when those in both Białowieża and the Pieniny Mountains were set up. The greatest numbers of both National Parks and Nature Reserves were founded in the years 1950–1960.

The last three decades of the 20th century were characterized by a very intensive development of both the forms and areas enjoying legal protection (Figs. 5 and 6). In the 1970s (following a widening of the range of categories of protected area to include Landscape Parks and Areas of Protected Landscape), the configuration

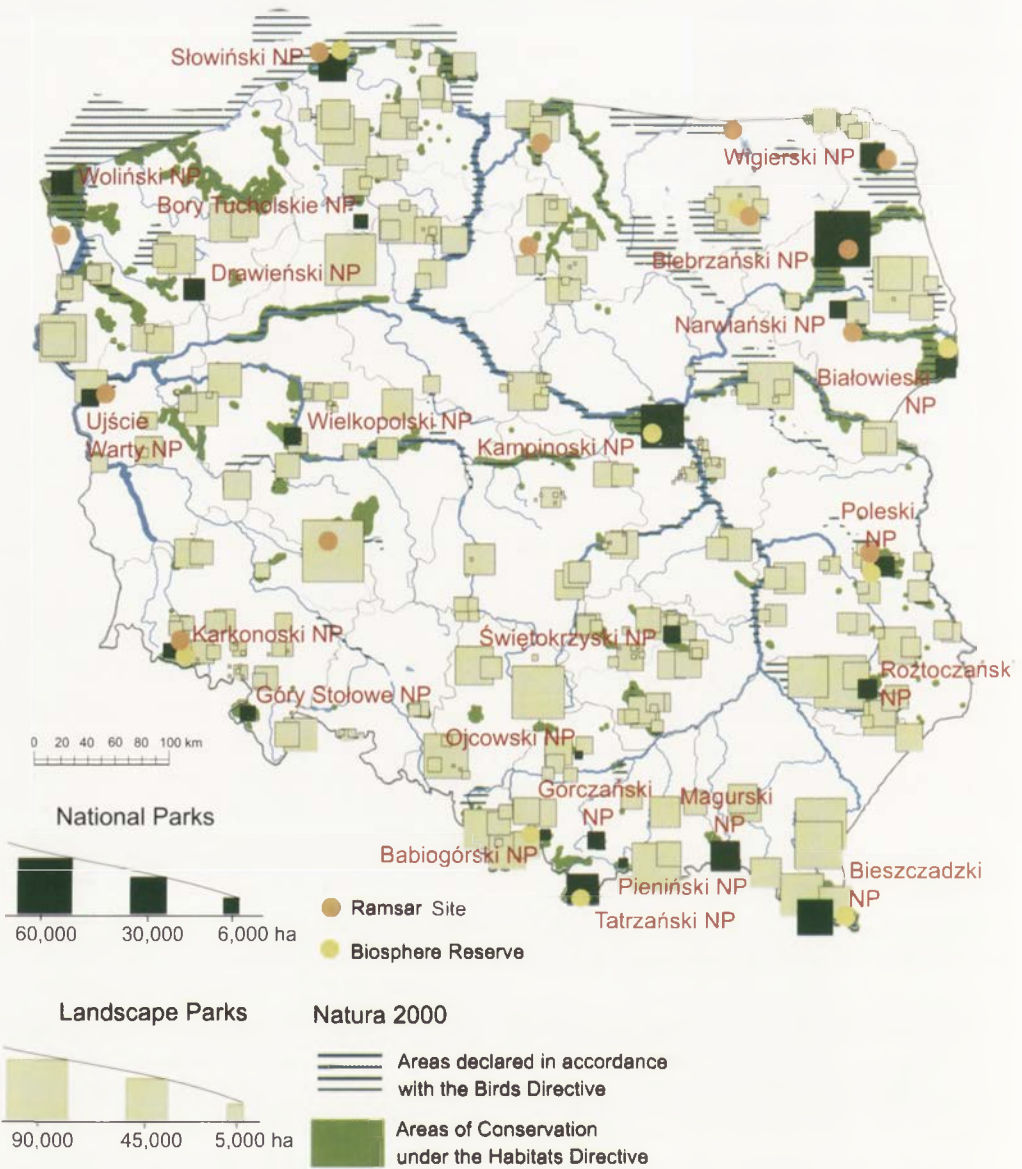


Figure 4. Mainly protected areas (by Aleksandra Deręgowska)

of these was so designed as to ensure spatial cohesion through the Ecological System of Protected Areas (ESOCh). Under the system, the function of ecological corridor was mainly to be played by the Areas

of Protected Landscape. It was at that time that the foundations of a very modern approach to nature protection were laid.

1991 saw three new forms of nature protection enshrined in law, i.e. the Area



Figure 5. Legally protected areas of unique environmental value, 1960–2004 (acc. to data from *Ochrona Środowiska*, 2005)

of Ecological Utility, the Documentation Site and the Nature and Landscape Complex. Though many of these have been established, their total area does not exceed 0.4% of the country (Fig. 6). Thus their establishment has had only a slight effect on the total area enjoying legal protection, but has nevertheless provided for the preservation of a very large number of small, but naturally-valuable areas. In the last decade of the 20th century, Poland also began work on creating the ECONET-POLSKA network, itself an integral part of the European Ecological Network (ECONET).

The beginning of the 21st century brought first a curtailment of the previously-intensive process of creating new protected areas, and then even a small decline in area in the years 2003 and 2004 (Fig. 5), this mainly being attributable to reduc-

tions in the area encompassed by Areas of Protected Landscape (Fig. 6).

As of 2004, the list of areas and objects enjoying legal protection extended to (Table 1): 23 National Parks, 1385 Nature Reserves, 120 Landscape Parks, 445 Areas of Protected Landscape, 115 Documentation Sites, 6177 Areas of Ecological Utility and 177 Nature and Landscape Complexes, together accounting for some 33% of Poland (Figs. 9 and 10). These were augmented by as many as 34,385 Monuments of Nature (*Ochrona Środowiska*, 2005), while many kinds of plants, animals and fungi were also under species protection.

The newest forms of the areal protection of nature – enjoying legal status since May 2004 – fall within the network of *Natura 2000* areas. The establishment in Poland of a *Natura 2000* network that would constitute part of the Europe-wide

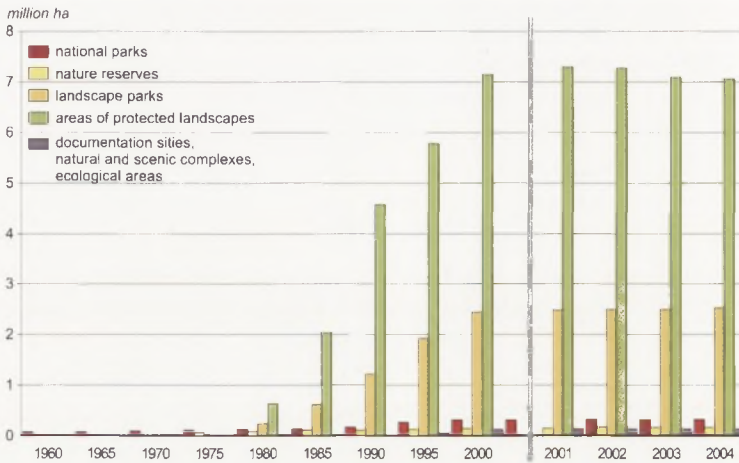


Figure 6. Natural areas by legally-recognized forms of protection, 1960–2004 (acc. to data from *Ochrona Środowiska*, 2005)

Table 1. Area of particularly valuable natural features enjoying legal protection, 2004

Forms of legally protected areas	Area in thousand ha	In % of total area of the country	In % of total protected area	In sq. m per capita
National Parks	317.4	1.0	3.1	83
Nature Reserves	162.4	0.5	1.6	43
Landscape Parks	2 517.2	8.1	24.7	659
Areas of Protected Landscape	7 042.6	22.5	69.3	1 845
Ecological Areas	42.6			
Documentations Sites	0.8	0.4	1.3	34
Natural and Scenic Complexes	85.3			

Source: *Ochrona Środowiska*, 2005.

system of the same name is now the priority task where action to protect nature is concerned. The legal bases are provided by the so-called "Birds Directive" (Council Directive 79/409/EEC of 2nd April 1979 on the Conservation of Wild Birds) and the Habitats Directive (Council Directive 92/43/EEC of 21st May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora). Poland is obliged to put in place this system of areas linked by ecological corridors, in this way estab-

lishing a functionally-cohesive ecological network. Its task will be to maintain biological diversity through the protection of the most valuable and rarest elements of nature, but also to safeguard the more typical forms and still-widespread natural formations characteristic of the given biogeographical region. The Ministry of the Environment has designated 256 areas for the *Natura 2000* network, of which 184 – covering 3.6% of Poland – are Special Areas of Conservation under the Habitats

Directive, and 72 – covering as much as 7.8% of the country – are Special Protection Areas declared in accordance with the Birds Directive (Fig. 4). The majority of these sites already enjoy protection as National Parks, Landscape Parks, Nature Reserves or Areas of Protected Landscape. Some of the *Natura 2000* area are SPAs and SACs simultaneously. Work is ongoing on the designation of new areas, as well as on the expansion of the network to include areas from the NGO list.

For several decades now, Poland has been part of international efforts to coordinate different countries' actions where nature conservation is concerned. One of the first significant instruments to set international standards for this was the Ramsar Convention of 1971, which deals with the protection of wetlands of international importance especially as waterfowl habitat. It was in 1978 that Poland joined the Convention, which recognises wetlands and their fauna and flora as a shared world asset whose loss would do irreparable harm. The Ramsar List of wetlands includes 13 sites in Poland, i.e. the Biebrzański National Park, Wigierski (Wigry Lake) NP, Poleski NP, Narwiański (Narew) NP and Słowiński NP, as well as Łuknajno Lake, Świdwie, Karaś and Siedmiu Wysp, the Stońsk Reserve (now forming part of the Ujście Warty or Warta Mouth NP), Drużno Lake, the Milicz Fishponds and the sub-alpine blanket bogs in the Karkonoski (Karkonosze Mountains) NP (Fig. 4). Under the Convention, state-parties are obliged to protect, not only those sites listed, but also any other valuable wetland areas on their territories.

The world's most important piece of international law in regard to biodiversity

is the Convention on Biological Diversity, or CBD, which was signed at the Rio Earth Summit in 1992. It came into force in Poland in 1996, its aim being to protect the said biodiversity, to ensure the sustainable utilization and management of all its elements, and to ensure a just division of the benefits deriving from genetic resources.

On becoming a Member State of the EU, Poland also committed itself to implementing the aforementioned *Natura 2000* programme, which itself makes reference to the European Community's obligations arising from the Rio CBD. Thus, the establishment of the network in question is the duty of each EU Member State, the Directives concerned being in the nature of hard law, financial penalties being likely should there be persistent non-compliance.

Among the other international conventions ratified by Poland in this sphere there is the *Convention concerning the Protection of the World Cultural and Natural Heritage*, to which Poland has been party since 1976. The most tangible result of this is the World Heritage List, which includes a number of cultural sites in Poland, as well as a single natural site in the shape of the Białowiecki (Białowieża Forest) NP. Then there is the 1979 Bonn *Convention on the Protection of Migratory Species of Wild Animals* (binding in Poland since 1996) and the 1992 Berne *Convention on the Conservation of European Wildlife and Natural Habitats* (binding since 1996). Maritime issues come under the Helsinki *Convention on the Protection of the Marine Environment of the Baltic Sea* (in force here since 1980), while Poland also ratified the *European Landscape Convention* of the Council of Europe in 2004.

Alongside its domestic legal activity are the various international initiatives Poland has joined with a view to nature being protected and research on it carried out as a matter of priority. One of the most spectacular results of this cooperation includes the devising of the aforementioned concept for a national ecological network known as *ECONET-POLSKA*¹, as well as the inclusion of particularly valuable protected areas on Polish territory within the network of MAB Biosphere Reserves².

The concept of a nationwide ecological network known as *ECONET-POLSKA* was devised in the years 1995 and 1996, as a research project of the National Nature Plan (NNP), within the framework of the European Programme of the International Union for the Conservation of Nature (IUCN). Uniform assumptions underpinning a Pan-European network known as *EECONET* (or the European *ECOLOGICAL NETWORK*) were adopted, along with a methodology as regards identification and designation of sites. *ECONET-POLSKA* is a large-scale system of node areas best preserved from the natural point of view and representative of different natural regions across the country, as linked together by ecological corridors that ensure the continuity of natural linkages within the system (Liro *et al.*, 1995). The *EECONET* system makes close reference to the Convention on Biological Diversity (1992), as well as the Council of Europe's *Pan-European Biological and Landscape Diversity Strategy* (1995). While not enjoying binding status, the concept has nev-

ertheless been adapted for incorporation within the so-called *Concept for a National Spatial Management Policy* in Poland, as well as the physical development plans in existence at the level of its 16 voivodships (provinces). The *ECONET-POLSKA* system accounts for as much as 46% of the country, comprising node areas and linking corridors, these being designated on the basis of such criteria as naturalness, diversity, representativeness, rarity and size. A total of 78 node areas have been designated (46 international + 32 domestic) – covering a total of 31% of Poland; as well as 110 ecological corridors (38 international and 72 domestic) – which together account for 15% of the country (Liro *et al.*, 1995).

Poland has been a participant in UNESCO's international Man and Biosphere (MAB) Programme since 1972. This interdisciplinary program seeks to research the relationships between people and their environment, creating the scientific bases that can underpin the rational utilization and protection of the resources of the biosphere. As part of the Programme, the so-called Biosphere Reserves are created – these including ecosystems representative of the world's main biomes, or important to the given country for other reasons (Brey Meyer, 2005). The Reserves serve as centres for research and monitoring, as well as in the carrying out of other observations proposed by "MAB" (Battiste, 1982). The simultaneous accomplishment of both protection and management is made possible by the specific spa-

¹ The concept was devised by a team of authors led by Dr. A. Liro (1995).

² Work to implement the Man and the Biosphere Programme of UNESCO in Poland is coordinated by Prof. A. Brey Meyer – Chair of the Polish National UNESCO-MAB Committee.

tial organization of the Biosphere Reserves, which comprise core, buffer and transition zones – Breymeyer (2005). There are now 9 Biosphere Reserves wholly or partly within Poland (Fig. 4). Of these, three enjoy Transboundary Biosphere Reserve status, i.e. the Eastern Carpathians BR (in Poland, Slovakia and Ukraine), the Karkonosze/Krkonoše BR (Czech Republic and Poland) and the Tatra Mountains BR (Poland and Slovakia). The other such Reserves encompass Babia Góra, Puszcza Kampinowska, Słowiński NP, the Western Polesie area, Lake Łuknajno and the Białowieża Forest (the latter bordering on to the Belovezhskaya Pushcha NP on the Belarusian side – itself a Biosphere Reserve, though one that has so far operated as a separate unit).

The actions taken by bodies of the central and local administrations, scientific institutions, numerous NGOs and many individual nature-lovers have gone a long way to ensuring the protection of valuable natural areas against degradation, thereby allowing for a reinforcement of European and world resources of natural heritage.

The most valuable natural areas under legal protection

Poland's National Parks are generally considered its most precious protected natural areas. Twenty-three of them have now been established, and their total area is 317,400 ha (Table 2), or 1% of the country.

A National Park is established to protect an area outstanding in terms of its natural, scientific, social, cultural and educational value, and covering at least 1000

ha. Protection within it is extended to all of nature, as well as to valuable features of the landscape. The National Parks are further founded to preserve biological diversity, the resources, forms and components of inanimate nature and valuable landscape features. Another aim is to restore natural resources and components to their proper state as necessary, as well as to reinstate deformed natural habitats, and plant, animal or fungal communities.

The largest areas under strict protection (in which a total and permanent end has been brought to human intervention in the ecosystem – as regards forms, components and processes) are located within the Bieszczadzki (Bieszczady Mts.) and Tatrzański (Tatra Mts.) National Parks – 18,600 and 12,300 ha respectively, as well as in the lowland Słowiński NP – 6000 ha, Biebrzański (Biebrza) NP – 5100 ha, and Białowieża (Białowieża) NP – 5000 ha.

In line with the classification of the International Union for the Conservation of Nature and Natural Resources (IUCN), 15 of the National Parks correspond with category II of protection, and two with category V. The 6 newest Parks have not yet been classified (Table 2).

Alongside the favourable categorization received from the IUCN, most Polish National Parks have also had their natural worth emphasized by the inclusion of the entire areas (in the cases of 5 parks) or parts thereof (in a further 2) on the List of Wetlands of International Importance, as well as by the conferment of Biosphere Reserve status upon 8 Polish National Parks, and by UNESCO's recognition of the Białowieża (Białowieża Forest) NP as a World Heritage Site (Table 2).

Natural and human environment of Poland

While the total area of the National Parks is not perhaps that large, these areas do encompass all the most valuable ecosystems and landscapes in Poland (Fig. 4). The best safeguarded is the nature of the Polish Carpathians, in which no fewer than 6 Parks have been founded (Tatrzański in the Tatra Mountains – Photo 4, Pieniński in

the Pieniny range, Gorczański in the Gorce range, Babiogórski at Mt. Babia Góra, the Magurski NP at Mt Magura, and the Bieszczadzki NP in the Bieszczady range). Due protection has also been extended to forest ecosystems, since there are as many as 15 Parks in which forests cover more than 70% of the total area, and several in

Table 2. National Parks in Poland

Name of park	Year of establishment	Area (ha)	IUCN category	Additional informations
Babiogórski NP	1954	3 390.5	II	Protects Babia Góra Mt. and is a Biosphere Reserve
Białowiecki NP ¹	1932; 1947	10 517.3	II	Protects Polish part of Białowieża (Belovezhskaya) Forest, within UNESCO World Heritage Site & Biosphere Reserve
Biebrzański NP ²	1993	59 223.0	-	Protects Biebrza Marshes – a Ramsar Site
Bieszczadzki NP	1973	29 201.0	II	In the Bieszczady Mts. (SE Poland) – part of a Transboundary Biosphere Reserve
Bory Tucholskie NP	1996	4 998.0	-	Protects the Tuchola Forest
Drawieński NP	1990	11 342.0	II	Protects part of the Drawa River basin
Gorczański NP	1981	7 030.8	II	Protects the Gorce Mts. of S Poland
Góry Stołowe NP	1993	6 339.7	-	Protects the Stołowe Mts. of SW Poland
Kampinoski NP	1959	38 548.5	II	Protects extensive forest near Warsaw – a Biosphere Reserve
Karkonoski NP	1959	5 580.5	II	Protects the Polish part of the Karkonosze (Krkonoše) Mts. (a Transboundary Biosphere Reserve. Part is also a Ramsar Site
Magurski NP	1995	19 438.9	-	Protects part of the Beskid Niski Mts. range
Narwiański NP	1996	7 350.0	-	Protects land along the Narew Valley – a Ramsar Site
Ojcowski NP	1956	2 145.6	V	Protects rock formations in the Ojców area
Pieniński NP	1932; 1954	2 346.2	II	Protects the Polish part of the Pieniny Mts. in S Poland
Poleski NP	1990	9 762.3	II	Protects the Polish part of Polesie – a Ramsar Site & Biosphere Reserve
Roztoczański NP	1974	8 482.8	II	Protects the Polish part of the Rztocze Hills
Słowiński NP ³	1967	21 572.9	II	Ramsar Site, Biosphere Reserve, Baltic Sea Protected Area
Świętokrzyski NP	1950	7 626.4	II	Protects the Świętokrzyskie Mts. of SC Poland
Tatrzański NP ⁴	1954	21 164.0	II	Located in the Polish part of the Tatra Mts. Part of a Polish-Slovak Transboundary Biosphere Reserve
Ujście Warty NP	2001	8 037.6	-	Protects the mouth of the Warta, with part a Ramsar Site
Wielkopolski NP	1957	7 583.9	II	Protects countryside of Wielkopolska (Greater Poland) near Poznań
Wigierski NP	1989	14 986.2	V	Protects Lake Wigry in NE Poland – a Ramsar Site
Woliński NP	1960	10 937.4	II	Protects part of Wolin Island, NW Poland

Source: Ochrona Środowiska, 2004, CSO.



Photo 1. Primeval forest in the Białowieża National Park

¹Białowieża (Białowieża) National Park. The Park preserves Europe's last lowland forest of natural origin, with some areas seeming to retain forest in the primeval state. There is a multi-species and multi-layered structure with a wealth of biodiversity, including many species only present in wilderness areas. This is also a refuge for plant, fungus and animal genetic resources, representing a kind of natural gene bank. Thanks to its existence, it would in future be possible to reinstate devastated natural systems elsewhere in Europe. The Park is thus worthy of being considered an item of the natural heritage of Europe as a whole, and indeed of the entire world. The site is also famous for the European bison which was saved from extinction and reintroduced here.



Photo 2. Extensive areas of marshland in the Biebrza Valley

² Biebrzański (Biebrza) National Park. This area retains a unique complex of fenland, and there remain extensive marshland areas (see Plate) and wetland areas in a near-natural state. Rare species of plant and animal persist here, in particular birds rarely met with anywhere else in Central or Western Europe. The Park is also a vital stopover for birds on spring or autumn migration.



Photo 3. Forest disappearing under an advancing dune

³ Słowiński National Park. Another unique landscape – this time on the coast and featuring mobile dunes, as well as shallow reed-fringed lagoons. The aforementioned dunes are currently the most active, not merely along the Baltic shore, but anywhere in Europe (Piotrowska, 1997). Depending on windspeed and direction, the dunes move several to ten-plus metres each year, the maximum figure noted being 25 (Fattyłowicz, 1996). As they migrate, they fill depressions and cover forests, as well as emptying into Lake Łebsko and adjacent peatlands. The phenomenon is best seen along the bar separating the Baltic from the Lake.



Photo 4. Morskie Oko – the largest tarn of the Tatra Mts.

⁴ Tatrzański (Tatra Mountains) National Park. The Park takes in the most attractive part of the Polish Tatras, which are alpine-type mountains characterized by diverse relief with a maximum range of altitudes over a small area reaching 1700m. The present appearance reflects glaciation during the Pleistocene, and in general the landscape is diverse. There are sharp, picturesque peaks and ridges, deep passes, U-shaped valleys and numerous cirques and tarns. The interest of the Park is further increased by a whole section with karst topography, including caves, swallow-holes and springs. The vegetation shows zonation with altitude, extending via the lower and upper montane forest zones (to 1250–1550 m a.s.l.), into a zone of dwarf mountain pine scrub (at 1550–1800 m a.s.l.), an alpine zone (1800–2250 m a.s.l.) and a layer of bare rock at the very tops. Many plant and animal species are endemic either to the Tatras or to the Carpathians as a whole, and there are also many rare and protected species.

which this figure exceeds 95%, as at the Białowiecki NP, protecting the famous Białowieża Forest (Photo 1), plus the Roztoczański, Świętokrzyski, Babiogórski and Magurski NP. Wetland areas gain protection in 6 National Parks, i.e. the Biebrzański NP protecting the famous Biebrza Marshes (Photo 2), plus the Poleski, Narwiański (Narew), Ujście Warty (Warta Mouth), Wigierski (Lake Wigry) and Słowiński NP. The last Park is also representative of a unique coastal landscape (Photo 3). A shortfall of the Parks would seem to be the limited degree to which they protect the very precious lacustrine ecosystems of both the Mazurian and Pomeranian Lakelands, and above all the considerable lengths of lowland river valley still existing in a near-natural state and thus representing something of a unique occurrence on the scale of the European continent as a whole. Fortunately, the protective status of the valleys in question has been raised, as stretches of the Vistula, Odra, Bug, Noteć and Warta Valleys have now been designated Natura 2000 areas under EU law.

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Socio-economic development

Przemysław Śleszyński

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: psleszyn@twarda.pan.pl

Economic processes prior to 1989

Between the end of Second World War and 1989, Poland was subjected to a command economy that in practice denoted the subordination of economic processes to communist ideology and political goals derived *ad hoc* in close connection with the reality of Soviet hegemony over the country. What economic strategy there was was founded upon economic plans (usually those infamous "five-year plans"), which took for granted the determination – in advance – of levels of demand for given goods and services, the money supply, inflation, the demand for labour, the distribution of productive capacity and the location and structure of investment, as well as a whole series of almost all other more important indicators, elements and phenomena relating to socioeconomic life. That was the theory, but in practice the plans were amended repeatedly or left unimplemented, especially when it came to the indicators of societal development (e.g. as regards outfitting in infrastructure, living conditions, the supply of consumer goods, etc.).

At the same time, the pre-1989 economy was characterized by full unemployment that took no account of the actual needs of different sectors and branches of activity. Those wielding power within the ruling Polish United Workers Party (PZPR) or PZPR exerted marked investment pressure within the economy, it being considered that this would ensure rapid economic development. However, new investment mainly went into industry, to the extent that the higher-order sectors were markedly underinvested-in. The result of the industrialization was a high level of employment in industry, most especially in such branches of heavy industry as mining and steel. The lack of auditing mechanisms, universal wastefulness and deliberate disregard for modern technological thought all ensured that industries were material-, labour- and energy-intensive, and in consequence uncompetitive (even by the standards of the communist bloc), while the economic system was ever more incapacitated. The situation worsened steadily, and increasingly so in the 1970s as Poland took out huge loans with countries in Western Europe, claiming that the sums would

go into industry and infrastructure, but in practice assigning them to the sustaining of consumption and hence the forestalling – for a while at least – of any eruption of more visible dissatisfaction in society or of the need to exchange the ruling elites.

However, the inefficient economy was less and less able to either meet the population's growing demands or to face up to global competition. The inevitable result was a wave of protests and strikes in which the factor of economic dissatisfaction was if anything even more important than the attendant desire for independence and a rejection of the status of subordinate to the USSR. The largest revolts took place in 1956 (in Poznań), in 1970 (on the coast, and especially in the Gdańsk-Gdynia-Sopot ("Tri-City") and in Szczecin, Słupsk and Elbląg), in 1976 (at Radom and Ursus, the latter now a district of Warsaw) and in 1980 (when "Solidarity" emerged, *inter alia* on the coast, in Warsaw, in Cracow and in Upper Silesia). The struggle that Solidarity unleashed was a great and unprecedented event anywhere in the then communist block. 10 million people signed up to the new trade union (or nearly 40% of Poland's entire adult society), and at the base of it all was the selection of a Pole – Cardinal Karol Wojtyła – for the papacy, and his subsequent pilgrimage to his homeland – as John Paul II – which took place in 1979 and featured the now-immortal invocation in the course of a sermon: "Let Thy Spirit descend and renew the face of the land. This land". Few Polish hearts or minds were left unmoved by that.

The emergence of Solidarity and subsequent economic crisis of 1980 put paid to the idea of the centrally-steered economy once and for all. A breakthrough came with

what was decided at the "Round Table" located in the village of Magdalenka, just outside Warsaw (formally the talks in question took place between February and April 1989, though in reality they had started much before that). It was via this forum that the communist authorities were joined by the opposition in mapping out new political and economic principles, including the calling of free parliamentary elections. In practice, however, the previous authorities guaranteed for themselves a very significant role in the running of the economy.

The period of political and socioeconomic transformation

When the June 1989 elections were effectively lost by the communists (the Party only retained the parliamentary seats reserved for it), the problem of fundamental importance was how to adapt the existing command-distribution system – already in the throes of a profound crisis – to the rules of the free market. The December of that year saw the Polish Sejm (lower house of parliament) adopt a package of 10 acts that came to be known as the Balcerowicz Plan (after the then Deputy PM and Minister of Finance, who has been president of the country's central bank since 2001). These reforms were pioneering by the standards, not only of Poland, but of the whole communist camp, which is not to say that the first governments managed to avoid a number of mistakes, notably as regards financial and economic policy (a case in point might be a 1992 pegging of the zloty-dollar rate that, in conditions of high inflation, drew an influx of speculative

capital, followed by an uncontrolled outflow of currency abroad).

The Balcerowicz Plan, accordance with American economist J. Sachs conceptions, was founded upon the building of a market system. The first action taken sought to rein in hyperinflation (of 351% in 1989 and 686% in 1990). This required the appearance of realistic zloty exchange rates, and in effect therefore a drastic increase in prices (most notably of fuel and energy) – in the face of pay that increased only slightly in real terms (measures included the introduction of a tax on excessive levels of remuneration). Prices were freed up (having previously been set by the state), while restrictions on domestic commerce were lifted, *inter alia* through the elimination of many concessions, controls, restrictions on the turnover in goods and services, etc.). This allowed for a dramatic liberation of entrepreneurial activity, especially in trade and services. The money supply was much restricted by way of increases in interest rates. The result

was a decline in inflation to 60% in 1991. The rate fell below 10% in the late 1990s and has stayed there ever since. While GDP declined in 1990 and 1991 (by 12% and 8% respectively), it grew again subsequently, sometimes by more than 5% a year, leaving Poland with “economic tiger” status for a time at least. Overall, the level of GDP at constant prices in 2004 was 160% of that in 1990, again assuring Poland top place in the ranking for Central European countries (though it needs to be recalled that it started off at the end of the 1980s in a relatively worse position than its neighbours which had been spared the brunt of that decade’s economic crisis).

The significance of industry and agriculture declined rapidly, while employment in services increased. However, layoffs in industry extended beyond the large, outdated enterprises producing low-quality goods in an inefficient way. Rather, moderately modern branches were also afflicted, being unable to face the competition



Figure 1. Main GDP indicators, 1989-2004

once borders had opened up and duty on imported goods had been lowered. In contrast, 2 million small enterprises – mainly family firms – appeared in just a couple of years, allowing at least some continuity of employment for those dismissed en masse as the large plants were restructured. The main problem even with this was that the process was very largely confined to the agglomerations and larger cities.

Consecutive years post 1989 witnessed progress with systemic and structural activity within the economy. There was, above all, an acceleration of the privatization and restructuring of enterprises (formally proceeded with as early as in 1990). Up to the end of 2004, some 7165 state enterprises had been privatized (including 1852 through closure). A stock exchange came into operation as early as in 1991. It was in large measure privatization in the economy that allowed for an influx of foreign capital – something of exceptional importance, since the market was short of money domestically, and any printing of banknotes would simply have stoked up inflation. As early as in 1993, this investment had reached a cumulative value of 3 billion USD, cf. not quite 7 billion USD by 1995 and almost 100 billion USD by 2005. It is nevertheless true to say that a great part of this was targeted at segments of the economy assured of a high rate of return from relatively small amounts of investment (as in the financing or commercial sectors). Even so, capital investments in the purchase of shares in Polish enterprises prevailed (the largest transactions were concerned with the banking and insurance sectors, as well as telecommunications). It was therefore a great success that, in 2003, the share of investment

that was of the “green field” type exceeded 50% – something that can undoubtedly be associated with Poland’s accession to European Union structures.

As of the end of 2004, 74% of all investment in Poland had come in from “the 15” old EU Member States, most especially from France, Germany and The Netherlands. One tenth of all foreign investment came from the United States. The greatest individual firms or businesses investing in Poland were in turn France Telecom, the European Bank for Reconstruction and Development (EBRD), Fiat, KBC Bank and Metro Group (each of which located in excess of 1.5 billion USD). Some of these investments had been commenced with even before 1999 (as in the case of Fiat in southern Poland).

However, the areas experiencing enhanced foreign-investment activity have in the main been the large, most rapidly-developing agglomerations, as led by Warsaw, followed by Poznań, the Tri-City, Cracow, Wrocław and the Katowice conurbation. Departing from this scheme were the investments in industry, in which the local factors are different from those in the case of investments into services.

The most valuable investments, taking in high-technology sectors like electronics, automation, IT, biotechnology, pharmaceuticals and so on, are alas relatively fewest in number. Among the more important investors in this regard have been Vivendi (1.3 billion USD), as well as Thomson, Philips, GlaxoSmithCline, Telia, Siemens, IVAX and Pliva (0.2–0.5 billion USD each).

The development of the economy has also been associated with increased commitments of Polish foreign capital – albeit to a level that is still vanishingly low. In mid



Figure 2. Foreign direct investments, 1991-2004

2005, the cumulative value of Polish FDI had risen to just under 1 billion USD.

Poland's accession to EU structures denoted many positive stimuli for the economy, as did the adjustment process that preceded it. But what was important here was not (as is sometimes deduced incorrectly) the positive balance to the transfers of funding connected with the

carving-up of the EU budget (payments to some agricultural activities, the Structural Funds, etc.), but rather the attendant pressure imposed on Poland to achieve a stable political and economic system that could guarantee predictability, and hence reduce the risk attached to investment and economic activity in general. At the same time, thanks to the procedures and



Photo 1. Cersanit plant – greenfield investment in Special Economic Zone

legal system as a whole in the EU, there is greater transparency for business activity (especially where the state and economic spheres come together). A good job, since, as is widely known, corruption and doubtful linkages between the worlds of politics and business attained plague proportions in the post-communist countries, often making successful development of whole sectors of the economy impossible, stratifying incomes, encouraging oligarchies, etc.

From 1990 on, there was a dramatic rise in levels of unemployment associated with the collapses or serious crises affecting whole sectors of the economy (most notably the State Farms, mining and textiles). Unemployment extended beyond 10% in September 1991, and stood at a rate of 15% in July 1993, before falling below 10% once again in May 1998. The first phase of growth was associated with the aforementioned collapse of many industrial plants – something that reflected a failure to adapt to free-market rules, a profile of activity that was inappropriate and unable to match up to real needs and a general uncompetitiveness (whereby goods were at one and the same time rather costly and of low quality). This last factor was particularly important in circumstances of much-reduced or eliminated customs duties allowing for a dramatic influx of goods from abroad (in the first place in the light-industrial and electronics sectors). A second wave of increases in unemployment was noted in the years 2000–2002, and was the result of a further restructuring of firms (especially those in which the periods over which employees had been protected from dismissal came to an end or those going into liquidation), as well

as the appearance on the labour market of the baby-boom generation of the early 1980s. Among a number of factors to be mentioned here is the lack of a consistent approach to the introduction of economic reforms after 1993 – when the post-communists were returned to power just 4 years into the building of the new Poland on a wave of social disillusionment with the course of reforms and the high costs they were incurring among ordinary people. This kind of swing to the left was observed once more in 2001 (with the intermediate period featuring rule by parties perceived as a continuing with the ideals of “Solidarity”, who came back into government in the 1997 elections).

Notwithstanding the high unemployment and increasing inequalities and disparities within society, the 15-year period of transformation has to be viewed as positive overall. By 2004, Poland was capable of generating a national income of 240 billion USD, translating into 6300 dollars per head. Since this was the equivalent of 12,100 USD in terms of purchasing power parity, it was not too bad – and compared with a figure only just over one-third as high at the end of the 1980s. Furthermore, the coming decade is not likely to witness any major threats to economic growth, since the last few years have brought improvements as regards most of the major macroeconomic indicators. This is true of the increase in exports, followed by a rise in industrial output, then in productivity, and so on.

A particularly spectacular result has concerned the aforesaid upward trend for the value of Polish exports in the last few years. While they were worth just 31.7 billion USD a year as recently as in 2000, the figure was

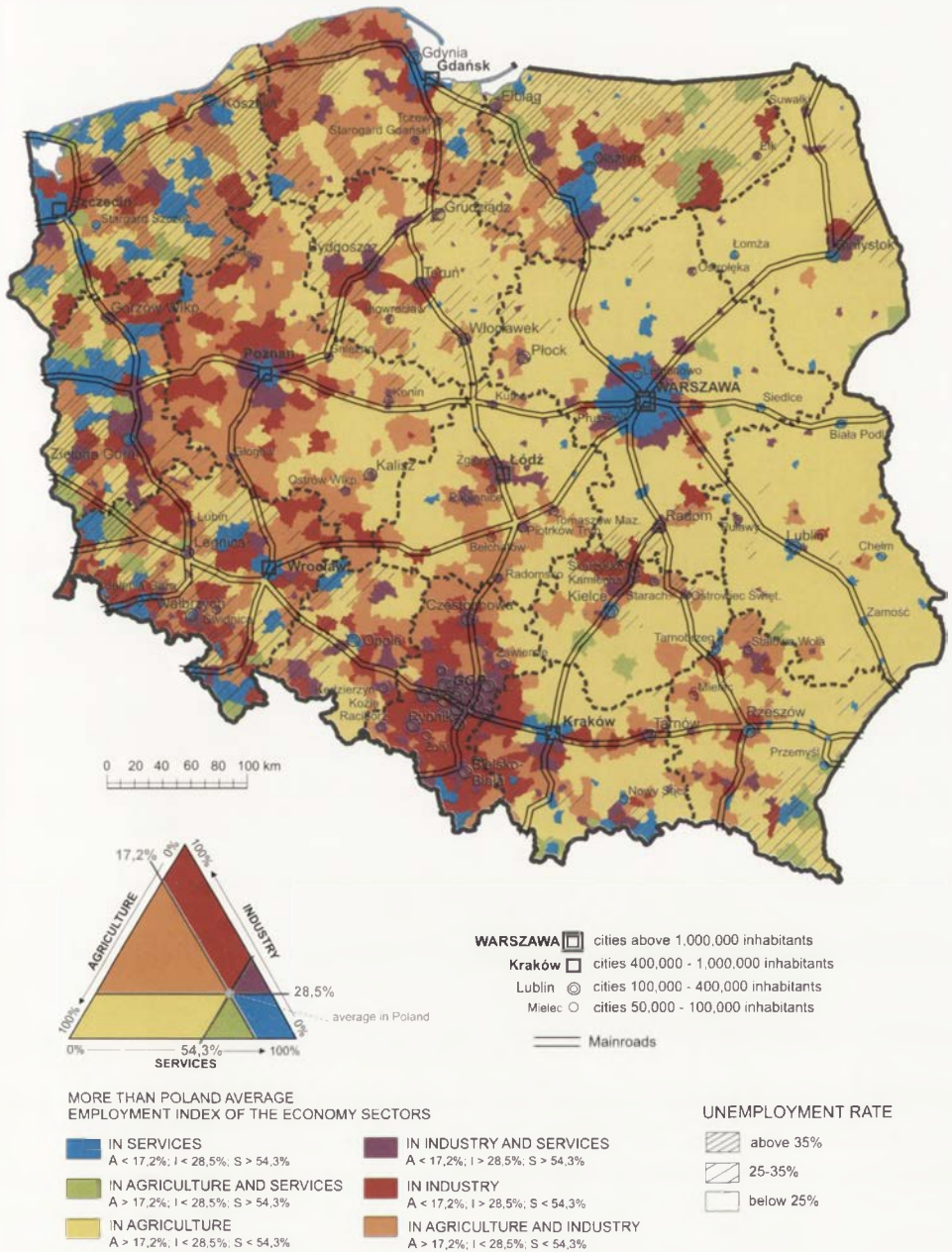


Figure 3. Labour market by gminas (communities), 2002

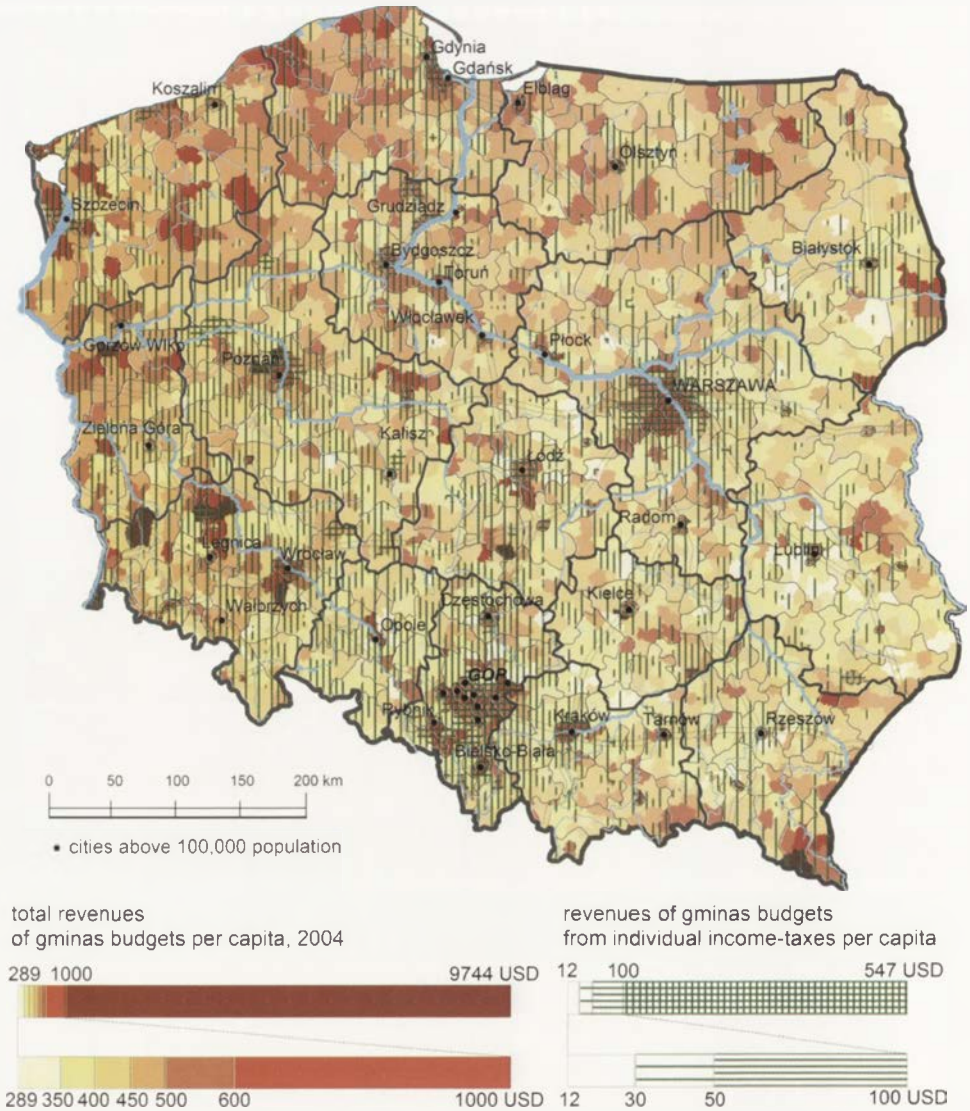


Figure 4. Budget revenues by gminas (communities), 2004

up to 53.6 billion USD by 2003 and no less than 73.8 billion in 2004. Unfortunately, this has not proved sufficient to generate a surplus in the foreign trade balance, which has remained stubbornly in deficit since 1993, and at something in the region of 14 billion USD in the years from 2001 onwards.

Expressed as a proportion of GDP, this was at the level of minus 6–7%. Among other perceived macroeconomic threats are the increasing level of public debt (to 145 billion USD at the end of 2004 – including 37 billion dollars of foreign debt), which equates to 48.8% of GDP at the present time.

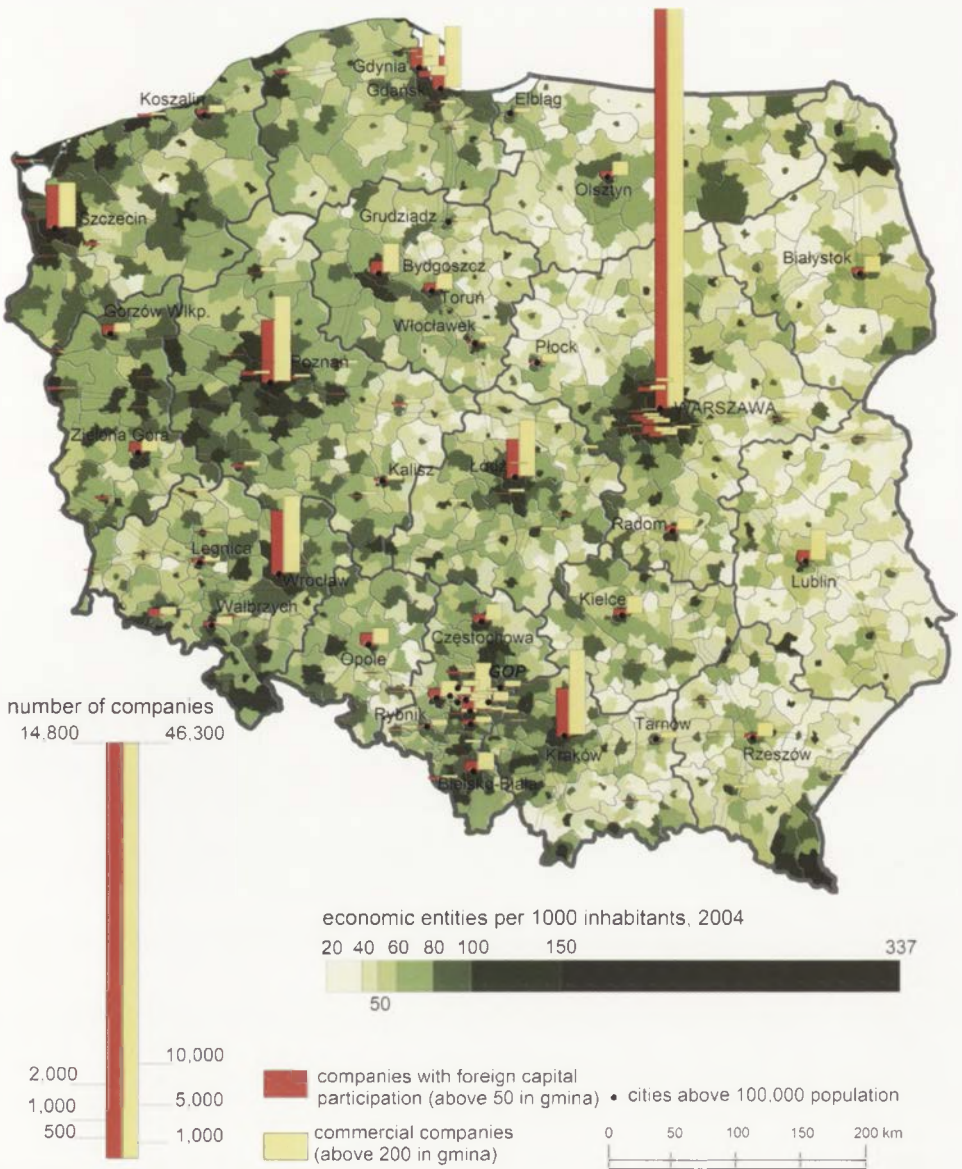


Figure 5. Development of entrepreneurship by gminas (communities), 2004

Enterprises

The mobilization of free-market processes produced rapid development in entrepreneurship. A million businesses had been registered by 1991, while a sec-

ond million had been achieved by June 1993 and a third by December 1999. By the end of 2004, there were 3.6 million firms in Poland, mostly small ones with just a couple of employees and frequent family ownership. There are far fewer larger

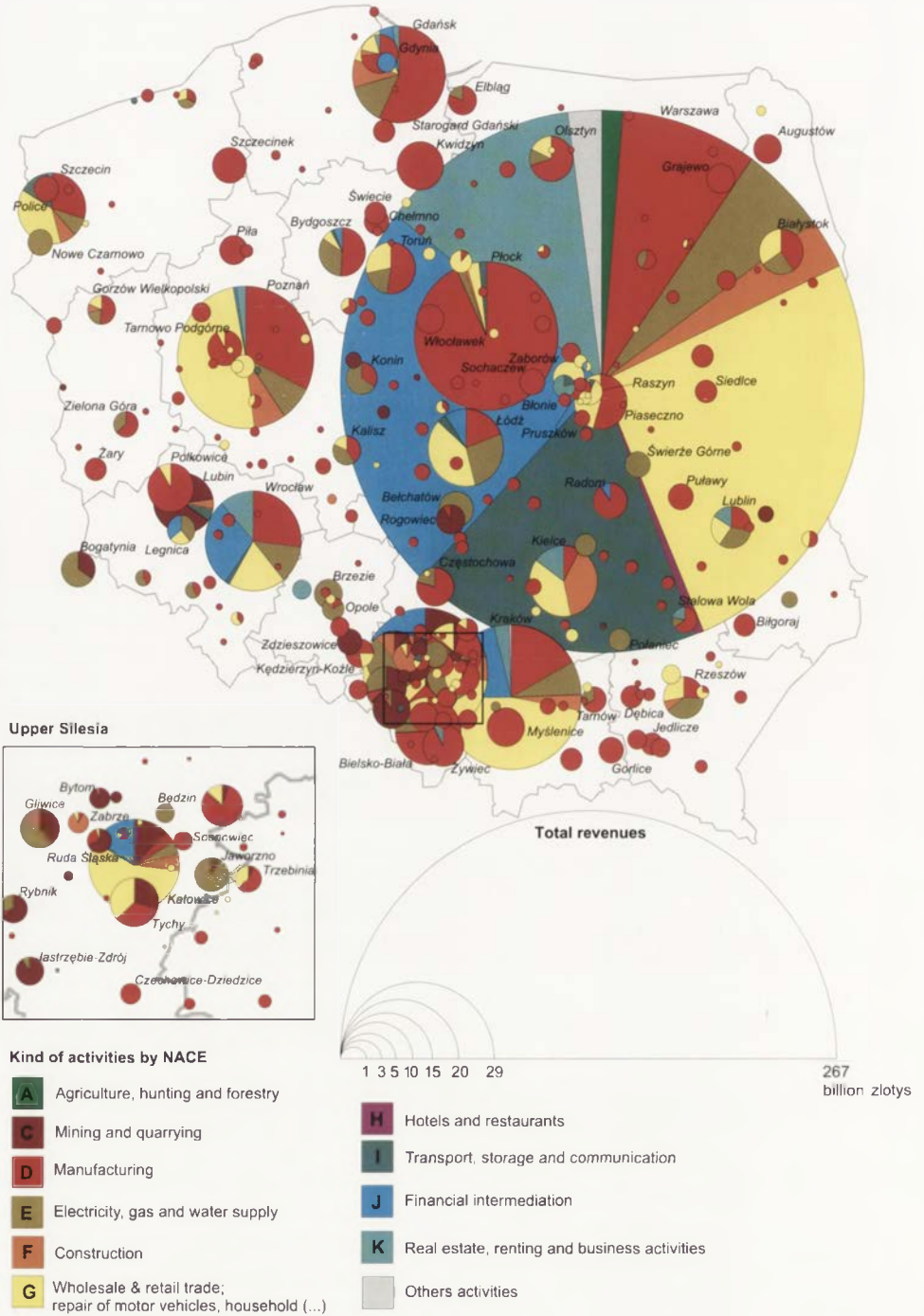


Figure 6. Geography of the 1000 biggest companies, 2001

enterprises, e.g. 221,000 commercial law companies.

The development of firms does attest to an entrepreneurial spirit within the population. However, far fewer firms have started up in agricultural areas, where small-scale farming is well-developed. Indeed, many researchers feel that indexes seeking to depict the growth of entrepreneurship should also include small farms, since these in practice function quite similarly to small family businesses.



Photo 2. Warsaw Stock Exchange
(Giełda Papierów Wartościowych)

Notwithstanding the above, it is the largest firms that play the biggest role in the economy. The list of the first 500 firms in terms of income account for around 60% of the national total from businesses, while an extension of the list to include the top 1000 firms encompasses around 70% and the top 2000 firms around 80%. It is thus within these firms that the struggle to determine the shape and condition of the Polish economy is largely played out. Poland's largest enterprise is the *PKN Orlen* oil-refining and fuel-selling concern, whose income in 2004 exceeded 11 billion USD. In turn, the most valuable Polish firm is still deemed to be *Telekomunikacja Polska*, which the newspaper *Rzecz-*

zpospolita valued at 8.5 billion USD at the end of 2005 (*inter alia* on the basis of its stock-market notings). However, this might be an underestimate, considering the level of annual income (around 4 billion USD per year in the period 2000–2004), as well as the *de facto* market monopoly.

Regional disparities in socio-economic development

Levels of economic development vary markedly across Poland, in part through the continued operation of factors first put in place in the 19th century. At this time of the flowering of the nation state across Europe, there was no Poland at all on its map, the territory we regard as Polish today having been partitioned off by the Russians, Prussians and Austro-Hungarians, such that matters of economic development (or lack of same) were in the hands of policymakers in those Empires. Further important historical and economic conditioning can be dated to the c. 20 inter-War years, when Poland was at last free once more, and thus able to pursue an economic policy very largely posited on the need to reharmonise those three separate systems which had tended to develop quite independently of one another. As if these two major factors were not enough, the devastation of World War II was followed by economic planning that trumpeted the slogans of egalitarianism for all to hear, and yet brought about a further widening of the gap between levels of development in the different regions. In the face of all that, the switchover to a free-market system showing preference

Natural and human environment of Poland

Tabela 1. Main macroeconomic data by voivodships, 2002–2004

Voivodship	Gross Domestic Product					Activity rate	Unemployment rate	Total revenues of communities per capita
	total	per capita	by kind of activities					
			agriculture	industry	services			
	million USD	USD	%					USD
2002						end of 2004		2004
Dolnośląskie	15 104	5 195	2.6	32.4	65.0	53.6	22.3	543
Kujawsko-Pomorskie	9 454	4 568	5.0	29.9	65.1	54.0	23.5	495
Lubelskie	7 708	3 505	5.0	23.6	71.4	58.2	17.8	448
Lubuskie	4 415	4 376	3.2	29.4	67.4	55.5	25.8	487
Łódzkie	11 841	4 533	2.9	31.3	65.8	55.1	19.6	485
Małopolskie	13 997	4 329	2.0	28.9	69.1	57.0	15.0	483
Mazowieckie	39 089	7 627	2.6	24.3	73.1	56.5	15.0	637
Opolskie	4 367	4 103	4.7	32.8	62.5	53.9	19.9	448
Podkarpackie	7 515	3 571	2.6	31.9	65.5	54.9	19.1	448
Podlaskie	4 657	3 853	6.0	24.9	69.1	55.5	15.9	468
Pomorskie	10 876	4 987	2.3	30.3	67.4	53.4	21.3	557
Śląskie	26 299	5 547	1.0	37.9	61.1	51.7	16.8	542
Świętokrzyskie	5 081	3 916	5.1	30.3	64.6	52.3	21.9	441
Warmińsko-Mazurskie	5 343	3 740	4.3	27.0	68.7	55.1	29.2	492
Wielkopolskie	17 317	5 165	5.2	32.5	62.3	57.1	16.2	495
Zachodniopomorskie	8 408	4 951	3.8	23.8	72.4	54.3	27.4	513
POLAND	191 472	5 008	3.1	29.8	67.1	54.9	19.1	828

for the more-competitive centres and regions could only bring those already-existing differences into yet sharper relief.

For there is a widespread conviction among both geographers and economists that Polish socioeconomic space has experienced polarization in the course of the transformation period. While benefits have accrued to areas that were already more developed, areas of underdevelopment seem to have fallen yet further behind. In truth, this is a rather complex process overall, though the most important factors remain differences in attractiveness in terms of investment and the running of a busi-

ness (be the economic activity of a social, economic or infrastructural nature, either exogenous or endogenous). The situation on labour markets has deteriorated – with unemployment the consequence, while there has been a decline in the purchasing power of both individuals and firms, and a socioeconomic recession overall. In turn, centres and regions that have already proved themselves attractive tend to draw in further investment, with the consequence that new job opportunities arise and there is economic growth through a process of positive feedback. Over the longer term the well-developed centres attract people

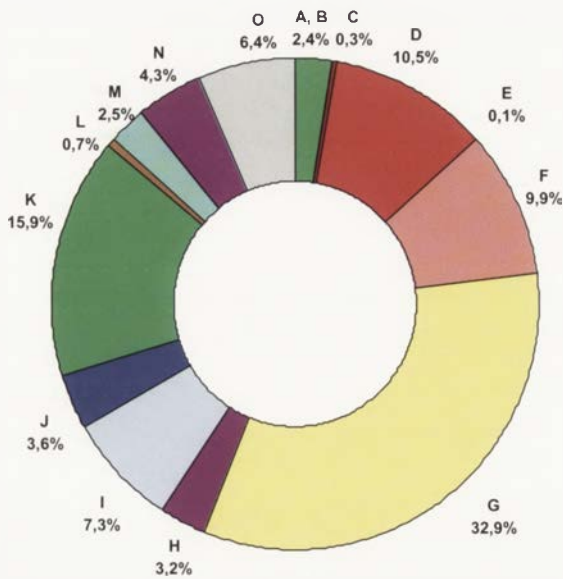


Figure 7. Structure of economic entities, 2005

Sections of European Classification of Economic Activity: A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and business activities; L – Public administration and defense; compulsory social security; M – Education; N – Health and social work; O – Other community, social and personal service activities



Photo 3. Bielany Shopping Centre near Wrocław motorway junction

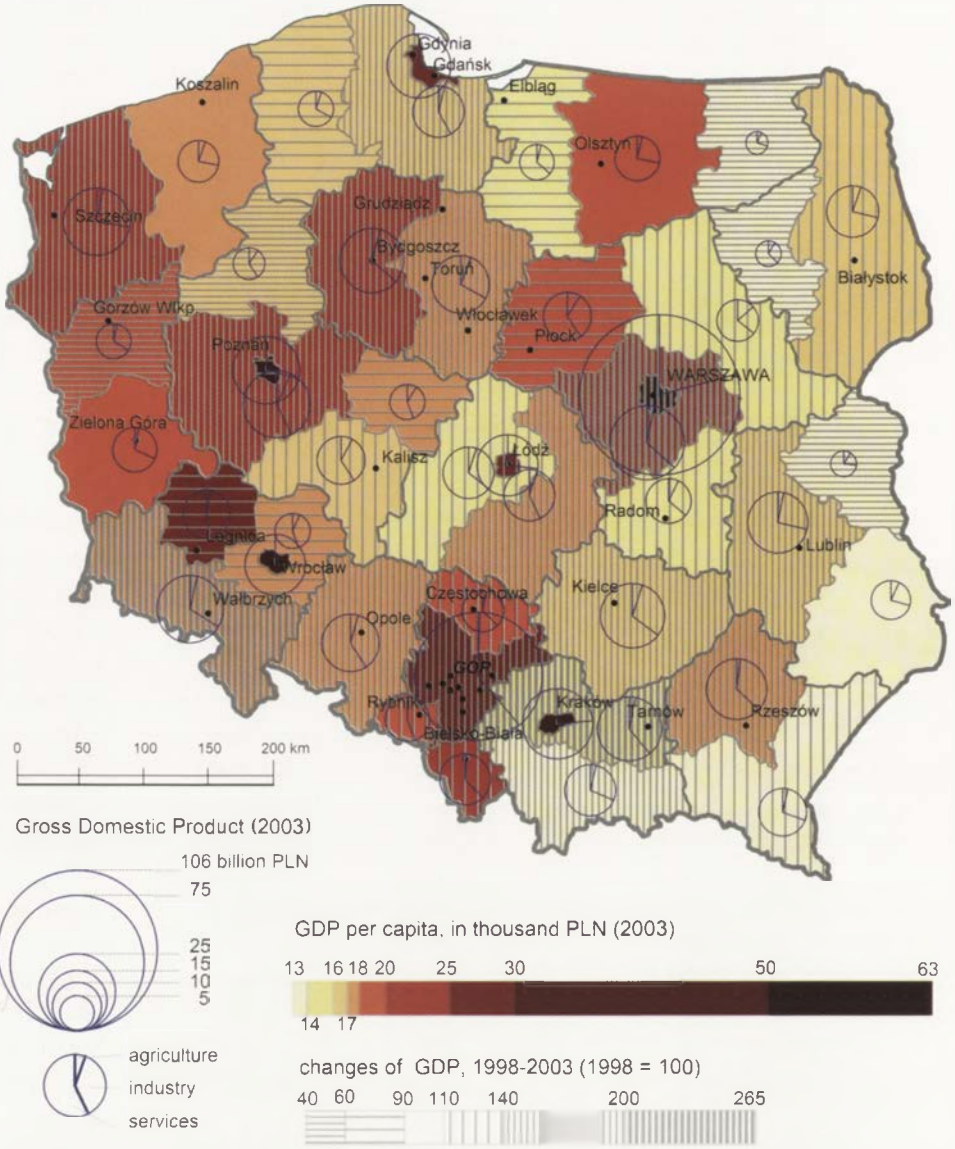


Figure 8. Gross Domestic Product by NUTS-3 (sub-regions)

in search of work and better living conditions, while crisis-hit areas gradually lose demographic potential.

Overall, the situation in Poland is quite unambiguous where the level of socio-economic development is concerned. While

the disparities resemble those encountered in other countries to some extent, the complex economic history of Poland ensures that there are some specific features. In the first place, it is the metropolitan centres that are best-developed and are on the highest

levels of both the administrative and settlement hierarchies. Lying at the other extreme are the problem areas mainly associated with industrial decline (as in parts of the Upper Silesian conurbation, the Sudety Mts. and the Staropolski district), or else the collapse/bankruptcy of the State Farms (as in the west and north). For example, disparities in the levels of different socio-economic indicators per inhabitant (e.g. national income, income into gmina budgets, remuneration and unemployment rate) in Warsaw and in the peripheral or problem regions lie in the range 1:2 to 1:5 – to the benefit of the Polish capital.

A great many geographers, sociologists and economists maintain that the country retains a division into what are known as "Poland A" and "Poland B" (i.e. a western and an eastern section with the dividing line running along the Vistula). This view is based around comparisons of the aforementioned indicators of socioeconomic development, e.g. national income, or else saturation with infrastructure. However, this thesis only holds good in part, since areas in which agriculture predominates (even those in which it attains a high level of commercial viability and profitability) are obviously not going to be able to generate high values for the different coefficients, and notably that for GDP. At the same time, a comparison of the level of development of rural areas shows that in many regions, the values for these indicators do not depart at all from those in the traditional, well-developed agricultural areas in such regions as Lower Silesia or Wielkopolska. For example, the transformation period saw a major development of agriculture in the Podlasie region (currently one of the most important areas for

dairying anywhere in Europe), while parts of Małopolska also benefited markedly (through non-agricultural functions primarily linked with tourism and small-scale manufacturing). In these regions, a considerable part of the income generated comes from the so-called "grey zone" not encompassed by the official statistics. In either case, factors of major importance to development were, not only a cultural tradition including an attachment to land and property and a higher level of education of social capital, but also a mobilization of resources by way of what are often strong international linkages, particularly with the USA. However, structural changes are essential here in the future, in order that the non-agricultural functions in rural areas might develop, along with light industry and a diversification of the services sector.

To sum up, the area of Poland can be considered non-uniform, with the level of economic development not always being conveyed most effectively by the widely-applied macroeconomic indicators. However, over time it is possible to anticipate an easing-off of the processes of spatial, social and economic polarization, of the same kind as was noted in such other once-weakly-developed countries that acceded to the EU (like Spain). Likewise, the directions to development are pre-determined, not only by the well-known macroeconomic conditioning linked with GDP (e.g. levels of inflation and employment, level of consumer demand and demand from private firms and state institutions, levels of investment outlays (especially on education and science), the level of industrial production, exports, etc.), but also by the targeted regional policy and activity undertaken by local government and local communities.

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Demographic development

Andrzej Gawryszewski

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: agawrys@twarda.pan.pl

Size and distribution of the population

In the late 19th and early 20th centuries, the lands that would once again become a Polish state were still in the hands of the Russian, Prussian and Austrian Partitioners. They were inhabited by some 25.1 million people, of which the towns and cities accounted for 4.9 million. By 1914, the population of the area in question had reached 30.3 million, which equated to a 19% increase over the period. However, as a consequence of the First World War, the 1919 population was down 4 million, standing at 26,282,000 at the beginning of the year. By then Poland had enjoyed its first couple of months of independence after 123 years partitioned and off the map of Europe. A mass repatriation of people was underway, and this would continue until 1924. Among those returning were civilians, whom fate had scattered far and wide in the directions of both Russia and Germany, as well as demobilized soldiers who had been drafted by each of the three partitioning powers. The first Census

(of 1921) revealed around 27,177,000 inhabitants (Table 1), and the next ten-year period was to bring a very high rate of population growth due to natural increase compensating for the negative migration balance, as well as ongoing repatriation.

At that point the population densities were characterized by spatial differentiation: a low density in the agricultural areas of the north-east gave way steadily to a higher population in agricultural areas of the south, and especially the industrialized region of Upper Silesia in the south-west (Fig. 1).

In the years 1900–1938, the share of the population that was urban increased from just under 20% to 30%. Nonetheless, as of the time the second (1931) Census of Poland was taken, only 12 of the country's 636 towns or cities had more than 100,000 people. Of these three had between 200,000 and half a million inhabitants (i.e. Cracow 219,000, Poznań 246,000 and Lwów 312,000), while one (Łódź) had between half a million and a million (in fact 604,000 people). Warsaw headed the list with in excess of a million people, precisely 1,172,000.

Natural and human environment of Poland

Table 1. Population growth, population density and urbanization

Year	Population		Percentage of urban population	Years	Population increase in percentages	
	total in thousands	per square km.			total	per annum
Territory before March 31, 1938 – 388 634 km ²						
1897/1900	25 106	64.6	19.6			
1921	27 177	69.9	24.6	1900–1921	8.2	0.4
1931	32 107	82.6	27.2	1921–1931	18.1	1.7
1938	34 849	89.6	30.0	1931–1938	8.5	1.2
Present territory – 311 904 km ²						
1946	23 640	75.8	34.0	1938–1946	-32.2	-
1950	25 035	80.3	36.9	1947–1950	5.9	1.5
1960	29 795	95.5	48.3	1951–1960	19.0	1.9
1970	32 658	104.7	52.3	1961–1970	9.6	1.0
1980	35 735	114.6	58.7	1971–1980	9.4	0.9
1990	38 183	122.4	61.8	1981–1990	6.8	0.7
2000	38 254	122.6	61.9	1991–2000	0.2	0.0
2004	38 174	122.4	61.5	2001–2004	-0.2	-0.05

Source: *Demographic Yearbook of Poland 1945–1966, 2004*, Central Statistical Office.

The Second World War changed the area, location and shape of Poland. As a result of what the Allies agreed at Yalta and Potsdam, the USSR took Poland's eastern lands, the country being "compensated" – at the expense of the defeated Germans – with lands east of the so-called Oder-Niese line which were known either as the regained territory or the western and northern lands. The net result was a decline of 76,700 km² in Poland's size. The cost in human terms was of course far more devastating – the estimated loss to the population of Poland in the years 1939–1945 being 6 million, including nearly 3 million Jews exterminated. It would only be in 1977 that the population again reached the level it had stood at in late 1938.

It was in the first post-War years that the Polish population rose fastest, in connection with the resettlement of those who had lived

in the eastern lands, the repatriation of prisoners from far inside the USSR and the return of forced labour from Germany. Above all, though, it was the very high rate of natural increase that had its effect through the 1950s. The population increased nowhere near as fast in consecutive decades, and indeed the population actually began to decrease again overall, from 1999 onwards.

By 2000, the density of population was almost 50% higher than in 1931. It now stands at 122 people per km² on average (Fig. 1). The highest concentration is in Upper Silesia, as well as in and around the country's largest cities. Only at the end of 1966 did the numbers living in urban areas finally exceed the population of country-dwellers. As of the 2002 Census, there were 883 towns and cities in Poland, of which 40 had more than 100,000 people and 18 more than 200,000. There were

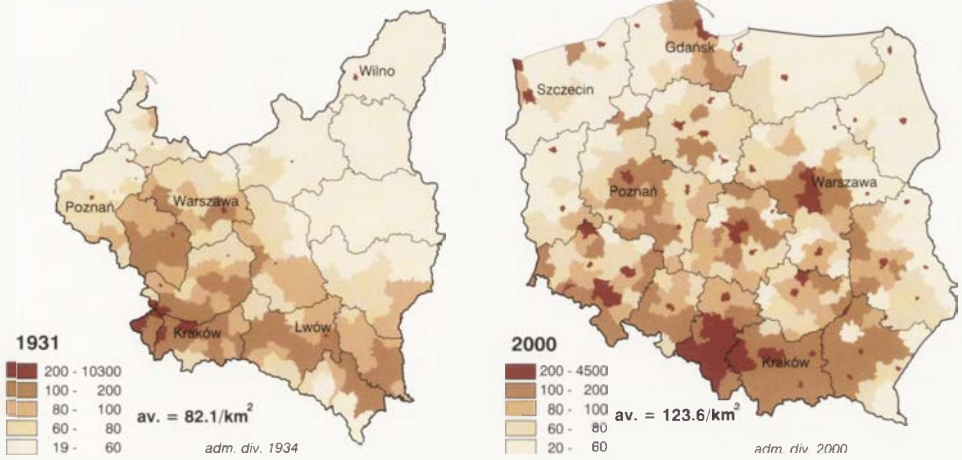


Figure 1. Population density by powiats (counties), 1931 and 2000
(by Janusz Książczak)

in turn 5 cities of half a million or more people, i.e. Poznań (579,000), Wrocław (640,000), Cracow (758,000), Łódź (789,000) and Warsaw (1,672,000).

Natural movement

Marriages and divorces

A clear demographic tendency is for few marriages to be entered into during wartime, and consequently for large numbers of weddings to take place in immediate post-war years. This particular demographic cycle comprises a wartime destructive phase – with a large number of deaths, a small number of marriages and births and a curtailed rate of natural increase; as well as a post-war compensation phase, in which there are many new marriages, and then a marked increase in numbers of births and consequently renewed natural growth of the population. The latter phase compensates for the former, bringing into existence the marriages and births “postponed” through the

period of warfare. In Poland, the elevated frequency with which marriages were embarked upon continued until the late 1950s, before falling somewhat in the following decade. However, the 1970s saw all those from the post-War baby-boom reach marriageable ages themselves (Table 2). In connection with this, the years 1950–1985 brought a rather higher frequency of new marriages in urban areas, while the period from the mid 1980s was characterized by a slight preponderance of new marriages contracted in the countryside. Overall, however, the rate of new marriages entered into has fluctuated at around the 5 per 1000 inhabitants level for some 10+ years now. The rise in the incidence of divorce is a more disturbing phenomenon. While 34 marriages in each 1000 were dissolved legally as of the second half of the 1940s, the figure reached 104 in the 1960s, exceeded 170 in the 1980s and was at the level of 239 by the years 2001–2003. Effectively, then, a quarter of all marriages entered into were ending in failure.

Table. 2. Vital statistics, 1896–2004

Years	Marriages	Live births	Deaths	Natural increase	Marriages	Live births	Deaths	Natural increase	Infant deaths per 1000 of live births
	in thousands (per annum)				per 1000 of population				
Territory before March 31, 1938 – 388 634 km ²									
1896–1900	206	1 093	629	464	8.2	43.5	25.0	18.5	223
1921–1925	286	985	526	459	10.1	34.7	18.5	16.2	
1926–1930	281	991	514	477	9.2	32.3	16.8	15.5	1741
1931–1935	273	905	479	426	8.3	27.6	14.6	13.0	136
1936–1938	280	866	481	385	8.2	25.3	14.1	11.2	139
Present territory – 311 904 km ²									
1946–1950	290.2	699.3	267.3	432.0	12.0	29.0	11.1	17.9	110.2
1951–1960	262.3	762.4	264.0	498.4	9.5	27.7	9.6	18.1	81.4
1961–1970	238.7	528.7	243.0	285.7	7.6	16.8	7.7	9.1	47.3
1971–1980	317.1	640.8	304.2	336.6	9.3	18.7	8.9	9.8	28.3
1981–1990	276.5	644.0	368.0	276.0	7.4	17.3	9.9	7.4	22.0
1991–2000	212.1	446.8	385.6	61.2	5.5	11.6	10.0	1.6	13.4
2001–2004	193.6	357.3	362.8	–4.5	5.1	9.3	9.5	–0.2	7.2

Source: *Mały Rocznik Statystyczny, 1939; Demographic Yearbook of Poland, 2004*, Central Statistical Office.

Births, deaths and natural increase

Poland's demographic situation at the beginning of the 20th century was one of a high birth rate, if showing a marked downward trend. In Europe as a whole, this trend had set in much sooner, such that – in comparison with the general situation for central, western and northern Europe, Poland's demographic development was seen to be lagging behind by some 20 years. By the end of the 1930s, however, the birth rate had gone down to 25‰, while the decline in the death rate to 14‰ had taken place much more slowly.

The first ten years following the war (to 1955) stood out for their exceptionally high incidences of birth-giving, the rate reaching 26‰ in 1946 and then even 31‰ in 1951; only to decline gradually in subsequent years. The number of births exceeded

750,000 in each of the years in the period 1951–1955, the maximum being the 793,800 live births reported in 1955 itself. The generation born in the late 1940s and early 1950s is thus known with justification as a "baby boom" generation. The spatial distribution to the phenomenon is shown at powiat (county) level in 1950 (Fig. 2), this making clear the differences in the phenomenon characterizing the former Polish lands on the one hand and the regained territories in the west and north on the other. The western and northern lands, having been subject to the expulsion of their German population, were mainly settled by the young, thereby explaining why the birth rate was so high (at 39.1‰ – compared with 27.8‰ in what had also been Polish areas before the War). The high birth rate in the west and north was also influenced by the

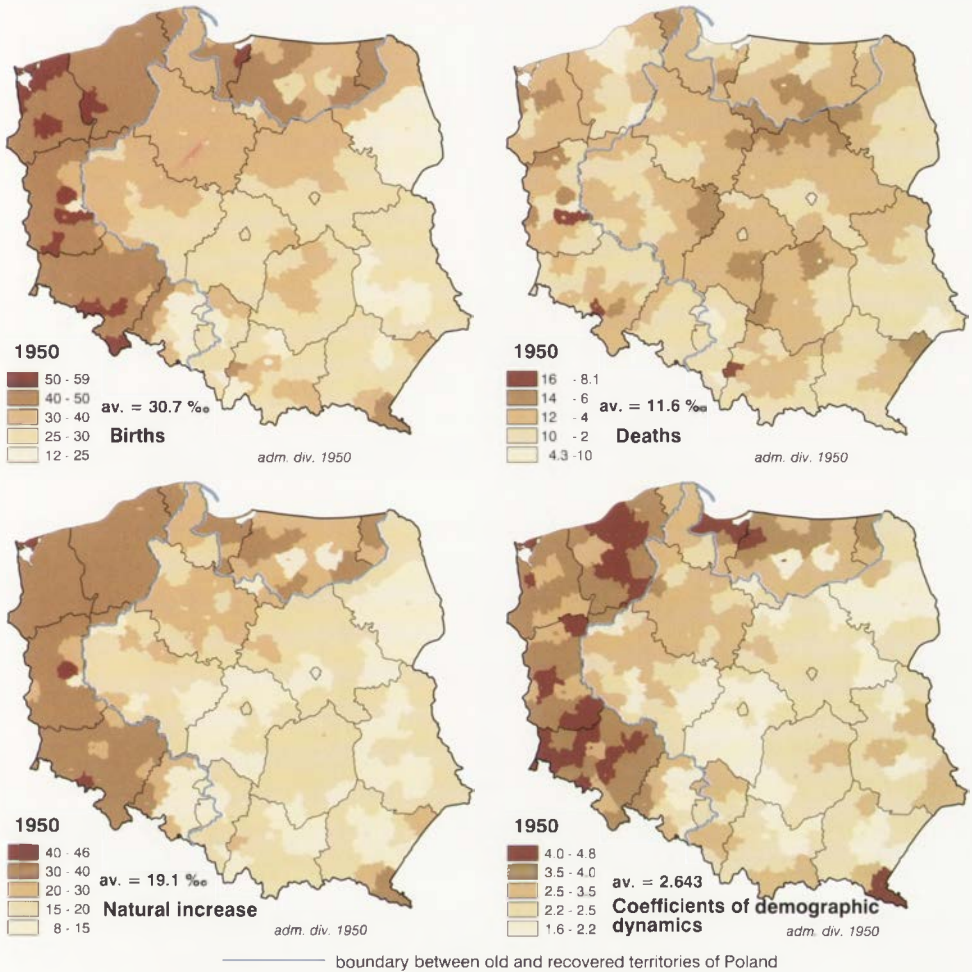


Figure 2. Births, deaths, natural increase and coefficients of demographic dynamics, 1950 (by Janusz Książak)

cultural mores of those transferring there – mainly rural, nearly half (48.8%) from the old Polish lands, and more than $\frac{1}{4}$ (27.7%) from the old eastern margins of Poland annexed by the Soviet Union after the War. The poviats in the west and north that did retain significant numbers of their native (autochthonous) inhabitants displayed lower birth rates than those in which a large influx of new settlers had arrived.

The compensatory wave of birth-giving had largely come to an end by 1958, and the birth rate declined steadily thereafter, such that by 1967 the number of registered live births was back down to 521,800 (or 16.3‰). However, the late 1960s saw the baby-boomers reach reproductive age and there was an upturn in the numbers of marriages contracted, followed by a renewed upward trend for numbers of

Natural and human environment of Poland

births – as a kind of echo of the original boom. This was maintained, if with some fluctuations, in the period 1976–1983, the peak being achieved in that last year, when some 723,600 live births occurred (equating to 19.7‰).

The numbers of births fell steadily in subsequent years, to just 378,300 births (9.8‰) in 2000, notwithstanding the attainment of reproductive age by those born in the mini-baby-boom of the years 1976–1983. By this time, major socio-political changes ongoing in the 1990s had modified ways of thinking and behaving where families and children were concerned. In place of the anticipated increase in numbers of live births from 1996–2003, the numbers in fact continued to fall.

In 2000, low birth rates were first and foremost characteristic of urbanized areas

(Fig. 3). What is typical is the disappearance of differences in birth rates between the so-called western and northern lands and the older parts of Poland – differences that had remained quite distinct as little as 20 years before.

A decisive influence where the numbers of births are concerned is that of the number of females of reproductive age – taken to be 15–49 in Polish statistical practice. The so-called coefficient of fertility relates the numbers of live births to the numbers of women in a given population capable of birth-giving. Thus expressed per 1000 females of reproductive age, the figure declined by around 50% in the period 1900/1901–1939, returned to the level of the 1930s in the post-War period and then declined by more than 60% in the years 1951–2000 (Table 3).

Table 3. Female fertility and reproduction rates of population, 1900–2004

Years	Fertility – live births per 1000 woman at age specified									Rate	
	15– –49	15– –19	20– –24	25– –29	30– –34	35– –39	40– –44	45– –49	total fertility	reproduction	
										gross	net
1900–1901	180	34	208	315	308	226	121	33	-	-	1.650
1931–1932	110	25	145	189	164	118	53	10	-	1.700	1.228
1950	109	39	194	209	157	100	38	4	3.705	1.790	1.491
1955	110	42	208	203	144	89	32	3	3.605	1.742	1.519
1960	93	45	199	165	103	60	22	2	2.980	1.438	1.339
1965	72	32	184	144	84	43	15	2	2.520	1.217	1.149
1970	64	30	165	126	71	36	11	1	2.200	1.064	1.011
1975	71	31	170	137	71	34	10	1	2.270	1.096	1.059
1980	76	33	180	136	69	29	8	1	2.276	1.108	1.073
1985	74	35	183	141	70	30	7	1	2.329	1.132	1.100
1990	58	32	165	121	59	25	6	0	2.039	0.991	0.967
1995	43	22	113	105	54	23	6	0	1.611	0.783	0.765
2000	37	17	81	92	51	21	5	0	1.337	0.649	0.640
2004	36	14	61	89	56	22	5	0	1.227	0.595	0.590

Source: *Demographic Yearbook of Poland*, Central Statistical Office.

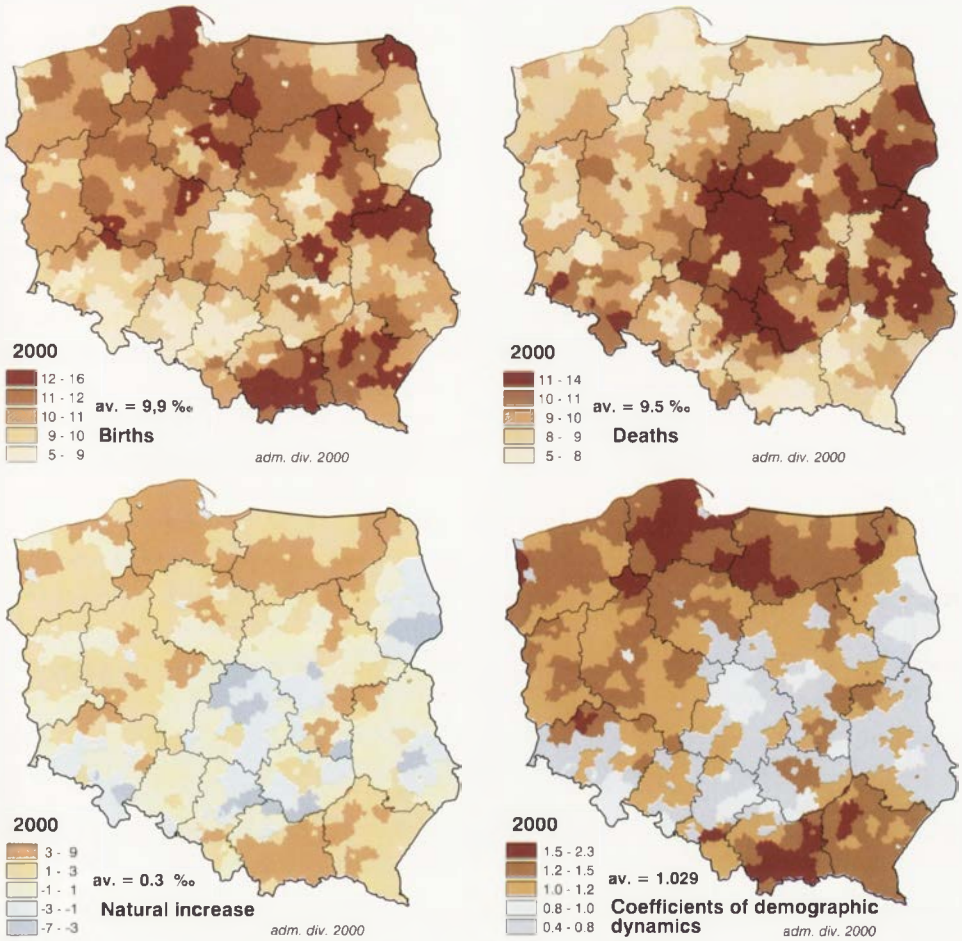


Figure 3. Births, deaths, natural increase and coefficients of demographic dynamics, 2000
 (by Janusz Książek)

The first 30 years of the 20th century brought a marked decline in the coefficient of fertility across all groups, with the greatest number of birth-giving events now characterizing women in the age range 25–34. There was a rise in the birth rate in the two youngest age groups (aged 15–24) in the 1950s, as well as a fall in the numbers of babies born to the older group of women of reproductive age (of 25–49). The 1960s in

turn saw a decline in the birth rate among potential mothers of all ages, albeit first and foremost among those aged 15–19 and 30–44, and one that was greater in urban areas. However, the declines in the birth rates among the 35–44 year-olds were actually greater among country-dwellers than in towns and cities.

It was in the 1970s that those born in the baby-boom of the early 1950s

themselves reached reproductive age, giving something of an increase in the birth-rate, above all among those aged 20–29. In contrast, among the group of older women, the coefficient of fertility remained at the level it had been at in 1970. The increase in birth-rate for the 20–29 year-olds persisted until 1985, before a fall that has so far gone interrupted began among women of all ages, but most especially among those aged 20–29 – and to an even greater extent in the rural areas than in the towns and cities. This attested to a change in the model applied in the establishing of families that applied in the countryside as well, and entailed a departure from the long-uphold model of the large family.

The downward trend may also be revealed in the following comparison: while every tenth woman of reproductive age gave birth in 1950 (every 5th among those aged 25–29), the same was true of only every thirtieth at the end of the century (every 11th in the group of 25–29 year-olds).

As of the first decades of the 20th century, the numbers of deaths in Poland remained at a high (if by then steadily declining) level, notwithstanding the youthful nature of the population. This reflected the poorly-developed healthcare system and generally limited access to medical care, most especially in poor areas of the east. The wartime devastation and biological weakening of the population combined with shortages of food and fuel, a catastrophic situation as regards hygiene, and spreading contagious diseases and mass migrations further encouraging epidemics, to leave in place circumstances that in no way favoured any more rapid

decrease in death rates. Only after 1952 did mortality begin to be curbed steadily, to the point where it reached what turned out to be the low point in the 1960s (see Table 2). Sadly, the next two decades brought a renewed, if slight, rise in the death rate, reflecting men's increased chances of dying while still in productive age (thanks to an unhealthy and/or unsafe lifestyle and way of working, plus excessive consumption of alcohol), as well as the changing age structure of the population. In the ageing society of the 1990s, notwithstanding improvements in material and health conditions, increasing medical knowledge, the better equipping of hospitals and access to healthcare, the death rate reached 10‰. The lower indexes over the last three years can be accounted for by a change in lifestyle and the spread of prophylactic medicine. For several decades now, the decline in the proportion of deaths due to infectious diseases was offset by an upsurge in the incidence of diseases of the circulatory system and connected with neoplasms. The forty years 1960–2000 brought more than a doubling in the coefficient for deaths due to diseases in these two categories, albeit with the rate for the circulatory diseases being at least twice as high as that for cancer. The number of new cases of neoplasms rose from 99 per 100,000 head of population in 1960 to 299 in 2000. The main threats to health lay however in the unsuitable lifestyles people pursued, as characterized by low levels of physical activity, improper nutrition, smoking, excessive consumption of alcohol, stress and environmental pollution.

One of the demographic indicators of the level of civilisational development

a society has attained is the number of deaths among infants per 1000 live births. While the figure was as high as 120 in 1946, it had fallen to 6.8 by 2004.

A second such indicator is average life expectancy at a given age (Table 4). Over the 70-year period 1931/2 to 2001, the average life expectancy at birth rose by 21.8 years in the case of men and 26.8 in the case of women. However, from the early 1960s on, figures went into decline. Thus, for example, while a 30-year-old man could hope for 41.1 years more on average as of 1960/61, by 1990/91 he could only count on 39.3 further years on average. Fortunately, the trend for life expectancy at the beginning of the 21st century is once again clearly upward.

were of between 10–15‰, while Poland had 17–18‰, albeit demonstrating a quite rapid downward trend. After Second World War, the figure increased abruptly once more, to around 18‰ – reflecting a greater number of “compensatory” births post-War. However, the years 1961–1970 brought a near-halving in the rate of natural increase, with a further marked decline in the 1990s that turned into a natural decrease as of the last years of that decade (see Table 2). As of the year 2000, the only clearly positive coefficients for natural increase to be noted regionally were for the northern and southern parts of the country, first and foremost in attractive areas near large cities.

Table 4. Expectation of life, 1897–2001

Years	Males					Females				
	life expectancy at age specified									
	0	15	30	45	60	0	15	30	45	60
1896/1897	33.1					35.4				
1931–1932	48.2	47.8	36.0	24.0	13.7	51.4	49.8	38.0	26.4	15.1
1952–1953	58.6	52.1	38.9	25.9	14.7	64.2	56.7	43.0	29.6	17.3
1960–1961	64.8	54.8	41.1	27.6	15.8	70.5	59.9	45.5	31.5	18.6
1970–1972	66.8	54.6	40.6	27.3	15.5	73.8	61.0	46.5	32.3	19.3
1980–1981	66.9	54.0	40.1	26.9	15.7	75.4	62.2	47.6	33.4	20.3
1990–1991	66.7	53.3	39.3	26.2	15.5	76.3	62.6	48.0	33.8	20.8
2000–2001	70.0	55.8	41.6	28.1	16.9	78.2	63.9	49.2	34.8	21.7

Source: *Demographic Yearbook of Poland*, Central Statistical Office.

A straightforward characteristic allowing for a general overview of the existing rate at which the population is reproducing (irrespective of differences in the internal structure to growth) is the coefficient of natural increase. At the beginning of the 20th century, the relevant figures for most European countries

By 2000, 30% of the country – accounting for 44% of its people – comprised regions in which the numbers of deaths exceeded those of births, giving a coefficient for the demographic dynamic equal to 0.805. Remaining areas still featured more births than deaths – the comparable figure being 1.240 (Fig. 3).

Structure of the population by gender and age

At the beginning of the 20th century, there was a slight prevalence of women over men in the Polish lands (a ratio of 104 to 100). However, as a result of wartime loss of life, the ratio in question had risen to 110 women per 100 men by 1921. Furthermore, this distorted structure was more fully developed within the urban population than the rural (the respective numbers of men per 100 women being 116.0 and 107.7). The most unbalanced situations of all characterized Warsaw (121.9:100), Lviv (121), Łódź (120.6) and Cracow (120.1), the effects here being further magnified by the move into the cities of women seeking employment in domestic service, or else in sectors of the economy with higher levels of feminization (like textiles).

The Second World War was even more disruptive of the population size and structure than the First. There was certainly a preponderance of men among the 6 million victims. Furthermore, when the War finally ended and men were liberated from concentration camps, Prisoner of War camps and forced-labour camps, they did not return to Poland immediately. Indeed, several hundred thousand people (mainly men) remained where they had been sent within the USSR for a far longer period. Thus, the first post-War summary census (of 1946) revealed a huge deficit of men – there were 2.3 million of them fewer than women: 121.5 females for every 100 males. However, while the figure for the lands that had been Polish before the War was 117.8, that in the western and northern lands was 137:100. Indeed one

powiat there reported a figure of 180:100. Once again, the distortion was greater in urban areas (at 130.8:100) than in rural areas (117.4).

Within a few years (by 1950), the deformation of the population structure by gender had moderated – in part because of migration processes (repatriation), and in part because of the natural rotation of the generations – i.e. the gradual die-off among year-classes in which the gender structure was most distorted, and the appearance of new year-classes of normal structure. By 1950, the “shortfall” of men was down to 1.2 million, and there were 109.6 women per 100 men (still a high figure – and one made worse by major differences from powiat to powiat, Fig. 4). The process by which the disproportions were gradually evened out persisted until the end of the 1950s. By 1960, the population was 970,000 men “short”, and there were 106.7 women for every 100 men. This was to say that the imbalance was back to where it had been prior to Second World War, albeit with a different structure in terms of age. However, a new phenomenon began to take hold – ensuring that there was only a slight further evening-out of the “excess” or women in the population. The phenomenon in question was the disproportionate incidence of mortality among men of later productive age, compared with women. Thus, by the year 2000 there were still 105.8 women per 100 men across Poland (albeit with the 109.5 in urban areas comparing with 100.1:100 in the countryside). Nevertheless, the figures overall are now comparable with those in such countries as Italy, Germany and the United States.

In 1900, the population inhabiting the Polish lands was striking in its youthfulness.

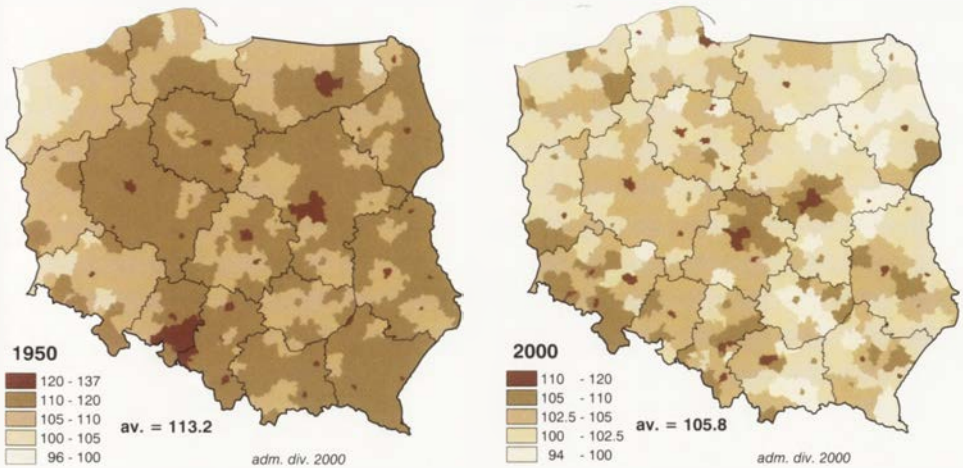


Figure 4. Number of women per 100 men, 1950 and 2000
(by Janusz Książczak)

Those aged 0–14 represented 39% of the entire population, while 54% of people were 15–59 years old. That left less than 7% of the population aged 60 and over (Fig. 5). Such a structure reflected a high rate of natural increase that was offset by high levels of emigration and high rates of mortality, but still great enough to ensure a population increase. The two World Wars inevitably wreaked havoc among the year-classes born while they were continuing. Equally, the post-War baby boom rejuvenated the age structure of the population, such that by 1950 some 31.6% of the population was aged 0–15, while 59.7% were aged 15–59 and 8.7% of people 60 or more. Subsequent years saw a steady decline in numbers of births, which had its own impact on population age structure, particularly in the light of the ongoing extension of life-spans.

The elevated incidence of birth-giving came to an end in 1984 as the generations of the post-War demographic peak

reached the end of their reproductive lives and there was an abrupt tailing-off of numbers of births. This only intensified as political changes from the early 1990s led young people to re-evaluate their life plans and – very often – to change the models pursued when it came to the founding of a family. The result – in combination with an ongoing increase in average length of life – was a fundamental change in the age structure of the population between 1989 and 2002. The share of the population accounted for by the young fell to 19.7%, even to between 13 and 15% in the large cities and agglomerations. In turn, the 15–59 year-olds came to account for 63.3% of the population, while there was a near-doubling of the elderly's share of the population – to 17.0%. By the end of the 20th century, then the age structure of the population had clearly assumed regressive characteristics, and indeed the population did decline by 476,000 in the years 1999–2003 inclusive.

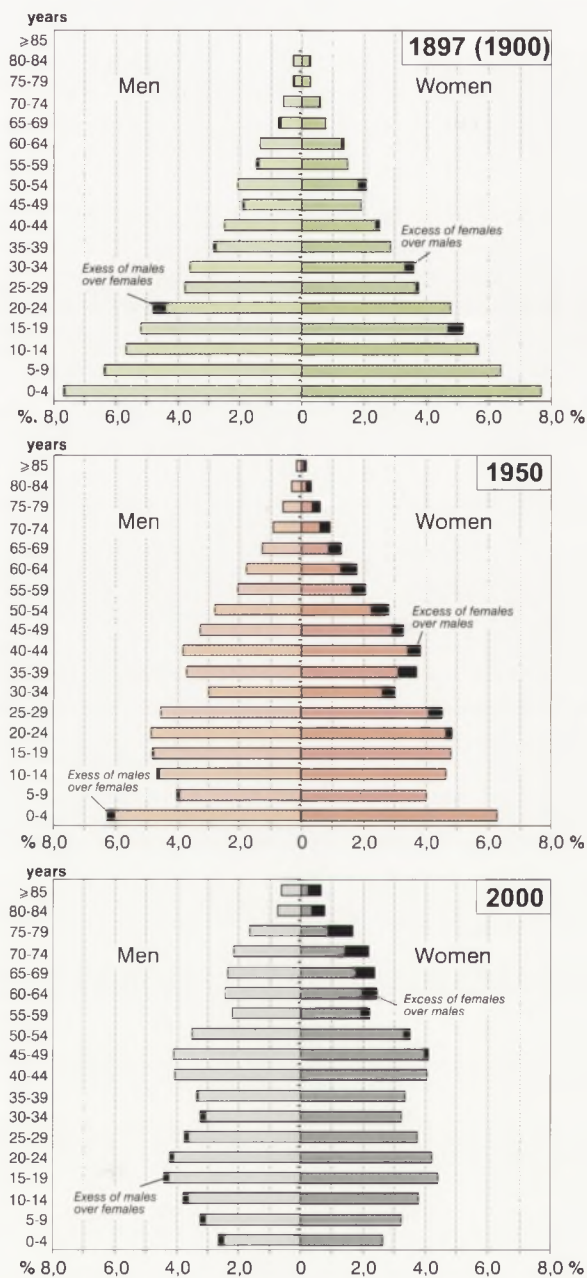


Figure 5. Structure of the Polish population by gender and age, 1900, 1950 and 2000 (by Janusz Książak)

The demographic "youthfulness" or "age" of society may be characterized most simply using the so-called median age of the population, which is to the age of some notional person at the centre who has half of the entire population younger than him/her and half older. While that age was 25.1 years in 1950 (26.3 urban and 24.2 rural), it had risen to 34.9 by 2002 (36.2 cf. 33.0 respectively).

Immediately after the War's end (in February 1946), there were also populations with a large proportion in the 0–17¹ age-bracket in the north-western parts of the so-called regained lands, and in some of the lands that had been Polish before the War, along with consequently low proportions of adults in these areas (Fig. 6). In the northern part of the regained lands, this situation reflected the conscription of males into the German army, escapes westward by the German civilian population ahead of the advancing front line in winter 1945, and the tendency for large autochthonous families with many children to remain behind – under the care of women. In contrast, in the part of Poland that had also been Polish pre-War, in the centre and south of the new state, the large share of children and young people reflected the deficit of adults, most especially adult men. It was from here that the Soviets had transported people deep into Soviet territory, here that resistance movements had been persecuted and repressed most by both the Germans and the Soviets, and here that both parties had found huge numbers of forced-labourers. It was also from here that people settling

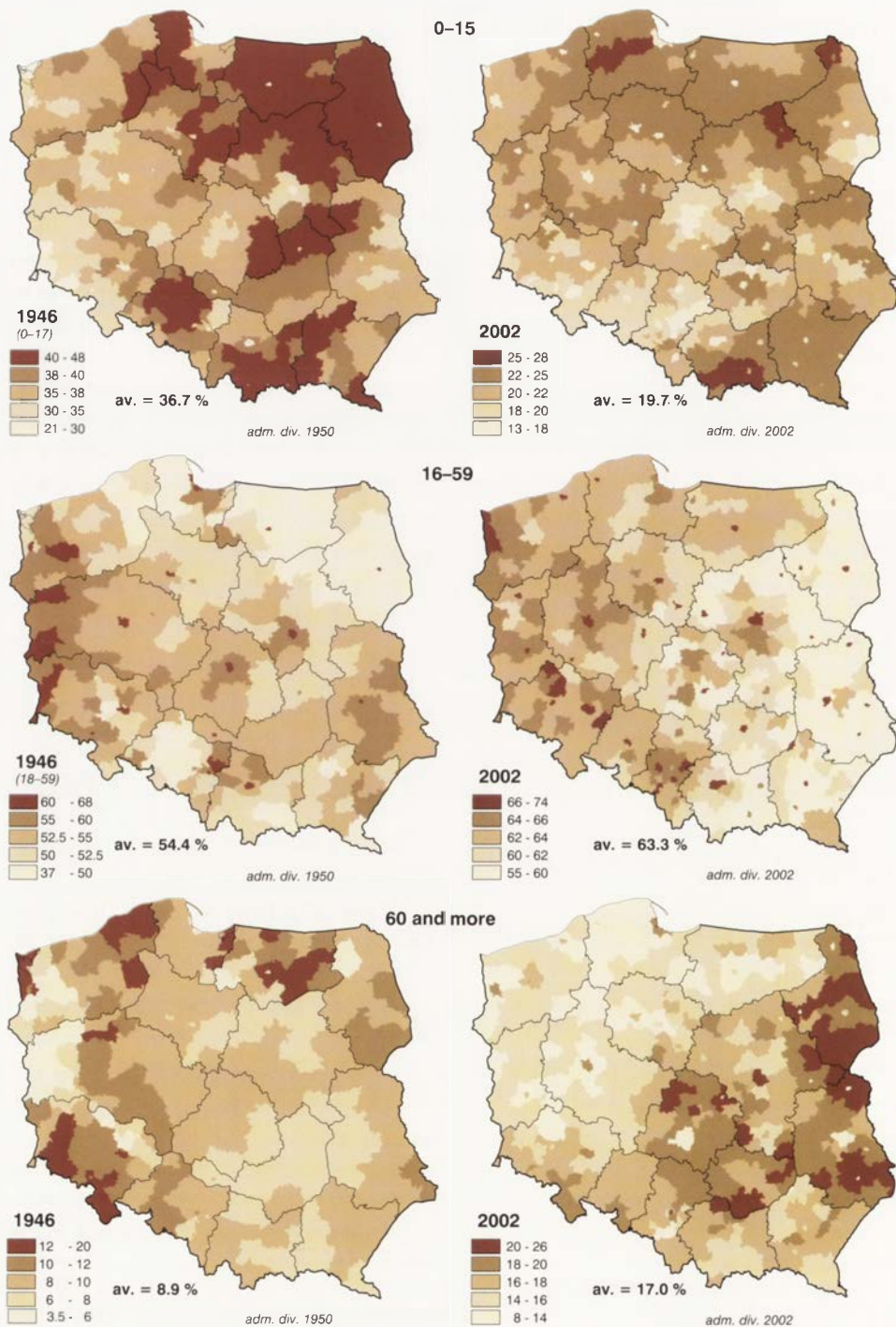
in the western lands were able to depart at a relatively early stage.

A more major concentration of adults (aged 18–59) was thus mainly to be found in the western part of the so-called land regained (from the Germans), on which some people of German extraction were still present, alongside an influx of adults from the old Poland, as well as the parts in the east that had ceased to be Polish following Soviet annexation. In several poviats, adults represented 2/3 of the entire population. In turn, large shares of the elderly were to be noted in the regained lands – these mainly being Germans who awaited expulsion from their native land in accordance with the provisions of the Potsdam agreement of August 2nd 1945.

The years 1946–1950 were characterized by intensive processes of migration (an outflow of Germans, an inflow of people being repatriated and movements of settlers), as well as by high reproductive rates. A similar situation applied in the 1950s, albeit with internal migration processes dominating. Only in later years did a steady decline in reproductive rates set in. All of these factors exerted a major influence on the structure of the population by gender and age – both nationally and in the different regions of the country.

As a result of all this, by 2002 the differences in age structure between the original lands and the regained lands had disappeared. Today a high share of the population accounted for by young people is to be noted in the northern and north-eastern poviats, while the share is low in the large or very large cities and

¹ The data from the first (summary) post-War Census of February 1946 only offers data for the age intervals 0–17, 18–59 and 60 years and over. It is not therefore completely comparable with the 2002 age structure (0–15, 16–59, 60 and over).



their suburban zones. There is a very clear division of Poland from the point of view of the share of the population that is adult, there being proportionally far more 16–59 year-olds in the west of the country than in the east. The reverse situation applies when it comes to the percentages aged 60 and over – which are much higher in the eastern poviats.

Internal population migrations

Internal migration in Poland has been registered since 1951. Any earlier data from the post-War period are estimates at best. In any case, the end of the War initiated massive internal movements of the population. The first migration to begin was one from liberated parts of the pre-War Poland into the so-called regained lands, which was based around the desire to loot the latter of any prizes that could be found. Movements of a rather different kind involved a smaller number of “pioneer” influxes of people, convinced that the regained territories needed to be taken in hand and restored. A final (largest) group comprised “normal” settlers migrating in search of conditions for living that were better than their home areas could offer. Overall, the mass internal migrations associated with settlement of the western and northern lands mainly occupied the years 1945–1947. Though subsequent years did not bring major quantitative changes, the year 1950 is considered the limit date beyond which there were

essentially no undocumented movements of population (Table 5).

At the end of the 1940s the existing trend for migration linked to the colonisation of the western and northern lands was augmented by movements reflecting the reconstruction of the industry destroyed during the War, and then the founding of new factories and plants – mainly in heavy industry and the machines industry – in or around the cities. The burgeoning development of industry was of an extensive nature, based on huge investment outlays and an increased demand for employment met by mass inward movements of people. In effect the dominant flow was rural-urban, though formally more rural-rural transfers were reported, because there were several tens of agglomerations in which restrictions made registration impossible for some years. In fact, this situation persisted – depending on the city involved – to 1962, 1972, or even 1984 in the large cities. In consequence, many would-be rural-urban migrants were compelled to register in the rural gminas adjacent to the cities in which they were actually finding work.

While the amount of internal migration declined with each passing 5-year period, it slowed abruptly when the economic crisis and stalling of new housing construction set in at the end of the 1970s. The number of movements in the years 1981–1985 was 20% down on that in the preceding period. The decline in numbers of migrations slackened off in the mid-1990s, while the main direction to the movements assumed a city-to-city character. The change in the

Figure 6. Population by age-group (0–15, 16–59, 60 years and more), 1946 and 2002
(by Janusz Książak)

Table 5. Internal migration of population for permanent residence, 1951–2004 (in thousand)

Years	Internal	Migration from				Net migration in urban areas	Number of migration per 1000 population
	migration total	rural-to-urban areas	urban-to-rural areas	urban-to-urban areas	rural-to-rural areas		
1951–2004	44 667.4	13 225.3	7 395.2	11 540.8	12 506.2	5 830.1	×
1946–1950	7 124.0	1 010.0	59.0
1951–1955	6 904.7	1 842.7	1 250.1	1 950.5	1 861.5	592.6	52.6
1956–1960	6 717.7	1 610.4	1 190.7	1 558.1	2 358.5	419.7	46.7
1961–1965	5 030.7	1 303.8	800.9	1 128.7	1 797.3	502.9	32.7
1966–1970	4 324.3	1 265.4	567.8	947.0	1 544.1	697.6	26.9
1971–1975	4 270.9	1 455.7	517.5	1 009.3	1 288.4	938.2	25.6
1976–1980	4 662.1	1 682.3	615.1	1 313.4	1 051.3	1 067.2	26.7
1981–1985	3 660.9	1 263.9	578.4	1 005.9	812.7	685.5	20.0
1986–1990	3 049.6	1 104.6	446.3	822.1	676.6	658.3	16.1
1991–1995	2 313.9	757.8	439.9	666.8	449.4	317.9	12.0
1996–2000	2 096.6	553.5	507.2	623.1	412.8	46.3	10.8
2001–2004	1 636.0	385.2	481.3	515.9	253.6	–96.1	10.7

Source: *Demographic Yearbook of Poland*, Central Statistical Office.

country’s socioeconomic system in 1989 – ushering in a market economy – made a rationalisation of the employment structure unavoidable, creating a demand for highly-qualified professionals that were not always present on given local labour markets. Movements of specialists from one urban area to another were thus favoured, the direction usually being from small towns to cities to large cities, each being able to offer better pay than the one before. However, the second-largest movement now taking place is a migration in the reverse direction from cities to rural areas. As precise analysis makes clear, these movements involve transfers of the best-off families from the big-city blocks to their own single-family housing located in attractive villages close to (within commuting distance of) those large cities.

Migrations abroad

In Poland, the statistics on migration abroad kept by the Central Statistical Office deal mainly with arrivals in the country for the purposes of permanent stay – i.e. immigration, as well as cases in which the country is left essentially for good, i.e. emigration. When the huge post-War movements of people came to an end, the Cold War was otherwise a period of minimized traffic, albeit with a renewal of repatriations in the period 1955–9. Otherwise, immigration for the purposes of permanent stay was maintained at the relatively stable and low level of a little over 2400 people a year. There were almost ten times as many emigrations. According to the official figures, there were 5.4 million permanent emigrations from Poland in the years 1944–2004,

while there were 4.3 million immigrations. However, it needs to be recalled that – in the whole post-War period up to the end of the 80s – migrations abroad remained under the control of the Ministry of Internal Affairs, with refusals to issue citizens with their passports being the rule rather than the exception. The main directions to the emigrations were westward to Germany and the United States (Table 6).

In each case it was family ties that were the deciding factor. From the early 1970s on, there were far more of what were formally short trips abroad that quite often turned into unofficial permanent emigrations. The precise numbers involved are not known. The changes in the political and economic system from 1989 on, and the associated amendment of the Passports Act, led to a dramatic increase in numbers of trips

Table 6. Arrivals and departures (permanent migration) by countries, 1981–2004

Countries	Departures from Poland (total)			Arrivals in Poland (total)		
	1981–1990	1991–2000	2001–2004	1981–1990	1991–2000	2001–2004
TOTAL	266 968	224 947	87 590	17 290	72 888	29 755
Germany	159 449	160 671	62 365	2 475	19 421	9 470
United States	26 578	24 524	10 029	3 368	11 586	4 709
Austria	11 402	4 987	1 924	329	2 014	589
Canada	11 260	13 365	3 510	608	4 182	1 186
Italy	9 370	1 845	1 220	286	1 869	984
France	9 192	2 832	1 151	741	3 112	957
Sweden	7 703	3 513	632	326	1 176	349
Australia	4 309	2 821	761	410	1 711	443
United Kingdom	3 550	1 366	1 287	867	2 399	1 028
others	24 155	9 023	4 711	7 880	25 418	10 040
	in percentage					
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
Germany	59.7	71.4	71.2	14.3	26.6	31.8
United States	10.0	10.9	11.4	19.5	15.9	15.8
Austria	4.3	2.2	2.2	1.9	2.8	2.0
Canada	4.2	5.9	4.0	3.5	5.7	4.0
Italy	3.5	0.8	1.4	1.7	2.6	3.3
France	3.4	1.3	1.3	4.3	4.3	3.2
Sweden	2.9	1.6	0.7	1.9	1.6	1.2
Australia	1.6	1.3	0.9	2.4	2.3	1.5
United Kingdom	1.3	0.6	1.5	5.0	3.3	3.5
others	9.0	4.0	5.4	45.6	34.9	33.7

Source: *Demographic Yearbook of Poland*, Central Statistical Office.

abroad, including short-term migrations for the purposes of earning money. The last Polish Census of 2002 revealed that – as of May that year – 786,000 Polish citizens had been more than 2 months abroad. Although Poland acceded to the EU as anticipated on May 1st 2004, a large majority of the “old” Member States declined to open their labour markets fully for Polish workers. The exceptions from the start were the UK, Ireland and Sweden and – in the period to September 30th 2005 – the UK alone had registered 170,000 incomers from Poland for legal work. It is estimated that around a million Poles are at work illegally across the EU, while c. 200,000 are working legally and more than 300,000 take part in the annual migrations to Germany and Spain in search of seasonal work.

At present, the most important demographic phenomena and processes in Poland include:

- a decline in the numbers of marriages contracted and an increase in the numbers of divorces,
- a progressing decline in numbers of births and a fixing of the model of the family with 1–2 children,
- a lack of simple replacement of the generations noted since 1989,
- a steady increase in the proportion of all births taking place out of wedlock (to one in six at the present time).

These changes reflect growing educational and professional aspirations among young people, competition on the labour market, the limited satisfaction of young people’s needs as regards housing and their material situation and difficulties with the reconciling of professional and family responsibilities.

The structure of the Polish population by nationality

Piotr Eberhardt

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: p.ebe@twarda.pan.pl

Introduction

The National Census carried out in Poland in April 2002 took account of two ethnicity-related criteria for each person, i.e. identification as regards a particular nationality and the language used at home. Thus each censused citizen of the Polish state has been under an obligation to detail his/her unambiguous affiliation with a given, subjectively-chosen national grouping, as well as to indicate the language he/she makes use of domestically.

The intention of the Census organisers was that the answers obtained for these two questions should be of major cognitive and statistical importance, in particular in the light of the fact that similar questions on ethnicity-related features were lacking from the forms used at any of the censuses carried out in Poland over more than 50 years. Thus, unlike the censuses taking place in the inter-

War period (i.e. in 1921 and 1931), or in the very first post-War census of 1946, the ones carried out in the Polish state subsequently (in 1950, 1960, 1970, 1978 and 1988) did not encompass questions on either nationality, or language, or religious faith.

This avoidance of such important matters was deliberate and had its political justifications. Following the change in the Polish borders at the end (and as a consequence) of the Second World War, the major attendant movements, resettlements and expulsions of Polish, German and Ukrainian people, in combination with the enormous demographic losses that had taken place – and been selective in terms of nationality (with Jews of course suffering particularly severely), had left Poland a very largely mono-ethnic country. This compared with a pre-War Polish state in which the various national or ethnic minorities had accounted for as much as 1/3 of the entire population¹. After the War, then,

¹ The 1921 Census of Poland revealed a population of 27,212,000, of which 69.2% claimed to be Polish, 14.3% Ukrainian or Ruthenian, 7.8% Jewish, 3.9% Belarusians and 3.9% German. The next (1931) Census had the population up to 31,915,000 inhabitants. The language criterion applied at that time revealed 68.9% of the population considering Polish their native tongue, cf. 13.9% Ukrainian, 8.6% Yiddish, 3.1% Belarusians and 2.3% German.

Poland re-formed as an ethnically-homogeneous state, with an estimated 95%-plus of the then population assumed to be of Polish nationality. Furthermore, a similar proportion of the population was declaring itself Roman Catholic, and the Polish language was entirely dominant across the country. It was thus anticipated that the national, ethnic, religious or linguistic minorities were of small size, and furthermore so scattered in distribution that no more distinct spatial concentrations existed, and there was no activity of a disintegrative nature as far as the cohesive existence of the state was concerned. For these reasons, ethnic issues were definitely regarded as of secondary importance, and not thought to constitute a major problem for authorities at central and regional level. Beyond all of that, there were also certain ideological counter-indications hindering consideration of these usually complex and sensitive questions of a demographic and societal nature. For the country's ruling communist authorities, class differences and wealth disparities were important, while ethnic diversity or differences were of no significance. Indeed, any exposure of such issues would clearly run counter to the prevailing and much-promoted Marxist ideology. Equally, any revealing or exposing of Poland's overwhelmingly Catholic face would have been politically

inconvenient for Communists then engaged in a battle against organized religion that was making an all-out effort to impose an atheistic outlook.

The various aforementioned factors ensured that it was only after the major geopolitical changes sweeping Central and Eastern Europe (including and most of all Poland) in the late 20th century, that it was once again possible to restore questions on nationality and language to the Census². All that would continue to be avoided (for not-very-obvious reasons) were matters of attitude to religion and citizens' affiliations with the different organized faiths. The Census organisers accounted for this by reference to rather incomprehensible arguments of a formal nature related to conviction. It is for these reasons that the precise census data at our disposal is concerned with citizens' nationality and language³, while matters linked with the religious structure of Polish society may only be considered on the basis of sociological research whose reliability is questionable. While it is also possible for information from the different faith organizations to be used, the cognitive value of this does not meet basic requirements from the substantive and statistical points of view⁴. Nevertheless, notwithstanding this lack of data, numerous

² For this reason, works on Central and Eastern Europe seeking to analyse relationships based on nationality in Poland have tended to base themselves on rough estimates. This has limited the analytical possibilities. It needs to be recalled that situations as regards both ethnicity and nationality, and religion were very complex across E-C Europe for the whole of the 20th century. There were numerous conflicts based around nationality issues that acted in favour of the disintegration of this part of Europe. Authors who have devoted books to this issue include: Eberhardt (2003) and Waldenberg (2000). There are also English-language Atlases on the subject, by Magocsi (1995), and by R. Crompton and B. Crompton (1996).

³ The latest Census documentation to have been published in regard to questions of nationality and language has not yet been interpreted scientifically. All that the first analyses have so far done is to put forward preliminary research hypotheses (e.g. Babiński, 2004)

⁴ An example here might be the controversy surrounding the size of the population of the Orthodox faith in Poland. Orthodox Church documentation speaks of a population of between 560,000 and 800,000 faithful. Yet very objective true estimates suggest that there are only one-third as many in Poland (some 200,000).

studies have been carried out in Poland as regards the abundance and distribution of different minorities, as well as their role in Polish society. These are auctorial in nature and may be burdened with a high degree of subjectivity⁵.

The composition of Poland's population by nationality and language

The 2002 Census attested to the presence of some 38,230,100 residents on Polish territory, of which the vast majority (37,455,200) declared themselves to be

of a given nationality. In the cases of only 774,900 individuals were nationalities not revealed, and these cases mainly reflected situations in which people were interviewed away from their place of residence. They were mainly included within the category of Polish citizens that had travelled abroad, and from whom it was not possible to obtain a subjective declaration as regards nationality. In principle, there were no respondents declining to answer the Census question as formulated. Thus, Polish was the declared nationality of 36,983,700 people, while other options were chosen by just 471,500 residents, or only around 1.2% of the country's population (Table 1).

Table 1. Composition of Poland's population by nationality, 2002

Nationality	Number of people	
	Total	%
Polish	36 983 720	96.7
Silesian	1 73 153	0.5
German	152 897	0.4
Belarusian	48 737	0.2
Ukrainian	30 957	0.1
Roma	12 855	<0.1
Russian	6 103	<0.1
Łemko	5 863	<0.1
Lithuanian	5 846	<0.1
Kaszubian	5 062	<0.1
Slovak	2 001	<0.1
Jewish	1 133	<0.1
Other	26 868	0.1
Not established	774 885	2.0
TOTAL	38 230 080	100.0

Source: *Ludność. Stan i struktura demograficzno-społeczna 2002, 2003*, Central Statistical Office, Warsaw.

⁵ Among these many studies, those of particular importance include ones by Tomaszewski (1991), Hałuszko (1992), Łodziński (1992), Adamczyk (1996), Chałupczak and Browarek (1998), as well as the collected works on national minorities entitled *Mniejszości narodowe* (1997) and *Mniejszości narodowe* (1998). These studies contain various statistical estimates, as well as discussing differences in Polish nationalities over space and time.

As has been noted, the second ethnic criterion made use of was a subjectively-made declaration concerning language. In line with expectations, a near-total supremacy on the part of the Polish language was revealed, it emerging that as many as 97.8% of citizens use Polish in their family contacts. In second place was the German language, claimed by 204,600 people mainly resident in Silesia. A certain proportion of people declared themselves bilingual, citing both Polish and German equally, as used interchangeably at home. Many immigrants, including Poles, cited English, or more rarely Russian, French or Italian. What did come as something of a surprise was the emergence of a large number of people (some 56,600) who claimed to use the Silesian language. In the view of linguists, this is not a separate language at all, but merely a dialect of Polish bearing a resemblance to Old Polish, albeit with certain accretions adopted from German.

The relationships between the language used at home and the identification as regards nationality are extremely complex and hard to interpret unambiguously. It may be pointed out that, while the Silesian and German languages are referred to by 261,000 of those censused, German and Silesian nationalities are declared by 326,000. The complicated question may be analyzed through the construction of several different research hypotheses, albeit ones whose adequacy remain open to question.

A further unexpected result was that so few people would cite the Ukrain-

ian, Belarusian or Lithuanian languages. A greater total number of people indicating the Kaszubian language had also not been anticipated (Table 2).

The sizes of the national and ethnic minorities in Poland

The Census results thus confirm in a very clear way the huge dominance in Poland of people of Polish nationality using the Polish language. On the other hand, the published results did bring a large number of surprises. The first of these was the appearance of "Silesian" as the largest national minority in the country. In line with the assessments of the specialists dealing with demographic and ethnographic subject matter, the Silesians do not in fact represent a separate nation, but are merely a regional ethnic grouping of Slav pedigree forming an integral part of Polish nationality. However, living in an ethnic borderland, they have been subject to cultural influences from both the Polish and German sides⁶. As the people living here were once citizens of the German state, they were subject to Germanization over long periods of history. As they were usually faithful to both the Polish language and Catholicism, they retained tied to Polishness, though they often lived within the orbit of German civilizational and cultural models. Many of them made a conscious choice of the option of Polish nationality, as opposed to German. Equally, a large group of Silesians remain-

⁶ The issue of the national affinities of the people of Upper Silesia in general, and the Opole region in particular is not merely an important political one, but also of scientific relevance. It is being studied at *Instytut Śląski* in Opole (Silesian Institute). A number of demographic, sociological, geographical and political studies dealing with the subject have also been published. Particularly noteworthy among these are the books by Berlińska, Jonderko and Maj (1993), *Integracja* (1994), and the work of Szmajda (1997) and by Berlińska (1999).

ing undecided took up an intermediate position. Indeed, there was an element of opportunism involved, the declared option often being conditioned by the political situation and possible economic benefits. The latter operated to favour an identification with German nationality. Thus a large proportion of the Silesians are not so much indifferent as of labile nationality. They are in constant search of a place within the orbits of either Polishness or Germanness, or else opt to wrap themselves up in their own regional identity – this being closer to them than anything else. The failure to reveal an attitude in an unambiguous manner has many causes. Besides considerations of outlook, the aforementioned eco-

nomics factors are of major significance. They reflect a critical attitude towards the realities of life in Poland, in comparison with the benefits that affiliation to the German nation can bring. On the other hand, “core Germans” do not regard Silesians as people belonging within their civilizational and linguistic circles, usually regarding them as Poles pure and simple. Taken together, these factors account for attitudes that are not always unequivocal, are variable and are a source of frustration and indecision. It is within the latter categories that separatist tendencies under the heading of the distinct Silesian “nationality” have emerged. A manifestation of these varying standpoints is the revealing by the Census of a relatively

Table 2. Poland's population by declared language, 2002

Language used	Population	
	Total	%
Polish	37 405 335	97.8
German	204 573	0.5
English	89 874	0.2
Silesian	56 643	0.2
Kashubian (Kashubian)	52 665	0.1
Belarusian	40 650	0.1
Ukrainian	22 698	0.0
Romany (Romani)	15 788	0.0
Russian	15 299	0.0
French	15 282	0.0
Italian	12 001	0.0
Lithuanian	5 838	0.0
Łemko	5 627	0.0
Other languages	287 807	0.8
Not established	772 223	2.0
TOTAL	38 230 080	100.0 ¹

¹ In some cases, those censused cited two languages as used in everyday life. This is why the number of residents of the country does not match the numbers declaring the different languages, and also why the percentages add up to a little over 100%.

Source: *Op. cit.* Table 1.

large group of some 173,200 people prepared to declare themselves "Silesian" in the presence of the census-taker. It may be anticipated that many of those ultimately opting for the word "Polish" in describing their nationality also had a difficult choice to make.

The autochthonous population of Silesian pedigree inhabiting Upper Silesia, the eastern part of the Opole region and Cieszyn-Silesia numbers almost 2 million inhabitants in total. However, these people are distributed across the territory in question in a rather irregular manner. Post-War migrations, and most especially the influx of people from the remaining areas of Poland operated in favour of ethnic and territorial disintegration. The native population of Silesia is diverse in terms of its conscious attitudes and views as regards historical tradition. Moreover, the folk culture also differs from place to place, in relation to the different political histories of the different parts of Silesia. While the Opole area was uninterruptedly within the German state up until 1945 (and was thus subject to the most advanced process of Germanization), the inter-War (1921–1939) Upper Silesia was divided. The eastern part belonged to Poland, while the western formed part of Germany. This was a further source of divisions and separate evolution where political attitudes were concerned. Up to First World War, Cieszyn-Silesia formed part of the Austro-Hungarian Empire, only returning to Poland when the Habsburg Monarchy fell. These different historical fates have naturally impacted upon the attitudes that the Silesian population tend to hold. The

population of Cieszyn-Silesia always identified fully with Polishness, irrespective of whether those concerned were Catholics or Protestants. Upper Silesia was dominated by Polish-speaking Catholics who emphasized their ethnic distinctiveness in the face of pressure from both Polish and German cultures. In Opole-Silesia, which remained German even in the inter-War period, there was a steady erosion of Polishness, which was only held on to in rural areas. Furthermore, the population of the Opole area proved unable to adapt to the new Polish conditions after the War (including as regards the systemic principles that were then put in place). Under such circumstances, they began to take up the pro-German option in a more and more conscious fashion. However, as many of them left their native land, emigrating for good to a richer Germany, the result was further ethnic and social disintegration in the region⁷.



Photo 1. Memorial of the Second World War German Victims on the cemetery in Chrzęstowice (Opolskie voivodship)

⁷ The matter of the regional differentiation in Upper Silesia and Opole are here simplified considerably. The historical aspects were presented comprehensively in the work by Nawrocki (1993), which includes a wide-ranging bibliography that reveals the political consequences of cultural regionalism in Upper Silesia.

The central part of Silesia is dominated by mining and heavy industry. A high proportion of the population is urban and this exerts an influence on people's living conditions. Big-city ways of thinking and behaving have modified the folk culture, while intensive processes of multi-directional (economically-motivated) migration have led to the marginalization of the native Silesians. The situation is now one in which the greater part of the population in that region derives from other parts of Poland. However, the peripheral (more agricultural) parts still support people of Silesian origin, who keep up the traditions and customs of that region. They use a Silesian dialect in their daily lives, albeit one being gradually displaced by the literary Polish language.

A further surprise provoking academic discussion was the discovery that the Belarussian and Ukrainian minorities were of such relatively small size. Data submitted hitherto by organizations representing the minorities had suggested there were at least 200,000 Ukrainians, as well as 150–180,000 Byelorussians living in eastern Poland. These estimates would now definitely have to be regarded as on the high side⁸, clearly failing to take account of the intensive assimilation processes encompassing the Belarusians, and all the more so the Ukrainians so well-scattered across the country.



Photo 2. Ortodox church in Czarna Białostocka (Podlaskie voivodship)

In line with presumptions, virtually the entire Kaszubian population acted collectively in declaring itself Polish. Notwithstanding the genuine distinctiveness of this ethnic group, only around 5000 Kaszubians (or 1% of the total) cited any Kaszubian nationality. Furthermore, there were no "core Kaszubians" declaring themselves to be of German nationality.

A further surprise was the unveiling of a small Lemko minority, since this has been regarded as merely an integral part of the Ukrainian nation⁹. In turn, the

⁸ Once the Census documentation had been published, researchers made some attempts to verify the official data. Among other things, it has been reported that the true number of Belarusians is in fact 55–60,000, and not 48,700 (Skorupska, 2005), while the numbers of Ukrainians plus Lemko people is not 36,800 but close to 50,000. Equally, these differences may be thought to have little statistical significance. The dispersed Ukrainian population in Poland is in rapid decline, just like the Polish population in Ukraine. While the 1959 Soviet Census gave some 363,300 people of Polish nationality for the Ukrainian SSR, the 2001 Ukrainian National Census gave a figure of just 144,100.

⁹ The Lemko are a group using a dialect of Ukrainian. They are mainly Greco-Catholic, though a small proportion are Russian Orthodox. Up to 1947, they inhabited the Carpathians, before being "resettled" and dispersed. Ukrainians regarded them as an integral part of their nation, though separatist tendencies are widespread among them. A certain group of Lemko have returned towards their native lands in the Low Beskids. There is quite an extensive literature on this small ethnic group (e.g. Kwilecki, 1974; Michno, 1995; Reinfuss, 1998).

Census had also been expected to reveal more representatives of the Slovak, Lithuanian and Jewish minorities than was the case. In fact, some 15,000 Lithuanians have been counted in Poland, along with around 12,000 Slovaks. The anticipated Jewish population of 10,000+ in particular failed to materialise, the consequence of a clearly under-appreciated process of intensive assimilation primarily reflecting mixed marriages. The offspring of such unions usually seem to be making a conscious choice of Polish nationality.



Photo 3. Old synagogue in Szczepieszyn (Eastern Poland)

All the cited data on the sizes of national minorities are the subject of research at present. However, this is not basically questioning the results of the Census. Today's Poland is a democratic country in which no one may be subjected to extra administrative or other difficulties – let alone persecuted – in relation to affiliations of nationality, language or faith. Research carried out *en masse* is always characterized by a certain deformation or distortion of the real situation. For example, those declaring themselves part of

a national minority are very largely people who have a declared option as regards nationality. Those sandwiched between two ethnic groups probably go with the majority, since the status of representative of a national minority may bring about a certain individual marginalization. This is a widespread phenomenon and is not only characteristic of Poland. It is thus accepted that the Census tends to supply minimal limit values. The actual grouping of people within national minorities may be somewhat larger. This is particularly true of the dispersed ethnic groups lacking support from any larger community. There are also sporadic cases in which the reverse situation may apply, since the giving of a nationality other than one's own true identity may bring benefits in economic terms or in terms of prestige. There are situations in which this might facilitate emigration, or offer greater opportunities for financial benefits to be gained. From the statistical point of view, none of these factors result in more major changes in the reality existing – particularly in a coun-



Photo 4. Kruszyniany Mosque (Podlaskie voivodship)

try such as Poland in which the national minorities are small and do not play a more major role in either political or public life. In general, the minorities will continue to be subject to intensive processes of assimilation.

The distribution of national and ethnic minorities across Poland

A more important cognitive issue than the simple numbers of citizens selecting one or the other option as regards nationality and language is the geographical distribution of these people across Poland. This is particularly true of any minorities that might dominate in certain areas, or else constitute a significant of local populations. People in such situations have greater opportunities to maintain their ethnic distinctiveness.

In this respect, the data contained in the most recent census offer many interesting insights. However, before proceeding with detailed analysis, it is important that the distribution of the population by nationality be presented in relation to the 16 major administrative units of voivodships into which Poland is today divided (Table 3).

Out of the total of 16 voivodships making up today's Poland, 13 of these administrative units have more than 95%

of their overall populations declaring themselves Polish. Adding in the so-called "undefined" cases, the vast majority of whom are in fact people of Polish nationality, it is possible to state that Poles represent close on 99% of the populations of these voivodships. There are then the two voivodships (Śląskie and Podlaskie) in which the proportion of the population that is Polish ranges between 90 and 95% (Fig. 1), leaving just the single Opolskie voivodship in which the share of the non-Polish population is significantly higher, at 18.4%.

The populations declaring German or else Silesian nationality are concentrated in just the two aforementioned of Opolskie and Śląskie voivodships respectively, albeit with the latter also extending into parts of Upper Silesia. Germans and Silesians together account for 12.3% of the population of Opolskie voivodship and just 3.8% of that of Śląskie. These are low percentages, though there can be assumed to remain a hard-to-define group of people who find it hard to decide whether they are closer to being Polish, German or Silesian¹⁰. Such attitudes are to be met with in many borderland areas, and have tended to become subjects of sociological studies.

The land included within today's Warmińsko-Mazurskie voivodship was German before the Second World War, but only now retains a very few people

¹⁰ In what is today Poland there was a German population of around 8 million in the inter-War period. This inhabited the part of the then German state to the east of the line formed by the Odra and Nysa Łużycka (the Oder-Neisse line). Following the border changes and decisions taken at the Potsdam Conference, this population was expelled to Germany in the years 1945–1948. The areas abandoned by these Germans were the target areas for an in-migrating Polish population. A small German population remained, mainly in Silesia, as well as the Mazury and Warmia regions. Much further information on this population is to be found in the books by Cygański (1989), Urban (1994), Kurcz (1995) and Matelski (1999), which also boast extensive bibliographies. This subject matter is also very popular in the German literature, and a particularly noteworthy item is an Atlas by Hilgemann (1984) presenting the scale of the "resettlement" of German people. This subject, which attracts political attention every now and again, has been the subject of a wide-ranging study by Nitschke (2000).

Table 3. Voivodship-level population composition of Poland by nationality, 2002

Voivodship	Population	Of which													
		Polish		Silesian		German		Belarusian		Ukrainian and Lemko		Other		Undetermined	
		total	%	total	%	total	%	total	%	total	%	total	%	total	%
Dolnośląskie (Lower Silesia)	2 907 212	2 849 627	98.0	99	0.0	2 158	0.1	150	0.0	4 943	0.2	4 869	0.2	45 366	1.5
Kujawsko-Pomorskie	2 069 321	2 043 240	98.8	13	0.0	717	0.0	83	0.0	207	0.0	1 718	0.1	23 343	1.1
Lubelskie	2 199 054	2 171 415	98.7	9	0.0	112	0.0	207	0.0	699	0.1	1 883	0.1	24 729	1.1
Lubuskie	1 008 954	985 914	97.7	20	0.0	651	0.1	68	0.0	1 560	0.2	1 078	0.1	19 663	1.9
Łódzkie	2 612 890	2 562 281	98.1	22	0.0	325	0.0	100	0.0	296	0.0	3 254	0.1	46 612	1.8
Małopolskie	3 232 408	3 191 026	98.7	74	0.0	261	0.0	62	0.0	2 338	0.1	5 597	0.2	33 050	1.0
Mazowieckie	5 124 018	4 947 397	96.5	66	0.0	574	0.0	761	0.0	1 311	0.1	10 681	0.2	163 228	3.2
Opolskie	1 065 043	869 258	81.6	24 199	2.3	106 855	10.0	20	0.0	285	0.0	1 983	0.2	62 443	5.9
Podkarpackie	2 103 837	2 079 208	98.8	12	0.0	116	0.0	27	0.0	3 418	0.2	2 001	0.1	19 055	0.9
Podlaskie	1 208 606	1 135 347	93.9	4	0.0	85	0.0	46 420	3.8	1 448	0.1	7 242	0.7	18 060	1.5
Pomorskie (Pomerania)	2 179 900	2 123 753	97.4	45	0.0	2 319	0.1	166	0.0	3 026	0.2	6 985	0.3	43 606	2.0
Śląskie (Upper Silesia)	4 742 874	4 362 979	92.0	148 544	3.1	31 882	0.7	136	0.0	680	0.0	5 101	0.1	193 552	4.1
Świętokrzyskie	1 297 477	1 278 011	98.5	3	0.0	70	0.0	13	0.0	142	0.0	910	0.1	19 328	1.4
Warmińsko-Mazurskie	1 428 357	1 387 297	97.1	5	0.0	4 535	0.3	274	0.0	12 022	0.9	1 409	0.1	22 815	1.6
Wielkopolskie	3 351 915	3 328 189	99.3	21	0.0	1 013	0.0	91	0.0	436	0.0	2 773	0.1	19 392	0.6
Zachodniopomorskie (Western Pomerania)	1 698 214	1 668 778	98.3	17	0.0	1 224	0.1	159	0.0	4 009	0.2	2 384	0.1	21 643	1.3
POLAND	38 230 080	36 983 720	96.7	173 153	0.5	152 897	0.4	48 737	0.2	36 820	0.1	59 868	0.1	774 885	2.0

Source: Op. cit. Table 1.

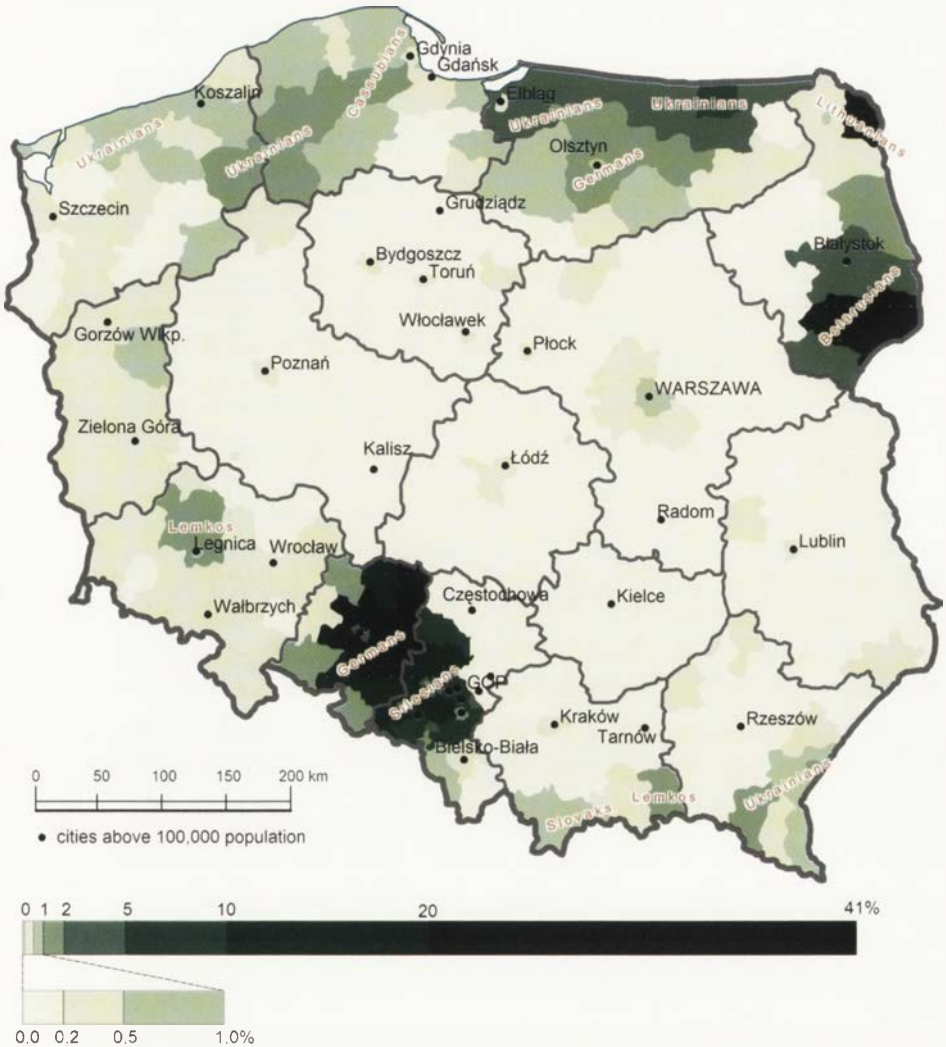


Figure 1. Population in powiats (counties), declaring other than Polish nationality or ethnicity, 2002 (by Mariusz Kowalski, acc. to National Census)

regarding themselves as Germans (4535 people or 0.3% of the total population). This state of affairs reflects emigration to Germany, not only of those with a genuinely German pedigree, but also – indeed

first and foremost – descendants who were native Mazurians and Warmians¹¹.

Almost all of the Belarusians are concentrated in the Podlasie region (Podlaskie voivodship). However, as a result of

¹¹ It was in the southern part of the old East Prussia that the Polish-language population was concentrated. This was Catholic in the case of Warmia, Protestant in the Mazury region. It was the subject of steady germanization up to 1945, but there remained around 120,000 Mazurs and Varmians immediately after the War, and they found it difficult to

forced post-War resettlement, the Ukrainian population is now scattered across the country¹². The greatest numbers are in Warmińsko-Mazurskie voivodship. Before the War, many Ukrainians were living in the eastern part of the Lublin region, as well as in the mountainous part of the then Podkarpackie voivodship. However, the latest census makes it clear that these two voivodships in their modern forms are almost entirely deprived of a Ukrainian population. The political border between Poland and Ukraine has become a clear ethnic limitation¹³.

The free Lithuanians are concentrated only in the northern part of Podlasie, while Slovaks are in the southern border regions of Małopolskie voivodship. In turn, the Russian and Roma people are spread across the whole country.

Leaving aside those who consider themselves Silesian – who have been mentioned already – there are just two national minorities (the Germans and Belarusians) that are concentrated in a clearly defined area in which they constitute a more or less sizeable fraction of the population. The determination of their geographical location is an important scientific and

political task. In accordance with the recommendations of the international organizations caring for the fundamental rights due to citizens in areas concentrating national minorities, they should be afforded defined and guaranteed means by which their national distinctiveness may be cultivated. These include primary- and secondary-level education, organizations in the sphere of folk culture and the chance to use their own language in contacts with the local administration. The designation of such an area usually takes as its threshold the presence of a minority group accounting for at least 20% of the overall population. Where the proportion exceeds this figure, the minority communities obtain relevant entitlements, becoming in some degree the co-hosts of the given administrative unit. In Polish conditions, requirements of this kind are set before the local level units, i.e. gminas. These cover relatively limited areas and tend to have between several thousand and 10,000+ inhabitants. The identification of those gminas in which the non-Polish population is concentrated represents the starting point for various kinds of activity engaged in, in the name of the national minorities.

adapt to the conditions of the new political system in Poland. As a result they steadily left their homeland and relocated to Germany. Around 10,000 remained, constituting a small proportion of the population. Half of them are believed to have finally chosen the Polish option. As a result of the mass outflow of Polish population, the Mazurian area became Catholic. Much information on the Mazurs and Varmiaks is to be found in the books by Sakson (1990, 1998).

¹² The expulsion of the Ukrainian and Lemko population from the mountainous parts of the Carpathians to north and west Poland was achieved in 1947 (being nicknamed *Akcja Wisła*). To this day, it remains a source of both political and academic controversy. Among the articles dealing with the complex subject are those by Olszewski (1993) and Pałski (2001). The result of the action was the elimination of Ukrainian villages in the Polish-Ukrainian borderland, and the emergence of the phenomenon of the dispersed Ukrainian population, albeit with the resettlement first and foremost involving the areas now included within Warmia-Mazury and Western Pomerania. Surrounded by Poles and Polishness, the population in question underwent rather rapid assimilation. Much information on the living conditions experienced by the dispersed Ukrainian population in Poland is to be found in the study by Czech (1991).

¹³ The Polish areas adjacent to Ukrainian territory now have a very small Ukrainian population. All that remains to attest to their presence are a series of old (primarily Greco-Catholic) churches. Among the books dealing with this near-border area is the work by Babiński (1997).

Poland in fact features two areas in which the statistical criterion referred to is met in full. One of these has formed in the Opole area, the other in the southern part of Podlasie. The first brings together a population considering itself German, the second a concentration of Belarussian people. Data from the last Census allow the territorial limits of these two regions to be established. In the aforementioned Opole region (once part of the historical Silesia), the Census data reveal a large spatially-contiguous area of 28 gminas (communities), in each of which more than 20% of the inhabitants declare themselves of German nationality. As has been noted, the twists and turns to this area's political fortunes in the 20th century were quite complicated. Until the decisions were taken in Potsdam, this area was part of the German state. Nevertheless, notwithstanding this political state of affairs, the region was included within the Polish ethnic area by both Polish and German ethnographers in the period before Second World War. A large proportion of the population there was not subjected to post-War expulsion and did assume Polish citizenship. It was rather the subsequent period that (as has been noted) encouraged a change in local people's nationality from the Polish to the German. Without going into the genesis of these transformations – which have not received a final satisfactory explanation and have been interpreted in various ways – it is necessary for the present reality as regards nationality to be fully recognized (Table 4).

It is nevertheless noteworthy that no gmina has a population more than 50% "German", and in only five does the per-

centage of inhabitants declaring such nationality exceed 40. There are then a further 13 gmina-level units in which the German population exceeds 25%. While the German population is nowhere in the majority, its influence in the gminas referred to is marked, on account of the advantage it enjoys as autochthonous in the area, having been there for many generations now. It also enjoys economic advantages as compared with the Polish population. Enjoying the formal right to obtain German citizenship, the people here frequently go and work in Germany, being present in Poland from time to time only. In contrast, a majority of the "core" Polish population comprises incomers not of Silesian pedigree, or else their descendents. The region in question has thus become something of a poly-ethnic one, in which the impacts of both Polish and German culture and customs can be observed. Nonetheless, it needs to be noted that the German language plays only a marginal role in the area, with Polish being widely used. There are however schools in which pupils learn German. Fortunately, the Polish, German and "Silesian" populations here are brought together by a common religious identity. The clear adhesion of all inhabitants to the Catholic faith plays its own cohesive and integrative role, making it much easier for people to live together in harmony.

A small area of Poland to the north of the Bug and adjacent to the Polish-Belarussian border has its specific ethnic features mainly reflecting religious faith. It is inhabited by a contiguous Orthodox community in large measure claiming to be of Belarussian pedigree. It was always

Table 4. List of gminas in the Opole region in which more than 20% of the population declare themselves German, 2002

Gminas (local-authority areas)	Population	Of which German	
		number	%
Cisek	7 016	2 978	42.4
Zębowice	4 230	1 782	42.1
Biała	12 145	5 103	42.0
Strzeleczy	8 224	3 418	41.6
Kolonowskie	6 582	2 703	41.1
Lasowice Wielkie	7 320	2 735	37.4
Reńska Wieś	8 805	3 042	34.5
Walce	6 215	1 970	31.7
Murów	6 312	1 955	31.0
Prószków	10 007	3 046	30.2
Komprachcice	11 063	3 260	29.5
Izbicko	5 568	1 563	28.1
Radtów	4 634	1 295	27.9
Lubniany	9 077	2 486	27.4
Leśnica	8 952	2 409	26.9
Chrzostowice	6 639	1 705	25.7
Ujazd	6 387	1 607	25.2
Dobrodzień	11 045	2 762	25.0
Bierawa	8 166	2 010	24.6
Głogówek	15 129	3 680	24.3
Tarnów Opolski	10 292	2 447	23.8
Olesno	19 381	4 608	23.8
Jemielnica	7 702	1 822	23.7
Polska Cerekiew	4 944	1 082	21.9
Pawłowiczki	8 700	1 802	20.7
Turawa	9 609	1 983	20.6
Krzyszowice	6 264	1 285	20.5
Dobrzeń Wielki	14 242	2 885	20.3

Source: *Op. cit.*, Table 1.

a very thorny problem to determine the numbers and distributions of Belarusians in Poland, on account of the fact that people of the Orthodox faith using dialects of the Belarusian language have never had a strong feeling of nation-

hood, and are characterized by very limited cohesion where their identification is concerned. It is most likely for this reason that the people in question have so rapidly been assimilated into Polish society. A Belarusian identity is only

Table 5. List of gminas (communities) in Podlasie in which more than 20% of the population declare themselves of Belarusian nationality, 2002

Gmina (local-authority area)	Population	Of which: Belarusian	
		absolute number	%
Czyże	2 787	2 274	81.6
Dubicze Cerkiewne	2 062	1 675	81.2
Orla	3 647	2 497	68.5
Hajnówka	4 494	2 886	64.2
Narew	4 522	2 220	49.1
Narewka	4 199	1 977	47.1
Bielsk Podlaski	7 715	3 584	46.5
Kleszczele	3 067	1 272	41.5
Czeremcha	3 824	1 092	28.6
Town of Hajnówka	22 545	5 932	26.3
Gródek	6 658	1 380	22.9
Town of Bielsk Podlaski	27 115	5 565	20.5

Source: *Op. cit.* Table 1.

kept up in rural areas, among those of limited educational attainments. People transferring to the towns and cities tend to lose contact with Belarusian language and folk culture, only differing from local Poles in certain ties of sentiment with their ethnic community. The area inhabited by Belarusians is thus growing smaller, with the peripheries being polonized steadily. Nevertheless, the Census has revealed a small area in which a significant part of the population declares itself Belarusian. Accepting the status of the gmina as the fundamental unit of territorial administration, it may be noted that there are 12 such units in which more than 20%

censused inhabitants declare themselves Belarusian (Table 5)

Two gminas (Czyże and Dubicze Cerkiewne) have a Belarusian character, leaving Poles as a rather small minority, while two more (Orla and Hajnówka) have Belarusians in the majority. The remaining gminas in the area are mixed Polish-Belarusian, with the greater part (some researchers say 2/3) of the population of the Orthodox faith. These people consider themselves "Orthodox Poles"¹⁴.

Among the 2500 local-authority areas or gminas into which Poland is divided, there is one other in which the non-Polish

¹⁴ The subject-matter of the Orthodox Belarusian population living to the north-east of Białystok and near the Białowieża Forest has in fact proved a very popular one, the areas in question representing interesting proving grounds for a range of sociological analyses. The population here lives where the worlds and traditions of the Western and Eastern Slavs come together, and is within the orbit of both the Orthodox and Catholic Churches. It is subject to intensive processes of assimilation into the Polish nation as regards both language and awareness, albeit with religious distinctiveness being maintained. The most interesting items of literature include the books by Sadowski (1991, 1995), Mironowicz (1992), Czykwin (2000) and Skorupska (2005). As a large part of this population makes use of a dialect of Ukrainian, rather than Belarusian, there is a controversy as regards the national and ethnic affiliations of the people concerned. The Ukrainian view of this political matter is presented by Hawryluk (1999).

population accounts for more than 20% of all inhabitants. This is the gmina of Puńsk, located by the Lithuanian border in north-eastern Poland. Of its 4454 inhabitants, 3312 (or 74.4%) give their nationality as Lithuanian¹⁵.

Finally, the treatment of the nationality issue in Poland requires a further reference to the Kaszubian people¹⁶, who are characterized by dual ethnic awareness. While their first homeland is Poland, and while they consider themselves an integral part of the Polish nation, they also feel strong emotional ties to their smaller homeland of the Kaszuby (Kashubia) region. They have their own language and culture there, which they both prize and maintain. It is difficult to determine their numbers, since many Kaszubians tend to lose their language and become immersed in Polish society once they have migrated to the cities. The Census under analysis shows that there are 10 gminas in which more than 20% of the population make use of the

Kaszubian language in their daily lives. In the cases of the gminas of Przdokowo, Sulęczyño and Stężyca, the respective proportions are 49, 48.6 and 43.2%¹⁷. The Kaszubian language is most often used in the central and northern parts of the Kaszuby region, i.e. in the gminas around Kościerzyna, Kartuzy, Puck and Wejherowo. In contrast, in such large cities as Gdynia or Gdańsk, and to some extent in the peripheral areas around Łębork, Bytowo and Chojnice, the Kaszubian language is only used by the oldest generation inhabiting rural areas, or to some extent also the suburbs. The significance of the remaining ethnic groups in Poland is limited. Certain folk relics have come under "big-city" influences, being promoted by the media and subject to all-embracing universalization. The only part of Poland to have maintained its original folk culture in an active state is the mountainous Podhale region. There, the culture of the Highlanders has proved a consistent tourist attraction.

¹⁵ Unlike the large Polish minority living in Lithuania, the community of Lithuanians living on present-day Polish territory is a small one concentrated close to the border. While the group's political significance is marginal, there is an extensive subject literature on it (e.g. Tarka, 1998 and Zołędowski, 1992; 2003).

¹⁶ The Kaszubians (Kashubians) are an autochthonous Slav group inhabiting part of today's Pomorskie voivodship to the west of the Vistula river. They are descendants of an eastern branch of the Pomeranians of old, and are characterized by a strong feeling of their own linguistic and cultural distinctiveness. Between the late 18th century and 1918, they were subjected to a systematic process of germanization. However, the greater part of the Kaszuby region became Polish in the inter-War period, an abrupt end being brought to the germanization, with efforts instead being made to encourage linguistic polonization. A majority of Kaszubians declare themselves of Polish nationality, though they are attached to their own cultural values. Both in the inter-War period and post 1945, the Kaszubians were allowed to cultivate their traditions and use their own language. There are Kaszubian schools. Despite this, the Kaszubian language is only being kept up in rural areas. There is a rich literature concerning the Kaszuby region and its people, but items of particular interest include geographical and demographic studies on the numbers and distribution of the population. Particularly noteworthy are the books by Łabuda (1996), Synak (1998) and Mordawski (2005). An extensive list of references on the subject was put together by Szutek (2003).

¹⁷ The latest scientific analyses suggest that the total number of Kaszubians plus people with at least a partially Kaszubian pedigree is some 566,700. Work on the degree to which the Kaszubian language is used has shown that 365,800 of those referring to a Kaszubian pedigree know its language, while some 200,900 people are no longer familiar with this their family language. In contrast, some 80,800 people use the language on a daily basis, while 46,100 make very frequent use of it, 112,700 use it at times and 130,900 have lost their command of it (Mordawski, 2005).

Final remarks

Compared with many other European states, Poland is a country of limited ethnic diversity. It is among the homogeneous and unitary states. This fact can be thought to link up with the history of the Polish nation, which fought for its survival when threatened with annihilation by its powerful Russian and German neighbours. In such a situation, the overall objectives of the nation superseded particular regional interests. As a result, a strong national patriotism developed in Poland, while identifications with given regions were relatively weak. This has also been the reason for the intensity with which the process of universalization has been ongoing. The frequent changes in political borders, and multidirectional migrations between different parts of the country led to a marginalization of regional differences in favour of a one-nation community.

Both the presented data and initial interpretation thereof make it clear that Poland is one of the mono-ethnic countries where nationality and language are concerned. Altogether less than 500,000 inhabitants are assigned to the national minorities. This is a small number of people and their political significance is vanishingly small, though of course they bring many valuable and original features into the country's culture. The relations between the citizens belonging to the different ethnic groups are deprived of antagonisms. It is unlikely that any conflicts as regards ethnically-based frictions will arise. The influence on life in the country is thus a stabilizing one. The national and linguistic unity in question also links up with the specific religious character of

Poland. Now, as in the past, the greater part of the population in the Polish state is associated with Latin-Rite Catholicism.

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Urbanization and the urban system

Piotr Korcelli

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: korcelli@twarda.pan.pl

Historical background

The density of urban places in Poland and the urbanization level generally decrease from west to east and from south to north. This gradient was already shaped in the early Middle Ages, and it became further accentuated during the political partitions of Poland in the nineteenth century. In central and eastern Poland, which from 1795 till 1918 was part of the Russian Empire, and in particular east of the Vistula river, the urban network is still relatively less developed. The west – central and southern regions, at that time the Prussian and Austrian–Hungarian parts, are characterized not only by a denser urban settlement, but also a generally better infrastructure.¹

The location of market towns, the phenomenon which accompanied the expansion of land cultivation and rural settlement onto previously unoccupied lands – forests, marshes, other vacant areas – appeared on a large scale in Silesia, the Wielkopol-

ska (Greater Poland), and the Małopolska (Lesser Poland) at the end of XIIIth century, while in eastern Mazowsze (Masovia) its main phase took place during XIVth century (Manteuffel, 1979). In the process, the older, established centres of royal (viz. prince's), and ecclesiastic authority were adopting town rights according to the Magdeburg Law, for example Poznań in 1253, Cracow in 1257. By mid–XVth century the network of urban settlements included some 500 towns (Trawkowski, 1979). It constituted the framework for the contemporary urban system, as more than 60 percent of the towns and cities existing in Poland today are of medieval origin.

The centuries that followed witnessed prolonged periods of urban decline, caused by wars, as well as a growing political and economic dominance of the landed gentry which monopolized many commercial privileges normally considered to be a part of towns' entitlements². As a consequence of this, Poland belonged at that time to less

¹ For an analysis of spatial differentiation of urban settlement, see: Dziewoński (1964)

² The first legal act of this kind, *the Warta statutes*, was introduced as early as in 1423. It gave the prerogatives to set prices for agricultural produce to state officials; also, it ordered dissolution of town guilds.

Natural and human environment of Poland

urbanized countries in Europe, in spite of the development of several relatively large, and a number of middle-sized urban centres. The former included Warsaw, which in 1611 replaced Cracow as the King's residence and the national capital. Already by 1643 the city could boast of more than 70 aristocratic palaces and other notable residential establishments (Suchodolski, 1986).

in Sweden during the same time interval). By 1937 it reached 34.5 percent (Dziewoński, 1964). In 1939, before the outbreak of the war, the population of Warsaw (Warszawa) was estimated at 1289 thousand, and of Łódź, Poland's second – largest city, at 672 thousand. Poznań and Cracow had 272 thousand and 259 thousand inhabitants, respec-



Photo 1. Kamień Pomorski small town
in Zachodniopomorskie (Western Pomerania) voivodship

The industrial revolution which arrived in Poland in XIXth century brought with it a highly diversified, spatially uneven pattern of urbanization. It marked the emergence of the Upper Silesian conurbation based upon coal and iron industries, and of the agglomeration of Łódź with its strong specialization in the production of textiles. Between 1850 and 1900 the rate of urbanization increased from 13.6 to 25.1 percent (for comparison, it grew from 25.5 to 40.9 percent in France, and from 10.1 to 21.5 percent

tively, and Gdańsk – 250 thousand³. Industrialization continued to be the main factor of urban growth in the XXth century (in fact – until 1989) and of the rebuilding of cities after the conflagration of Second World War. The war brought with it the destruction of many cities, both large and small, and the annihilation of a considerable part of the urban population. Warsaw was particularly affected. It lost 80 percent of the building stock, while the number of its inhabitants dwindled to just 162 thousand in 1944.

³ Before Second World War Poland's major cities included also Lwów (Lviv), with 340 thousand inhabitants, and Wilno (Vilnius) – 262 thousand. The population size of Wrocław (German Breslau at that time) was 621 thousand.

The process of urbanization

During the post-war decades the urbanization processes were rather dynamic. By 1966 one-half of Poland's population was living in urban places, and in 1990 the corresponding share was 61.8 percent. This structural shift involved a three-fold increase in the size of the total urban population, from 8.0 to 23.6 million over the 45 years. Since 1990, however, the number remained almost unchanged (23.5 million in 2004), and the urbanization rate has been stagnating as well. This change of trends is a consequence of both a decrease in the volume of rural – to – urban migration, from 1966 thousand to 96.6 thousand between 1990–2004, and a corresponding growth of urban – to – rural flows, from 83.9 thousand to 138.2 thousand *per annum* (Figs. 1 and 2).

Several factors are responsible for this rapid turnover in the balance of population movement between rural and urban areas. The most important of these is the nature of the post – 1989 economic transformation, the first phase of which (the years 1990–1992) involved a drastic fall of industrial output and employment numbers, while the following ones – a jobless economic growth accompanied by a considerable improvement of labour efficiency.

In addition to this, the economic sectors that in the past attracted a disproportionate share of workers coming from rural areas, namely construction and manufacturing, have been shrinking in terms of their total employment share relative to the service sector. The second factor is the opening, albeit partial, of the West European labour

markets for the Polish migrant workers. It is estimated that at any point in time there are at least several hundred thousand, short- and long – term migrants from Poland working abroad, both in the traditional immigration countries – the United States, Germany, France and Britain, but also in Spain, Belgium, Ireland or Greece. Unlike during the 1980s, when Poland's major cities constituted the main emigration origins, the present-day migrants have been coming predominantly from smaller towns and the rural areas (Okólski and Stola, 1998). This supports a thesis, according to which migration to work abroad represents to some extent a substitute form of movement, undertaken in the situation of declining absorptive capacity of domestic labour markets (Korcelli, 1994).

Conversely, the increase in the size of urban – to – rural migration can mainly be attributed to suburbanization which has become a notable phenomenon during the 1990s. As a major part of suburban development takes place over unincorporated, i.e. formally rural territory, a considerable part of residential moves, from cities to suburban areas, are subsumed under the urban – to – rural category. Similarly, migration from rural places situated beyond metropolitan areas to suburban communities of rural administrative status is enumerated in the population statistics as rural – to – rural moves, though they form *de facto* a part of the urbanization process. To this one should add a serious undercounting of migration moves in general, and of rural – to – urban and inter – urban migration in particular, the fact reported in a number of empirical studies (for example, Lisowski, 2000).

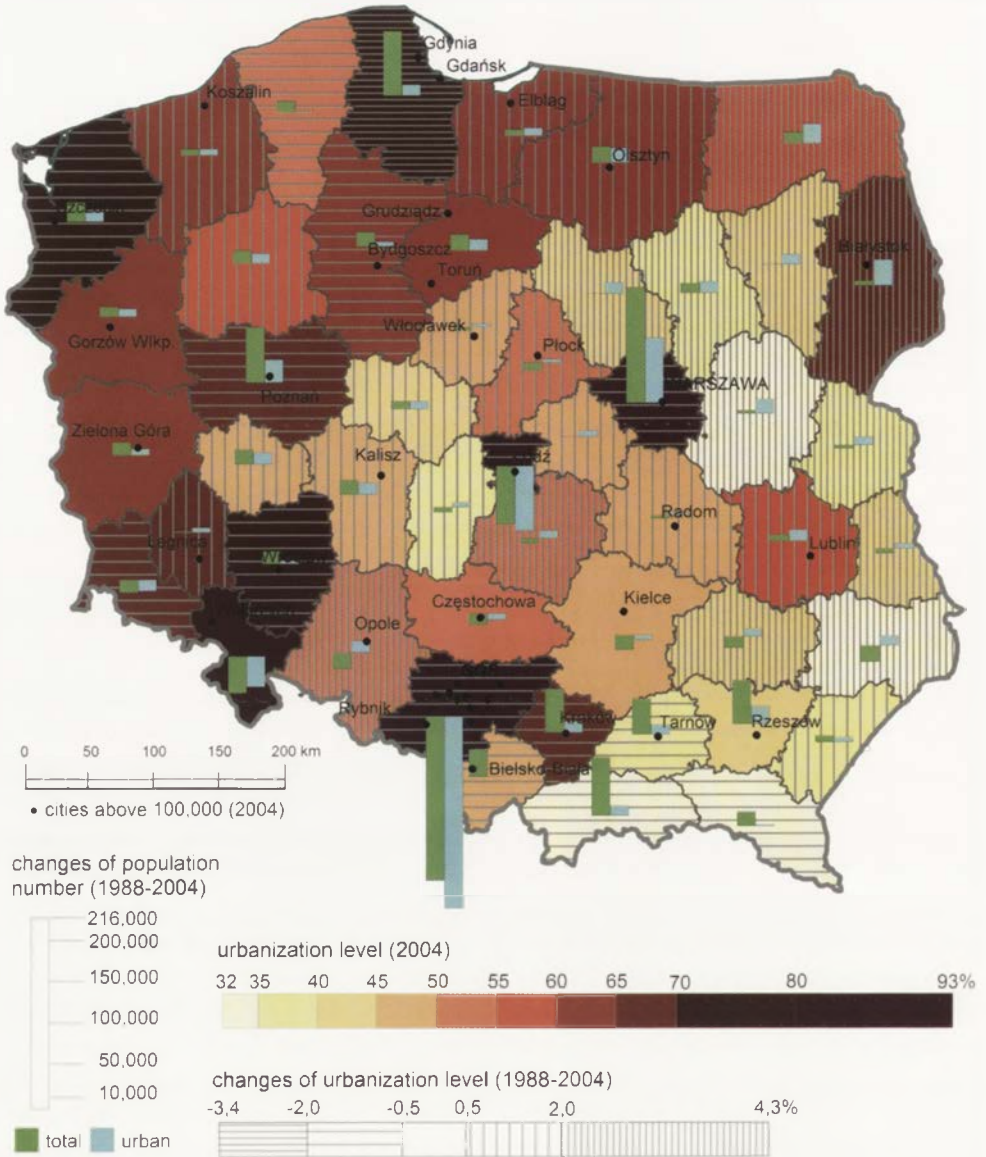


Figure 1. Changes of population number and urbanization level, 1988-2004 (by Przemysław Śleszyński)

Therefore, the recent de-urbanization trend, as seen in the light of Poland's current population registration, may be considered a statistical artifact. The urbanization process is still active, while

its forms have evolved. Its measurement is hampered, among other factors, by the lack of official, comparable definition of metropolitan areas, or functional urban areas.



Figure 2. Net rural-to-urban migration in Poland, 1950-2003

Structure of the urban system

The 1990s have brought relatively little change in the general structure of Poland's urban system, one characterized by a fairly regular spacing of towns (even though, as mentioned earlier, their overall density decreases towards the east and the north) and a well-articulated, multi-level urban hierarchy (Fig. 3). The distribution of urban places by population size, which closely follows the rank-size rule (see: Dziewoński, 1964), has undergone only relatively small alterations during the last decades. The primacy of the capital city is very low in comparison to most other countries. Warsaw in its administrative boundaries contains just 4.3 per cent (1.7 million), and the metropolitan area of Warsaw only some 6 per cent (2.8 million) of the total population of Poland, as of 2004. In fact, the

largest urbanized area, the Upper Silesian conurbation is 60 per cent bigger in terms of population size than the Warsaw metropolitan area. On the basis of its structural properties, Poland's urban system is generally assessed as one of the most polycentric national urban systems in Europe (*European Community, 2004*).

Within this aggregated pattern, and under structural stability of the urban system, specific trends of population redistribution have taken place over the last several decades. During 1950–1990 there was a gradual shift towards a concentration of the urban population in medium-sized and large cities (Table 1). The small towns, below 10 thousand inhabitants, and later also those between 10 and 19 thousand, were declining relative to all other urban places. Increases in shares of the total urban population were recorded, in particular, by cities with population of

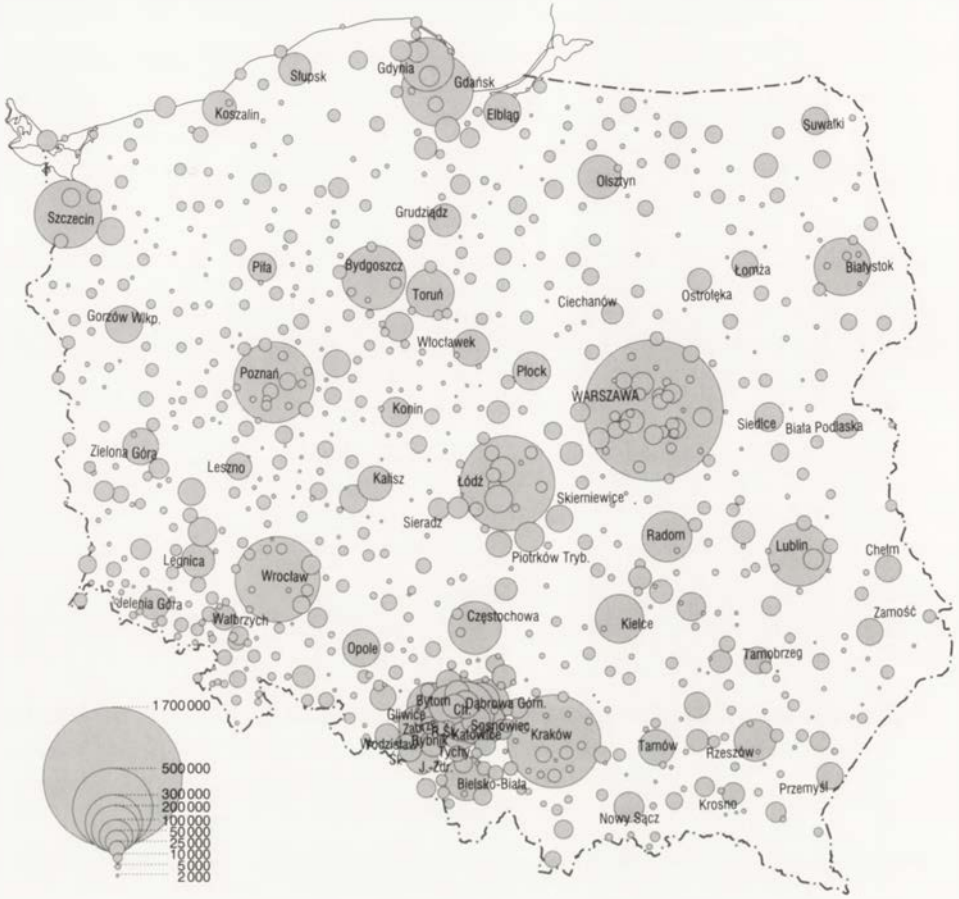


Figure 3. Distribution of urban places in Poland by population size, 2004 (by Janusz Książak)

Table 1. Distribution of urban population in Poland by city-size categories, 1950–2003

Population size (thousand)	Percentage of the total urban population						
	1950	1960	1970	1980	1990	2000	2003
Below 5	11.0	8.5	6.4	3.8	3.4	3.7	3.9
5–9	11.5	11.6	9.2	6.1	5.3	5.4	5.5
10–19	10.8	13.3	13.1	11.4	10.8	11.2	11.5
20–49	15.9	14.7	17.1	16.5	16.8	17.7	17.4
50–99	8.8	8.9	10.9	12.5	13.7	14.1	14.1
100–199	17.2	13.3	12.8	14.7	12.8	12.7	12.7
200 and above	24.9	29.8	30.4	35.0	37.3	35.2	35.0
(500 and above)	(14.7)	(12.7)	(19.1)	(20.5)	(19.0)	(18.9)	(18.9)
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

50–99 thousand, and of more than 200 thousand. These rules, however, are no longer applicable. Since 1990 the relative, as well as absolute increments of population numbers have been observed in the lower and intermediate city-size categories only. Cities of 100–199 thousand inhabitants, and especially those above 200 thousand, have experienced population losses. Among the largest cities, those of over 500 thousand inhabitants, only Warsaw and Cracow have recorded a moderate population growth.

These changes reflect a rapid decline of rural-to-urban migration, as well as a fall in the level of birth rates, which started in mid-1980s and has been especially acute in the large cities. In addition to these factors, the differential growth and decrease of population numbers of individual urban places, and of their aggregates as defined by the city-size categories, is a product of evolving inter-urban migration. For most of the period under discussion (since 1950) these population flows were of a hierarchical nature, i.e. migrations from smaller to larger cities were outnumbering the moves in the opposite direction. During the 1990s, along with the general decrease of spatial population mobility, this pattern has first become blurred, and then partly reversed, at least in the light of official statistics on internal migration⁴.

Patterns of urban economic change

In a sharp contrast to the overall stability of Poland's urban system, as measured by spatial population distribution,

its economic and social dimensions – the allocation of economic activities and the differentiation of welfare levels, have given evidence of high dynamics since the introduction of market economy rules in 1989–1990. The large cities, together with their surrounding urbanized zones (metropolitan areas) have experienced generally positive economic change. Against data for Poland as a whole, these cities and regions are characterized by rather low (5–8 percent) unemployment rates and above-average incomes and consumer demand levels. While attracting a large proportion of both foreign and domestic private investments (Domański, 2001), they have been able to restructure their economic base, by shifting from the former dependence upon manufacturing industries to a dominance of service sector activities. A notable development is a rapid expansion of cultural and educational functions of major cities. Today, all large and a number of middle – sized urban centres are seats of institutions of higher education, both public and private. In some large cities, for example Poznań, the university constitutes the biggest single employer.

This general model of change is by no means uniform among the individual large cities. The position of Warsaw in this respect is rather unique. By the late 1990s the city, together with its metropolitan ring, has emerged as Poland's leading economic region, assuming to some extent the role played previously by the Upper Silesian conurbation. Warsaw's relative prosperity rests upon a rapid expansion of the new private sector, interdependent with its function of a national financial market, and the gateway function for international business

⁴ The latter question was discussed in the previous section of the article.

Table 2. Major cities and metropolitan areas in Poland by population size, 2003

City	Population in thousand	Metropolitan area population, in thousand
Warsaw	1 690	2 681
Łódź	779	1 062
Cracow	758	1 227
Wrocław	638	1 137
Poznań	574	1 227
Gdańsk	461	1 221 ¹
Szczecin	414	684
Bydgoszcz	370	725 ²
Lublin	357	466
Katowice	322	3 239 ³

¹ Gdańsk – Gdynia (254 thousand) conurbation.

² Bydgoszcz – Toruń (209 thousand) agglomeration.

³ The Upper Silesian conurbation, comprising among others: Bytom (191), Chorzów (116), Dąbrowa Górnicza (131), Gliwice (202), Ruda Śląska (148), Rybnik (142), Sosnowiec (230), Tychy (132), Zabrze (194).

transactions. Together with its surrounding zone, Warsaw accounts for one-fourth of the total foreign direct investments in Poland, while its share in the new office space built since 1995 has amounted to about 80 per cent.

Several regional centres – Cracow, Gdańsk–Gdynia, Poznań and Wrocław, each with population size in excess of 0.5 million, and over one million within the respective metropolitan areas (Table 2) constitute other major, though secondary to Warsaw, poles of attraction on the new economic map of Poland. These polyfunctional centres here sustained a relatively smooth structural transformation since 1989–1990, as new industrial and commercial activities have been substituted for declining branches of industry, and have created impulses for an on-going reconstruction of building stock and urban infrastructure. Conversely, the Upper Silesian conurbation and the agglomeration of Łódź, which suffered heavily from de-industrialization in the early 1990s, are much less advanced on the path towards economic and physical modernization. The more recent inflow of investments in manufacturing to these areas is by far insufficient to compensate for the massive job losses incurred in the traditional industries.

The categories of medium-to-large, and medium-sized cities have also been polarized into winners and losers during the transformation period. This applies to an even greater extent to small towns, the successful ones tending to be situated within, or close to the major metropolitan areas.

Hence, a characteristic discrepancy has emerged during the 1990s between the relatively stable pattern of population distribution and the reallocation of economic activity – its gradual concentration in the large cities and metropolitan areas⁵. As a consequence of this, economic and social

⁵ This discrepancy is only partly mitigated by non-registered migration, both internal and international, and by commuting-to-work.

disparities, when measured by income and unemployment differentials, tend to increase at both an inter-regional and an intra-regional scale. One can therefore speak of economic and social polarization within Poland's urban system.

Problems and policy questions

The persistence and the deepening of socioeconomic disparities between individual cities, regions and subregions constitute the main challenge for policies of spatial, economic and social cohesion. The polarization trends are fostered by poor connectivity within the urban system, i.e. a generally low level of spatial accessibility of individual urban centres, as well as their clusters, at both a regional, national, and international scale. This state of affairs can only be ameliorated with the help of huge public investments in transportation infrastructure. Over the last 15 years or so investment pro-

grammes in this domain have been largely delayed, and failing on efficiency criteria.

Interrelated with this issue is the frequently discussed question of peripherality of the urban system of Poland at the European, more specifically the European Union level. In this context differences between the eastern and the western regions are emphasized. Locational disadvantages faced by urban centres situated in the east may lead to a further accentuation of the historical west – east development gradient. National policies should therefore provide comprehensive measures of support aimed at strengthening the competitive position of such regional centres in eastern Poland, as Lublin, Białystok, Olsztyn and Rzeszów. Also, the growing international role of Warsaw, which performs functions of a supraregional centre for the whole east-central and north-eastern part of Poland can be viewed as a desirable development, one counternacting the trends towards west – east economic polarization.



Photo 2. Old Town in Gdańsk

At a regional scale, the socioeconomic transformation and redevelopment of the Upper Silesian conurbation constitutes Poland's biggest spatial development problem. Long-term, costly programmes are necessary to address the complex economic, social and environmental issues accumulated in this large urbanized area, the unquestionable economic heartland of Poland till 1989. More specific problem of that region concern further restructuring of coal mining and related industries, water economy, industrial waste, land degradation, housing conditions and technical infrastructure, among others.

Finally, a relatively new but potentially growing issue pertains to patterns of sub-urban development, both residential and commercial, which increasingly assumes forms characteristic of urban sprawl. Insufficient inter-community collaboration, i.e. lack of good governance practices at a local level, together with inadequate infrastructure, as well as land-use and environmental conflicts, represent problems of expanding range and complexity, questions that should attract the attention of planners and policy makers not only at a regional, but also at the national level.



Photo 3. Itza – small town in Mazowieckie voivodship

These issues in fact are dealt with by regional development strategies, and in particular, by the National Spatial Development Concept (*Koncepcja...*, 2001), in which the idea of “equilibrating spatial development” is put forth. According to this concept, economic efficiency goals should receive priority over spatial equity in short and medium term, while spatial convergence represents a longer term policy objective (for an extended discussion, see: Korcelli, 2005).

Future prospects

The slow-down of the urbanization process, as observed in Poland since the late 1980s, seems to represent a rather stable trend. Although the volume of rural-to-urban migration will likely increase again in the 5–10 years perspective, it will no longer be a large-scale movement. Many rural communities will change their functions and become *de facto* urbanized. The improvement of living conditions in the rural areas will lead partially to a substitution of migration by commuting flows, even over long distances.

Within the urban system, spatial concentration of both population and economic activity will prevail at regional and interregional levels, focusing on the metropolitan areas as well as some medium-to-large cities. Under a negative demographic change – a slow but continuing decrease of the total population numbers, this will imply a thinning-out of the urban network in many non-metropolitan, especially the peripheral areas. Small towns may be particularly affected by depopulation trends. In the case of medium-sized

towns prospects for a stability or even a sustained development are much brighter, owing among others to the administrative reform of 1999 which assigned functions of intermediate-level (powiat) centres to some 300 such urban places⁶. Hence, polycentricity, the basic characteristic of Poland's urban system, is likely to be retained in the future perspective.

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⁶ The upper administrative level consists of 16 voivodships (provinces, regions). The total number of powiats (counties) is 379, out of which 65 are city-powiats (city with powiat status, 2005). The latter units correspond to the large, and some middle-to-large cities within their administrative boundaries. Among the 2478 gminas (municipalities, communities), the lower-tier units, 307 are defined as urban (their boundaries correspond to town boundaries), 580 as urban-rural, and 1591 as rural.

Urban issues in Poland

Grzegorz Węclawowicz

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: g.wecla@twarda.pan.pl

Introduction

The urbanization taking place in Poland has its own specific features based around: a historical location on the periphery of the main economic core of Western Europe; persistent Polish cultural distinctiveness and identity through several centuries; a lack of political and economic independence throughout the nineteenth century; the devastation wrought by the Second World War; and the communist system imposed thereafter.

It was the process of socialist industrialization and accompanying urbanization between 1945 and 1989, as shaped by communist ideological priorities, that changed Polish society from a rural to an urban one, at least in numerical terms. On the other hand, the aspect to urbanization understood as a modernization process has still to be completed. The communist period, notwithstanding the substantial progress it allowed for in certain spheres, introduced a "lame urbanization", i.e. a concentration of the labour force without any formation of a civil society. Urban places were merely additions to industrial plants

and became subordinate to their requirements in organizational terms. For the ruling communist clique, cities were viewed as loci of political support on the part of the working class, and as loci of industrial production, but not as loci of commercial activity or the exchange of information. This type of urbanization can therefore be treated as a precursor to urbanization proper, which occurs over a longer time and entails a more balanced development of other urban functions. In the Polish case, forced industrialization stimulated a huge migration from rural areas and became the leading tool by which the social structure of the country might be transformed.

The market and the democratic transformations have changed this situation. Yet the "shock therapy" in the economy and exposure to the external influence of the competitive world market created tremendous challenges for Polish cities. Substantial progress with the modernization of urban areas and an increase in quality of life is accompanied by numerous structural problems attendant upon accelerated and more efficient development. The

main problem concerns reflect a shortage of capital for urban modernization, particularly when it comes to remedying the extensive infrastructural underdevelopment inherited from the communist past. Equally important is the management of urban affairs; this being subordinated to the fragmented policies of economic sectors.

Furthermore, the economic dynamism and growth connected with the socio-economic transformation have been not shared equally by all regions or cities, or by all the social groups within cities. Urban areas, particularly the larger ones, have emerged as winners in the socio-economic transformation. Their gain is the result of endogenous growth of the private sector, and also importantly of the elimination of the barriers the previous political system had imposed. Even then, the economically-successful cities have not been free of the processes of marginalization, social exclusion, and segregation.

In general, then, the main urban problems Poland faces are unemployment; a housing shortage; the lack of or need for modernization of the municipal infrastructure of a technical and social nature; problems with governance and the lack of a coherent urban policy.

The objectives and demands of a market economy raise a question as to how Polish cities must be modernized, or indeed whether a process of re-urbanization and re-industrialization needs to be introduced.

The new social, economic and political position of cities

According to the most recent (2002) National Census, the proportion of people living in urban areas in Poland is 61.8%. Most of the population increase in Poland since 1946 has been concentrated in urban areas. And immigration has been a very important determinant of the growth. By contrast, the population of rural areas has remained relatively stable. From the beginning of the 1980s, the process of urbanization in the country as a whole slowed down. This phenomenon is well documented when the last National Census under communism (of 1988) is set against the first (2002) National Census under the new system, taking place on the eve of European Integration (Table 1), as well as the population balance sheet indicating the basic demographic ingredients of the post-war evolution in Poland (Table 2).

The urban system has a polycentric character (see Fig. 3 in the chapter *Urbanization and the urban system*) with no primacy of the capital. The largest city in Poland – Warsaw – is followed by 17 others with more than 200,000 inhabitants (Table 3). Together, these concentrate 21.6 per cent of the country’s population and 35 per cent of its urban population. Overall, more than 61% of the urban population lives in cities of more than 50,000 inhabitants. The

Table 1. Population based on Census data, 1946–2002

Specification	1946	1950	1960	1970	1978	1988	2002
Total: in thousand	23 930	25 008	29 776	32 642	35 061	37 879	38 230
Urban areas: in thousand	7 517	9 605	14 206	17 064	20 150	23 175	23 610
Urban areas: in % of total population	31.8	39.0	48.3	52.3	57.5	61.2	61.8

Source: *Statistical Yearbook 2003*, Central Statistical Office.

medium-sized towns (of between 20,000 and 50,000 inhabitants) concentrate only 10.7 per cent of Poland's population and 17.7 per cent of the total urban population.

size cities, which are not fully prepared to function as centres of innovation for their surrounding regions, ensuring that their functions must be reinforced in this respect in future.

Table. 2. Population balance, 1946–2003

Specification	2003	1946– –1950	1951– –1960	1961– –1970	1971– –1980	1981– –1990	1991– –2000	1946– –2003
	in thousand							
Total								
As of January, 1	38 219	23 895	25 035	29 795	32 658	35 735	38 183	23 895
Actual increase	–28	+1 116	+4 884	+2 957	+3 157	+2 510	+461	+15 021
Natural increase	–14	+2 160	+4 983	+3 157	+3 366	+2 760	+613	+17 024
Live births	351	3 497	7 623	5 576	6 382	6 415	4 463	35 029
Deaths	365	1 337	2 640	2 419	3 016	3 655	3 850	18 005
Urban areas								
Actual increase	–58	+1 619	+2 977	+2 336	+3 556	+2 591	+386	+13 329
Natural increase	–17	+744	+2 104	+1 263	+1 680	+1 451	+157	+7 356
Net migration for permanent residence	–41	+875	+873	+1 073	+1 876	+1 140	+229	+5 973

Source: *Statistical Yearbook 2004*, Central Statistical Office.

The relative balanced concentration of population in urban areas (see Fig. 3 in the chapter *Urbanization and the urban system*) with the existence of several, large urban centres and agglomerations, has some economic advantages. The disadvantage of such a structure is that, when taken together with the relatively poor housing situation, a barrier to labour mobility becomes problematical. The structure is nevertheless characterized by a relatively low level of urbanization and urban concentration when set against some Western European countries, suggesting that the urban agglomerations' economies are not yet fully developed. In the eastern part of Poland in particular, underdevelopment of the urban network is the basic constraint on the spread of modernization and economic prosperity. A further disadvantageous element of Poland's urban network relates to the medium-



Photo 1. Market Square in Warsaw's Old Town

The new regional structure indicates two basic trends. The first is the collapse of the old industrial regions and the increasing degree to which the already less-developed eastern part of the country is seen to be lagging behind. The relative prosperity generated by the transformation along

Table 3. Cities size distribution, 1950–2004

Groups of cities by number of population	1950	1960	1970	1980	1990	2000	2004
	Urban population in % of total country population						
POLAND	39.0	48.3	52.3	58.7	61.8	61.8	61.5
Below 5 000	4.3	4.1	3.4	2.2	2.1	2.3	2.4
5 000 – 9 999	4.5	5.6	4.8	3.6	3.3	3.3	3.5
10 000 – 19 999	4.2	6.4	6.9	6.7	6.7	6.9	7.0
20 000 – 49 999	6.2	7.1	8.9	9.7	10.4	10.9	10.8
50 000 – 99 999	3.4	4.3	5.7	7.3	8.4	8.7	8.8
100 000 – 199 999	6.7	6.4	6.7	8.6	7.9	7.9	7.5
200 000 and more	9.7	14.4	15.9	20.6	23.0	21.8	21.5

Source: *Statistical Yearbook 1960–2005*, Central Statistical Office.

the western border contrasts sharply with the stagnation and constant high unemployment along the eastern border with the former Soviet Union. These regional situations affect urban areas above all. A second issues concerns the formation of new, prosperous regions with production adapted to the requirements of the new economic conditions, i.e. competitive domestic and international markets. The traditional disparities, however, between rural and urban areas and between small and large cities, have also increased substantially.

Some regions have assumed a stronger position than others, mostly on account of the economic prosperity of their main metropolises and large cities. Warsaw is the most obvious example; the city not only having the highest concentration of rich people, but also being noted as the largest contributor of GDP on a regional scale in Poland. It accounted for 13.0% in 2003, despite the fact that it accounts for only 4.4% of Poland’s population (Table 4). Other winners are the metropolitan areas of Poznań, within which the city alone contributes 3.0% to the GDP total.

The Tri-City of Gdańsk-Gdynia-Sopot accounts for 2.8 per cent, Cracow for 3.0 per cent and Wrocław for 2.4 per cent of national GDP. The multi-city urban conurbation of Upper Silesia (as NUTS 3 sub-region consisting of 16 cities), accounted for a high (9.2%) share of the country’s GDP in 2003, while holding 7.6% of all Poles. Finally there is Łódź with its 2.5% contribution to overall GDP. Together, the seven urban (NUTS 3) sub-regions generated 35.9% of the national GDP, while they are inhabited by only 21.1 per cent of the national population.

In the GDP per capita ranking of the NUTS-3 territorial divisions of Poland, the top places are taken by urban areas (Fig. 1). Warsaw is richest, followed by Central Silesia, then Cracow, Poznań, the Tri-City of Gdańsk, Gdynia and Sopot, and then Łódź and Wrocław with the industrial region of Legnica. The poorest region – Etcki, located in East-Northern Poland is 28.5 time poorer than the wealthiest.

Within the regional structure of Poland, it is the highly urbanized belt stretching between the two relatively prosperous metropolitan areas of Wrocław and Cracow,

Table 4. Gross domestic product and population in the largest urban sub-regions of Poland, 2003

Specification	GDP		Population	
	in million PLN*	in %	in thousand	in %
POLAND	816 080.6		38 190.6	
Wrocław	19 967.1	2.45	637.5	1.67
Łódź	20 745.1	2.54	779.1	2.04
Cracow	24 660.9	3.02	757.7	1.98
Warsaw	106 187.6	13.01	1 689.6	4.42
Gdańsk-Gdynia-Sopot	22 477.8	2.75	755.5	1.98
Upper Silesia: Bytom, Chorzów, Dąbrowa Górnicza, Gliwice, Jaworzno, Katowice, Mysłowice, Piekary Śląskie, Ruda Śląska, Siemianowice Śląskie, Sosnowiec, Świętochłowice, Tychy, Zabrze	74 713.4	9.16	2 886.7	7.56
Poznań	24 473.4	3.00	574.1	1.50

Source: *Gross Domestic Product. Regional Accounts 2003, 2005*, Statistical Office in Katowice.

* in 2003 1 EUR = 4.40 PLN

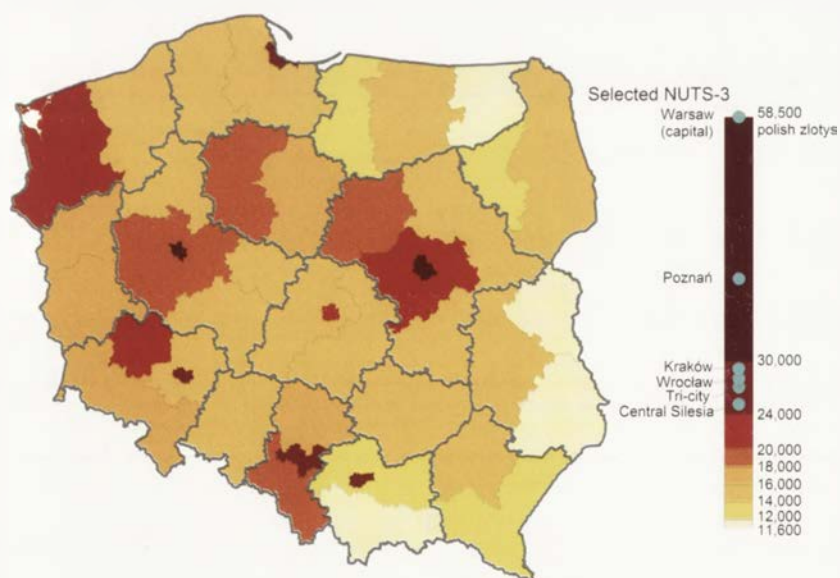


Figure 1. Gross Domestic Product per capita, 2001



Photo 2. Gdynia – seaport and town constructed in 20 ties

currently with a “black hole” in the middle (in Upper Silesia) that have a chance of becoming another large urbanized region of progress. The basic regional and urban problems are issues relating to the conurbation of Upper Silesia, which has to be restructured economically. This region needs substantial support, as the last large coal-mining region in Europe, with the problem here clearly exceeding the capabilities of local authorities. Łódź is another large metropolis in Poland facing the problem of de-metropolization. The only chance for it lies in the development of science and research functions, and in closer connections with Warsaw. The future completion of the two main Polish motorways, with its crossroads near Łódź, the modernization of the rail connection with Warsaw, and the possible future location of a new international airport on the western fringe of the Warsaw Metropolitan Area can be beneficial developments for Łódź.

The economic and managerial hierarchy in the urban system is well visible when the headquarters of large enterprises are

looked at. The locations of the 1000 largest enterprises by revenue attests to the predominant positions of Warsaw and other large cities. The only exception is the high position of Płock (which is of medium size) in reflection of the presence there of the country’s largest petrochemical complex. It is an indication of the growing concentration of economic potential in the largest cities, which are becoming more and more competitive in gaining specialized functions of national or even international rank (see Fig. 6 in the chapter *Socio-economic development*).



Photo 3. Warsaw's Central Business District

The development of the business environment could be best illustrated by the expansion of commercial office space in Warsaw. At the regional level, the marked concentration of new investment in Warsaw has created here Central Europe's largest market for commercial office space. Notwithstanding this fact, the city can still be described as an emerging market. An artificially high rental level at the beginning of the transformation has been a result of the shortage of proper quality office space for foreign and domestic companies expanding in/into Poland. Since 1989, however, over 120 office buildings have been constructed, augmenting the office space function in Warsaw to roughly 1.9–2.1 million sq m. of usable space (Śleszyński, 2002). As a result, rent levels dropped from 60 euros per sq m at the beginning of the transformation period in the 1990s to below 30 euros per sq m per cent in 2002. The vacancy rate is now 17 per cent. However, the rent level of office space outside the centre is much lower, and varies from 15 to 19 euros per sq. m. The second city in the ranking for new commercial office space in Poland is Poznań (still with just a quarter of the amount of new office space in 2002 than Warsaw could boast), where the rental rate is below 20 euros. The third and fourth positions are taken by Cracow and then Wrocław.

The new international context created a challenge for the Polish urban system – competition for a place in the emerging urban hierarchy of Europe (Domański, 2002; Dematteis, 1996; Korcelli, 1997). The outcome of this competition will determine the prospects all urban places enjoy where prosperous development at

the beginning of the 21st century is concerned. In spite of the legacy of the past (primarily the communist period), the cities in Poland have many important assets (Kukliński, 2000; Zalewski, 1997). This is above all true of the relatively high-quality labour force, the geographically or geopolitically favourable locations, urban and industrial fabric easily adaptable to the new requirements, and a relatively lower level of intra-urban disparities (much smaller at least than in comparable cities of Western Europe). However, in the previous decade, Poland failed to modernize its cities to the extent that would guarantee competitiveness in an integrated Europe.

Urban problems in Poland

The general economic dynamism and growth connected with the socioeconomic transformation have not been shared equally by all regions and cities, or by all social groups within cities. The economically successful cities have also been afflicted by processes of marginalization, social exclusion and segregation.

The main urban problems in Poland are:

- 1) unemployment, the main factor currently behind the increase in levels of poverty and social exclusion,
- 2) the housing shortage, in general the shortage of affordable housing and dramatically increasing modernization gap of the housing stock,
- 3) unfavourable demographic trends,
- 4) the technical and municipal infrastructure.

Unemployment

Unemployment is the most crucial economic and social problem in Poland, and one which also affects urban areas. The unemployment rate increased from zero in 1989 to 16.4 per cent in 1994, and then dropped below 10 per cent in 1998. From that year up to now there has been a steady rise, with unemployment reaching 18 per cent in January 2006. The spatial pattern to unemployment since the beginning of the 1990s has remained stable; only the scale has been magnified. The unemployment rate in the largest and most prosperous cities remains at a relatively low level. However, in the former industrial cities in general about a quarter of the economically-active population remains unemployed. For example in Radom the figure is 28.3, Świętochłowice 25.9, Siemianowice Śląskie, 25.6 and Bytom 24.6.

Poverty concentrates among homeless persons, elderly pensioners, the unemployed and the employed but badly paid. The third social diagnosis (Czapiński and Panek, 2003) estimated that, as of March 2003, as many as 25 per cent of households were below the objective poverty line (as compared with a subjective figure as

high as 57%). The general pattern was for the smaller the settlement, the larger the percentage of households living in poverty. For example, in rural areas, as much as 26.7% of the population was living in households threatened by poverty (i.e. below the relative poverty line), compared to 15.6 per cent of the inhabitants of towns smaller than 20,000, 11.1 per cent of the inhabitants of cities of 20,000–100,000 and 3.1 per cent of the inhabitants of cities with more than 500,000 people.

Housing problems

Another fundamental problem for Polish cities concerns the housing situation. According to the last National Census (of 2002), the whole housing stock represents 12.4 million dwellings with 45.4 millions rooms and 842.9 million square meters of usable floor space. Nearly 2/3 of the housing stock is located in urban areas. Since the National Census of 1988 the total housing stock increased by only 915,600 dwellings (i.e. 8.5 per cent) in comparison with a 14.9% increase between the censuses of 1978 and 1988. The 327.6 dwellings per 1000 head of population leaves Poland in a very low position in Europe as a whole.

State policy concentrates on support for new construction, while maintenance and improvement of the existing stock is left behind or neglected. Modernization of substandard urban areas, especially the large housing estates, needs substantial improvement of current legislation. The basic barrier here is the lack of public resources and incentives from local government. An additional constraint is the lack of clear legislation or a pattern of good practice for cooperation within private – public partnerships.



Photo 4. Warsaw – post socialist large housing estates

Emerging demographic problems

The national-scale demographic trends will have a basic impact on cities (Fig. 2). According to a prediction by the Central Statistical Office (CSO), the decrease in levels of fertility in Poland, which began in the early 1990s, is not yet complete. It is probable that the overall rate will decrease further from a current 1.25 to 1.10 by 2010.

This will be accompanied by a decrease in mortality, and an increase in life expectancy. According to the same prognosis of the CSO the average life expectancy in Poland will increase from 74.5 now to 77.8 in 2015 and 80 years in 2030. The key problem will be the population growth and aging of the Polish and urban populations in particular. The populations of the largest

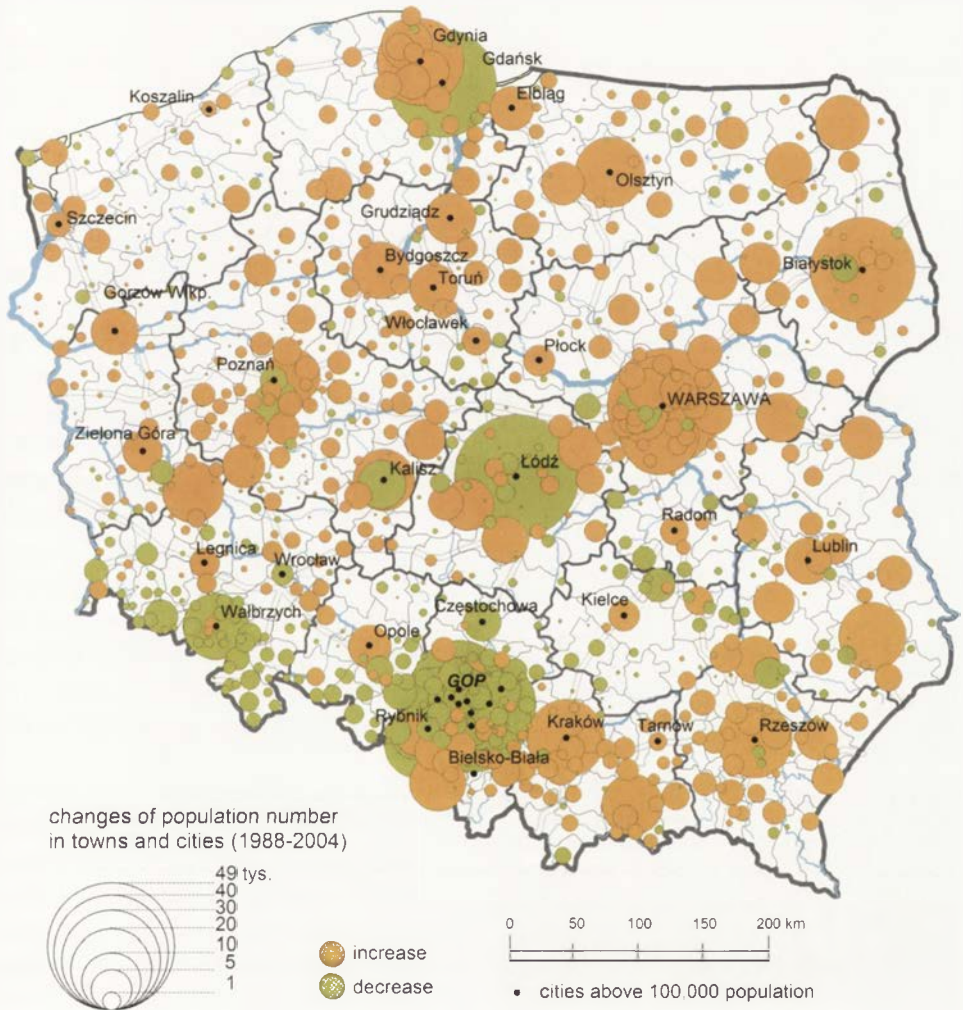


Figure 2. Changes of population number in town and cities, 1988-2004 (by Przemysław Śleszyński)

cities in Poland will decline over the next few decades. The most dramatic prediction again concerns the five largest cities. The proportion of people of post-productive age in Warsaw will increase from 19.6% in 2003 to 30.1% in 2030. Other cities will experience a similar process.

The case of transport infrastructure

The problems of the transport system on an intra- as well as inter-urban scale relates, not only to the need for modernization of the national and regional roads, but also to the coordination of local and regional interests. The best example is the struggle over the precise locations of motorways. The next unresolved problem concerns the confrontation between the mass-transport system and the pro-individual motorization policy of some metropolitan authorities (Parteka, 2002). The crisis situation in transport infrastructure limits the competitiveness of the whole Polish urban system and of individual cities. The rapid increase in car ownership, particularly in urban areas, has revealed the unpreparedness of the structure of cities and road infrastructure. This is becoming one of the barriers to future development. The increase in car ownership has contrib-

uted substantially to a rapid initiation of the urban sprawl process around the largest cities, and to a strengthening of suburbanization. Together with urban sprawl, the issue of landscape degradation has emerged, as well as problems with the maintenance of green space in and around cities.

Governance and urban policy

The administrative organization of Poland involves three tiers of territorial division. The lowest level – of the *gmina* (municipalities, communities) – is the basic unit of local government (of which there are 2,478), corresponding with the EU's communal or NUTS 5 level. The *powiat* as a group of *gminas* is the basic government unit of county or NUTS 4 level (there being 379, of which 65 are actually cities with *powiat* status). The *voivodships* – the basic regional level (16 units) correspond to provinces or NUTS 2 regions. Up to 1999, there were only two tiers, though the delegation of certain responsibilities began with the *Local Government Act* (1990). Since then the *gmina* has been the basic unit to the territorial structure. Urban areas could have the status of city, which is parallel to that of *gmina*, or of *powiat* in the case of only one large city, or a set of smaller cities and several *gminas*.

The rapid shift of control over urban space from the central to the local has created many problems. The new local government was not prepared to deal with the emergence of numerous new actors, mostly from the private sector. However, an institutional context for strategic planning has gradually been established. *The Act on Spatial Development* (1994)



Photo 5. Kazimierz Dolny – small town and tourist centre in Lubelskie voivodship

equipped local authorities with two legal planning instruments in the shape of the local physical development plans and the strategic plans. Elements of urban policy and urban development can be found in the numerous strategies, planning concepts and local plans that have emerged. Since that time, proposed strategies have been based on: assets relating to geographical location, the improvement of existing economic potential and production, the search for new functions for cities or new niches in the market, or the creation of better living conditions.

Toward the formation of national urban policies

In spite of the large impact European integration has had on the reorganization of political and economic life, urban policy in Poland is still in disarray (Węclawowicz, 1996; 1998).

The attempt to formulate a new regional policy has been congruent with an end being put to the illusion that the invisible hand of the market will solve all problems. This attitude has an important impact on the formulation of strategic plans for particular cities. All elements of the regional and urban policy being pursued in the first half of the 1990s remained reactive (to the spatial concentration of problems which accumulated to the point of political explosion), rather than creating visions for longer-term strategies. To date the attitudes of politicians have not yet crystallized fully, and there is a constant floating of attitudes to the market mechanism and the role of the state. Furthermore, the con-

sequences of social, economic and political reforms, like the re-introduction of local government, privatization of the economy and sets of new industrial, environmental, transport and agricultural policies, have had a clear impact upon urban development. Their combined effect has probably been greater than that of spatial planning and the reintroduction of regional policy.

The whole post-War period saw cities recognized as important economic actors, however in regional and spatial policy it is the interests of regions that prevail¹. To moderate this phenomenon, a Joint Committee of Central and Local Government has been in place since 1993, this partly representing the interests of the urban municipalities in the consultation of governmental policies regarding local government and urban issues. This Joint Committee also monitors the most important elements of urban life for the member cities of the Association of Polish Cities. The most important of these monitored fields of public life are health care, social support, education, culture, and transport.

The cities and their inhabitants as subjects of urban policy

The allocation of the responsibility for urban development to local government, at the beginning of the social and political transformation, resulted in a revitalization of local initiative. It has been possible to observe immense improvements in the level of maintenance of municipal infrastructure and the housing stock, as well as the creation of a more pleasant urban landscape in urban areas since 1989.

¹ With one exception – the post-War reconstruction of a Warsaw in ruins under the slogan: “The whole nation constructs its capital”.

In many cases, local government policies have, notwithstanding the limited financial resources, successfully attacked infra-structural, social and economic problems. The basic economic and social problems should be limited by the policies imposed at national level. Nevertheless, local authorities do have legal instruments, albeit of limited scope, to control and reduce unemployment, social exclusion and poverty, criminality and vandalism, and homelessness. The issue of environmental pollution is also within the reach of the local authority: local governments have acted in the fields of the collection of waste, sewage, the resolution of parking problems, and the maintenance of the streets and green areas. Finally, local governments can influence the allocation of shops and everyday services.

Social policy, pursued primarily at the local level, has a very direct impact on the everyday life of the inhabitants of cities. It focuses, *inter alia*, on education, safety, health, access to culture and recreation and housing. While short-term strategies and actions to reduce such poverty-related problems as crime, alcoholism and drug-abuse seem to be working, it has so far proved difficult for an integrated approach to be arrived at. However, even within specific sectors, the problem of integrated development of long-term prospects is present. Housing is a case in point.

The introduction of the free market at the time of transition went hand in hand with shifts in the responsibility for housing provision from the central to the local government level. So, currently, housing in urban areas is under the supervision of local authorities. During the last 14 years of socio-economic reform in Poland,

central government has prepared several instruments aimed at improving the housing situation, but in most cases these instruments have not corresponded with each other. Also they have been characterized by a lack of continuity. This is for example the case with programmes aiming to increase the accessibility of housing through the development of a financial system that brings together support for social housing, a housing allowance system and tax incentives. The only direct state-level intervention remaining was in the form of measures should technical problems arise with prefabricated housing construction in cities. The allocation of subsidies from the central level, however, has been directed to the housing co-operatives, as owners of the housing stock in estates.

A national urban policy still seems far away. However, urban problems and urban policies are starting to become important issues in the public debate over the future of Polish cities. Two events organized by the end of 2003 have initiated an intensive public discussion. They are described briefly below.

The First Congress of Polish Cities (November 2003), organized as a meeting of the representatives of local governments, agreed to support several ideas to improve urban management. The majority of these entail the amendment of current legislation. This is above all true of legislation on the income of the local authorities. Connected with this is a proposal for far-reaching reform of public finance. The basic idea is a decentralization of the state financing system and re-allocation of local taxes, plus subsidies for cities. Also included is new legislation on public-private partnerships, regional develop-

ment and spatial planning. This Congress also mentions the lack of a comprehensive revitalization policy. Revitalization of urban areas is currently one of the most challenging problems. Local governments cannot cope with these problems alone, because they do not have sufficient financial assets or organizational capacity. In addition, the technical infrastructure of these areas is old and inefficient in the majority of Polish cities. Today, the management of an increasing amount of derelict land in inner-city locations is one of the most important issues. Brownfields often represent a large part of a city's structure. Revitalization and investment in urban development are therefore linked closely with environmental issues and the transport system. In this field, a matter of key importance is the reform of the financial system, which should provide local government with the resources needed to meet obligations regarding environment protection.

The perception of the urban problems presented by the cities' representatives, and the need for new legislation, correspond with the perception of the problem laid down during the First Congress of Polish Urbanism organized in September 2003. At that Congress, the vision of a social alliance for the future development of the Polish cities was proposed. Cities should be treated as a "common good", but also as a "common responsibility". This slogan was widely distributed, revived the discussion on urban problems and prospects and highlighted the need for a more comprehensive urban policy to be shaped on the national and local scales. Thus far, the introduction of democratic local government has brought many

improvements, but also more inefficiency and even increased frustration on the part of town- and city-dwellers.

Toward a new place for the Polish urban system in the European context

The basic challenge for the Polish urban system is the degree of participation in, and scale of contribution to, any increase in the competitiveness of the European urban system as a whole vis-à-vis the world economy. This participation and contribution could either be significant or marginal. Polish cities – as engines of the growth and modernization of Poland – must be supported. The same is true in the context of the entire European Union. At present in Poland like in the European Union does not have explicit urban policy. All sets of urban initiatives in Poland in the field of research, strategic planning and institutionalized interest groups have been formed. The best example is the Union of Polish Metropolises (formed in 1990), the Association of Polish Cities (formed in 1991), and the Union of Polish Towns (formed in 1990).

The Union of Polish Metropolises promotes Polish metropolises which are not so visible in Europe, by providing information and help towards the formation of a stronger network of twelve urban centres – the aim being cooperation rather than competition. The members of the union are: Warsaw, Łódź, Cracow, Wrocław, Poznań, Gdansk, Szczecin, Bydgoszcz, Lublin, Katowice, and Białystok – plus (in spite of its relatively moderate size) Rzeszów. These urban centres together

with their agglomerations house the most important administrative, financial, cultural and educational functions. Together, the twelve Polish metropolises can contribute substantially to the European urban network.

In the administrative hierarchy, however, cities have a much lower political significance than any other regional administrative bodies. The basic policy challenge for Polish cities is the issue of urban and metropolitan governance. Currently, there is still a lack of mechanism to achieve in practice a balance between those elements of different fragmented policies which favour competitiveness, development, regional and international objectives on the one hand; and policies which support social cohesion, redistribution and local development on the other. The prevalence of local interests and short-term political objectives blocked the formation of a spatial alliance (defined for example on the scale of the metropolitan region or urban agglomeration) and partnership between central government, local government, the private sector of the local economy and mass, conscious participation on the part of citizens. After 14 years of social and economic transformation only a very minimal coordination of strategic planning at the local, regional and national levels (and then not always in a correct way) has been arrived at. The governance of the Polish urban areas and metropolitan regions is still a far cry from the OECD's *Principle of Metropolitan Governance*.

The intensification of economic and cultural exchanges between European Union Member States combines with the process of enlargement to create a growing need

for the new Trans-European transport networks. Their axes or corridors are of strategic importance for the future. At the moment, the East-West links between the European Union and the newly-integrated countries remain only poorly developed. They are designed to remove bottlenecks in economic exchange and in the regional development of the peripheral regions.

The transport and communications field is recognized as one of the key factors in modern economies. The issues have two interlinked dimensions – an internal one connected with the construction of motorways in Poland, and a more European dimension which will shape future urban policy as well. Under the “European transport policy for 2010: time to decide”-White Paper, the 1990s saw Europe begin to suffer from congestion in certain areas and on certain routes, and the congestion in the centre goes hand in hand with excessive isolation of the outlying regions. This situation was considered likely to deteriorate dramatically with eastern enlargement into the Central European countries. The substantial improvements of modern transport and communication links of the European core with the enlarged periphery are thus necessary to ensure regional cohesion within the European Union. This issue is recognized in the Polish *National Development Plan 2004–2006*, approved by the government in January 2003. Reliance on EU assistance under the structural policy and Cohesion Funds is designed in the first place for regional problems, not urban ones. The planned improvements of the transport system concentrate above all on the roads and motorways, which will shape the future chances for development of many cities. At the same time it aban-

don, in reality, the need for modernization of the railway system, which will deteriorate further, except in its the inter-city connections.

The *National Development Plan* has some significant limitations like the fact that while it is a list of EU fund expenses, it is not the way toward a knowledge-based economy. There is an absence of stimuli for entrepreneurship development, a sectoral arrangement of priorities, too centralized a fund management system causing problems, and an excessively complicated organizational structure of the *Integrated Regional Development Operational Program* (Grosse and Olbrycht, 2003). The most important issue is the strong dependence on European Union resources and the time span. The main objective defined as the development of a competitive, knowledge-based economy and entrepreneurship has secondary priority in reality. Nearly 60 per cent of available funds will be spent on the development of basic infrastructure: roads and environmental protection.

The position of three large metropolitan areas of Warsaw, Poznań and Łódź in the European system will probably be a basis for the regional development of Poland and the creation of a "core development area" between them. It is the best prospect for those three metropolitan areas, of which Warsaw and Poznań are strengthening their positions on the West-East axis like Paris-Berlin-Warsaw-Moscow, while the chance for Łódź is to stop its de-metropolization process.

On the regional – Central European – scale, the Warsaw metropolitan area could be perceived as: the "Eastern End Trajectory" of economic development

(Korcelli, 1999) or as a potential gateway for the European Union into Eastern Europe (Węclawowicz, 2002).

The concept of the Warsaw Metropolitan Area as a future gateway of the European Union could easily be combined with the much wider concept of "The Eastern Gateways of the European Union". Such an extended project could indicate a unique and historic chance for the economic and social progress of the Central European metropolitan areas (Warsaw, yes, but also Białystok and Lublin) through a promoting of the development of the West-East transport and communication "Euro corridor".

Like other Central European metropolises, the Warsaw Metropolitan Area is situated on the immediate fringe of the enlarged European Union, being in close proximity to the highly-developed region which is facing basic constraints over expansion further east, due to the bottleneck regarding transport facilities. The project aims to improve economic conditions and social cohesion, maintain a positive environmental context through more sustainable modes of trade and transport, with a view to prosperity and quality of life being enhanced in the fringe regions. This is the best way to facilitate economic expansion further East, as a basic asset of the whole Europe in global competition. It could be profitable for the core economic development of the European Union to have a good facility for further economic expansion across the new member states and into Eastern Europe (Russian Federation, Belarus and Ukraine) and beyond. Altogether, this concept could contribute to the creation of the new shape of the Europe of the future.

Conclusions

Poland's polycentric urban system, whereby metropolitan areas and large urban centres exist, is an important asset for future urban policy in Poland. However, it also creates a set of new challenges, of which the most important are economic integration and the formation of a functional metropolitan network. An integrated network of Polish metropolises and large cities could prove more efficient in securing an advantageous place in the emerging urban hierarchy of the enlarged European Union and more unified European Economic Space.

Unfortunately, the economic integration of the Polish metropolises and large cities into the functional network created under communism has not proved fit for the free market, democracy, and integration and opening-up of Polish space to external influence. There have been moderately successful efforts to increase the attractiveness of Poland and Polish cities in terms, for example, of foreign investments. This is true of the Warsaw Metropolitan Area, notwithstanding its dominant attractiveness on the national scale, as well as other large cities and metropolitan areas in Poland.

In the case of some Polish metropolises, the new economic, social and cultural links create alternatives to Warsaw as regards a status as capital of Poland where cooperation possibilities are concerned. For example: the Tri-City (Gdańsk, Gdynia and Sopot) could reorient its connections with Scandinavian metropolises and become a partner for Copenhagen or Stockholm and Wrocław for Prague or Berlin. Cracow could establish closer ties with Vienna and Budapest. Separately, however each Polish

metropolitan area could serve a suburban function for larger western metropolises in close proximity (in the way that Bratislava in the Slovakia could serve this function in relation to Vienna). In Poland, the large urban metropolises like Poznań, Wrocław and Szczecin could be subordinated to Berlin. In this case, the obvious challenge for Warsaw will be to become more attractive than Berlin and other large western metropolises, or to form a strong functional network, or to remain merely the capital of eastern Poland. In this way, the globalization and metropolization process which is the basis for the development of cities will form the network over countries and regions. The integration of the Polish urban system will provide for a substantial strengthening of the economic potential of the EU urban system, and will contribute to the achievement of the EU Lisbon Strategy's main objective.

The process of metropolization of Poland will continue on the basis of the network of the largest cities. The polycentric structure of the urban network is still assumed to guarantee a balancing of development in surrounding, usually backward, regions. The network of the large cities is sufficient in the western part of Poland, but is not so in the east. In each case, all the metropolitan areas are in need of substantial infrastructural modernization. Since EU accession day (1st May 2004), Poland has had an opportunity to obtain financial support within the framework of the Structural Funds and the Cohesion Fund. The challenge and chance for urban areas is that these resources should be spent sensibly, this being a substantial precondition if the quality of life in, and economic development of, Polish cities is to improve. Unfor-

tunately, Polish cities are not prepared sufficiently for the absorption of EU resources.

The underdevelopment of housing and economic performance of the Polish city will generate a process similar to that ongoing at the beginning of the 20th century. The urbanization of Polish society has been accomplished through migration to the United States and industrial regions of Europe. The urbanization of the rural population will in turn be realised through international migration to the urban areas of the European Union, since there is no place in the nearest regional cities or large national-scale metropolises.

The urban policy pursued under the labels of what is "spatial" or "regional" has all the time twisted between an egalitarian attitude on the one hand, and selective or efficient options on the other. However, the competitiveness of the contemporary global economy and European integration leave no choice. Selective policy prevails, and that means a shift from regionally-oriented spatial policies toward more urban- and metropolitan-oriented spatial policy.

The transformation of Poland from a communist system to the free market and democracy has divided people, regions and cities into categories of winners and losers. One of the most important political challenges where the objective of European integration is concerned should now be to put in place conditions allowing any repetition of such a situation to be avoided. The new urban and regional policy should reduce the rate at which disparities grow. Structural policy will in turn need to be extended to a new spatial policy that has a much stronger urban dimension, with a view to a higher competitiveness and social cohesion being achieved.

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The development of rural areas

Jerzy Bański

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: jbanski@twarda.pan.pl

Preliminary remarks

While geographers at work in Poland have long been interested in rural areas, their research tended to be specialized, in general being carried out in relation to agricultural, population or settlement geography. Only in rather recent times has spatially-orientated research on rural areas assumed a more comprehensive character. Such work has been the province of specialized research teams based at several higher-educational establishments, i.e. the Rural Areas Research Group of the Institute of Geography and Spatial Organization of the Polish Academy of Sciences and the Committee on Rural Areas of the Polish Geographical Society.

Notwithstanding the varied definitions of rural areas that scientists have come up with, macroscale studies have mostly in practice made use of the definition adopted by state statistics. In Poland, the Central Statistical Office (CSO) holds rural areas to be all those located beyond the administrative limits of towns or cities (Table 1).

Historical changes in rural areas

The spatial configuration of rural settlement units in Poland¹ is a very varied one, first and foremost in reflection of the country's chequered past. Still having affinities with the different economic and political

Table. 1. Poland's rural areas in line with the different criteria applied in distinguishing them

Criterion	% of Poland's population	% area of Poland
Urban-rural administrative division (Central Statistical Office definition)	38.1	93.4
Density of population up to 150 people per km ² (OECD definition)	35.0	91.7
Density of population up to 100 people per km ² (EU definition)	32.8	83.0

¹ As of 2000, there were 56,786 rural localities.

systems of the three empires which partitioned Poland out of existence for 123 years, the contemporary settlement system is complex and far from achieving functional and spatial homogeneity or cohesion.

The contemporary landscape of the rural areas in Poland is above all the product of the ongoing process of the land's agricultural management. While there was an initial period in which people incorporated themselves more or less harmoniously into the natural landscape (which did not lose its *primaeval* features), the process of intensification of output and attendant increased density of the settlement network within the landscape inevitably increased the role of anthropogenic factors.

The period of feudalism was mainly characterized by changes in the system of land ownership. Owners of large tracts of land came on the scene, as did the peasants working for them. Joint cultivation of the land gave way to utilization by families. Agriculture became a primary activity and progress was made with the techniques by which to cultivate land. There was a gradual decline in the area under forests, whose place was taken by farmland.

The period of the manor-farm/feudal economy saw the emergence of agriculture under the control of lords of the manor. The development of farms of larger areas resulted in a decline in the area of peasant farms, but also in better farming techniques. The late 16th and early 17th centuries brought the drainage of the marshes and wetlands in the Żuławy (Vistula Delta), Kujawy and Pomeranian regions, with Dutch settlement ensuing. The nature of rural architecture changed, and at the end of the period, brick- or stone-built manor houses began to appear in the western part

of what was then Poland, if only among the richest of magnates' families.

The period of the Industrial Revolution in turn left a particular mark on the rural landscape. The aforementioned Partitions split the country into three, with each sector being subject to a different level of economic and social development, being administered in its own way and subject to different kinds of rule of law. As has been noted, the differences put in place then remain visible to this day. The development of industry combined with dynamic processes of urbanization to favour the development of commercial agriculture. The market for agricultural produce and products expanded, while techniques in land cultivation and animal husbandry improved.

From 1826 onwards, the agrarian reforms introduced in the Prussian lands enfranchised peasants and resulted in a redistribution of land previously under manorial ownership (Cymerman *et al.*, 1992). Simultaneously, the Prussian-controlled part of the non-existent Poland was dominated by the small and medium-sized farms of the gentry, as well as the small-holdings of peasants, the prices for what they could produce remaining rather low. In turn, the Russian fiefdom known as the Congress Kingdom of Poland had agriculture as its primary economic function, even though its level of development was behind those noted in both the Prussian sector and Austrian Galicia, ensuring that the peasant holdings were characterized by genuine poverty.

The First World War wrought destruction in the Polish countryside. Buildings and infrastructure were destroyed or devastated, as was the land itself in some cases.

The inter-War period of a newly-independent Polish state reinstated on the map of Europe was characterized by changes in the spatial structure of rural areas as parcels of land were allotted to war invalids and agricultural workers. Many farms of several hectares each appeared at that time. Second World War did still greater damage. Above all, there was a massive loss of the rural population, along with destruction of the "material substance" of agriculture and a consequent cessation of cultivation over no less than 7.5 million ha (Bański, 2002a).

Under those circumstances, the communist system imposed upon Poland began with agricultural reform even before the War had ended (from 1944). The nationalization of the large private estates of old allowed for the establishment of State Farms, productive cooperatives and also a large number of very small farms in private hands. The then newly-(re)acquired lands in the west and north of today's Poland were settled by incomers from the eastern areas that had come under Soviet control, these having their own, different, ways of cultivating the land and managing farms.

Nevertheless, the post-War period can be said to have resulted in major and favourable developments where the social and technical infrastructure of rural areas was concerned. New and better roads appeared, along with industrial plants, schools, health centres, housing estates for farm workers, etc. The living conditions for the rural population also improved.

Only in the last decade of the 20th century did the market economy become re-established in Poland. New social and economic processes observed in connection with this led to a further reduction in

disparities between the urban and rural populations in terms of standard of living. However, the significance of agriculture as such began to decline, its place being taken by other economic functions (mainly trade, services and housing). Today, the greatest spatial transformations in the countryside are taking place in suburban areas and satellite towns around cities, as these gradually become absorbed into the urban fabric. The development of housing and substitution of agriculture by other economic functions is producing a loss of the previously-existing spatial structure in many "rural" areas (Photo 1).



Photo 1. A new housing estate in the Warsaw suburbs that departs from the typical rural settlements in terms of both its architecture and its spatial layout

Population changes in rural areas

The number of rural inhabitants was maintained at a similar level during the whole post-War period. It is true that the ongoing process of urbanization in Poland continued, and resulted in a steady and considerable loss of population from rural areas, but this was largely compensated for

by a relatively high rate of natural increase. While there were some 15,597,000 people living in rural areas just after Second World War (66% of the national population), the equivalent figure in 2002 was 14,619,700, by this time representing just 38.2% of the national total (Fig. 1).

net loss to the countryside at that time was running at some 250,000 people a year, but the qualitative effects were more marked even than the quantitative, since those migrating were in the main young (women in particular) and rather better-educated.

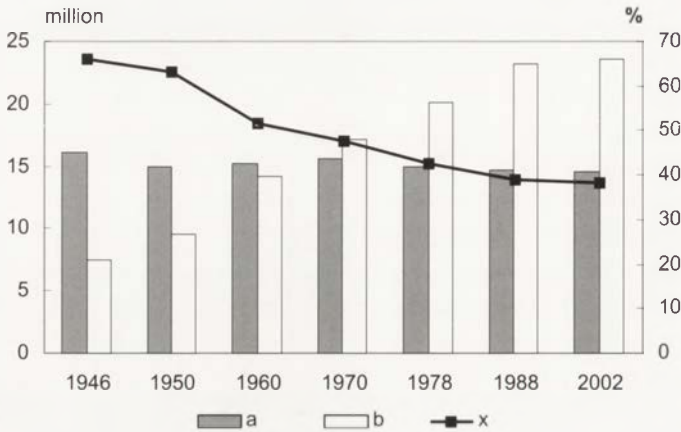


Figure 1. Changes in the rural (a) and urban (b) population, as well as in the share of the population that is rural (x) in the years 1946–2002 (on the basis of Census data)

Nevertheless, even in rural areas the rate of natural increase did gradually begin to fall in the years 1950–1970. In the face of the continuing outflows of population to the cities, the inevitable result – appearing in the 1970s – was for the negative migration balance to exceed the natural increase, with the result that the rural population began to decline. The process of out-migration even intensified post-1975, *inter alia* because voivodship capitals with additional functions were designated at that point, and proved absorbent of population². The

The brakes were applied to the migration processes when economic crisis took hold in the 1980s. At that point, natural increase was once again able to compensate for numbers leaving the countryside that were lower than before (Stola, 1998). Fewer and fewer people were moving to the cities in the early 1990s, above all because the labour market had contracted and urban costs of living were higher.

In consequence, in more recent years it has even been possible to note some localized instances of the reverse phenomenon to the above, i.e. an increase in population

² The administrative reform replaced 17 voivodships plus 5 cities with voivodship rights (i.e. Warsaw, Łódź, Cracow, Poznań and Wrocław) with 49 “new” voivodships.

outflows to rural areas. This has been sufficient to raise the rural population, even in the face of a distinct decline in the natural increase. Overall, then, the 1990s can be said to have brought a clear weakening of the tendency for population to concentrate in urban areas (Bański, 2006).

The last years of the 20th century and first years of the new millennium witnessed post-War Poland's first overall decline in population nationally. This was accompanied by an unprecedented positive migration balance for rural areas. However, the latter phenomenon was not strong enough to end the overall process of concentration of population. For most rural areas are still showing a negative migration balance and a very low level of natural increase, or even a natural loss of population. Thus the increase in numbers of people is first and foremost typical of the rural areas directly adjacent to the large agglomerations, and it is mainly thanks to them that rural areas taken together show a positive migration balance.

As those choosing to leave the cities are mainly wealthy and well-educated, suitable conditions for the development of at least some rural areas are being put in place; the introduction of better technical and social infrastructure that will meet the new residents' more exacting requirements being favoured, for example. In 2000, rural areas received around 103,000 former city- or town-dwellers, cf. the c. 99,000 people who left the countryside for the town. The net increase in the rural population that year was thus of c. 4000 people. However, the net gain in rural areas was up to some 7000 in 2001, 17,000 in 2002 and over 30,000 in 2003 (Bański, 2005a).

Thus, the population changes affecting rural areas in the 1990s and early 21st

century have been proceeding in two different directions. While close to the cities, the migration balance has been positive, its value is seen to decline steadily towards the periphery. Areas there have continued to manifest markedly negative migration balances. Overall the 1990s brought both a clear weakening of the rate of concentration of population in towns and cities and a concentration of population in metropolitan areas (Bański, 2005b).

The average figure for population density in rural areas is of c. 50 people per km². The highest density of population is to be found in rural south-eastern Poland, also the region in which the share of the whole population accounted for by country-dwellers reaches its highest level. The most densely populated rural areas are in Małopolskie (119 people per km²) and Śląskie (Upper Silesia; 116) voivodships, while the sparsest population is present in the rural west and north (24 people per km² in Zachodniopomorskie (Western Pomerania) and 24 in Warmińsko-Mazurskie voivodships).

The contemporary situation as regards the distribution of the rural population is determined by many natural, social, economic and historical factors. The rural population is above all concentrated where natural conditions favour agricultural output. These are in the southern belt of uplands and across the Polish Lowland. There are further marked concentrations of rural population close to the large urban centres, since the latter offer job opportunities.

The gender structure to the rural population is in relative balance, the coefficient of feminization as of 2002 being 100.8. However, particular attention ought to be paid to the population of marriageable age (20–29), upon which natural demographic

development depends (Fig. 2). As those migrating from rural areas are mainly young women, they generate “shortages” of women available for matrimony back home. However, the female move out of the countryside is not exactly a whim or matter of convenience, being rather forced upon young women by difficulties with finding off-farm work, tough living conditions and a lack of any better prospects. This is above all true of the eastern parts of the country long associated with depopulation and the ageing of the population that does remain.

For all that the most recent period of 10 or so years has been characterized by favourable processes where the structure of the rural population by gender is concerned, the age structure has been subject to change of a largely unfavourable nature. The move through demographic highs and lows experienced by different age groups ensured that the years 1988–2002 brought increases in the proportions of the population of productive and post-productive age, at the expense of the representation of the youngest age group.

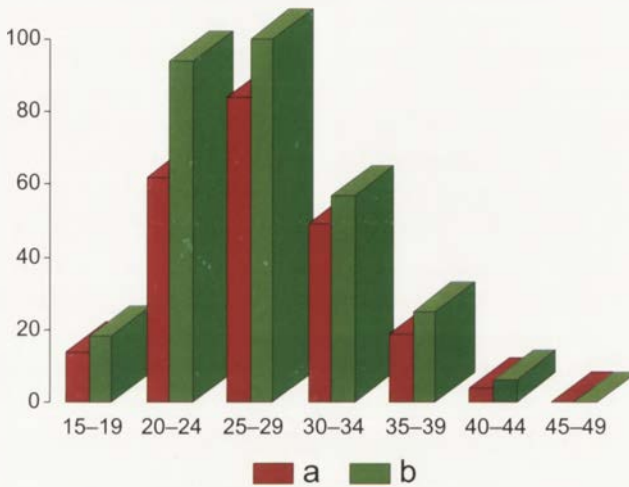


Figure 2. Live births per 1000 women in different age groups, 2002
a – towns and cities, b – countryside
(acc. to Central Statistical Office)

Over the last 10–20 years, the situation regarding the structure of the rural population of marriageable age by gender has improved markedly – the overall value for the coefficient of feminization in the 20–29 year-old age group increased from 85 in 1980 to 92.4 in 2002. The rise was slow but steady. According to Frenkel (1997), this above all reflects a declining number of people migrating to urban areas.

The problem of the large share of the population that is of post-productive age mainly affects central and eastern parts of the country. This results from the unfavourable gender structure, as well as the process of outflow of young people from the poorest areas. The cumulation of many other unfavourable phenomena intensifies both the demographic and social problems of the areas in question.

The development of non-agricultural activities in rural areas

The structure of the rural population by profession is dominated by the group employed in agriculture. According to data from the Central Statistical Office, almost 4,230,000 people were employed in agriculture in 2002, i.e. c. 29% of the national labour force. It has been usual for those addressing this issue to claim that the share taken by those employed in agriculture assumes much lower values. For example, Frenkel (2003) estimated that agriculture accounted for around 19% of all those in work, while Orłowski (2001) assigned a value of 16% to this.

The main condition underpinning the development of rural areas is an increase in their diversity, above all through enrichment of the structure to the socioeconomic functions. For this reason also, ever-greater attention is being paid to the need for non-agricultural economic functions to be developed, i.e. those in services, tourism, housing, forestry and (more rarely) industry.

Analysis of the functional structure of rural areas shows that, in about half of all gminas, agriculture is pretty much the only economic function (Bański and Stola, 2002b). They are thus gminas of a mono-functional nature. Among the remaining gminas, there is a prevalence of those in which agriculture co-occurs with other economic activities (Fig. 3). Only in around 20% of gminas is the leading role played by non-agricultural functions – mainly in forestry and tourism, or else of a mixed character (Bański, 2003a).

The changeover from a centrally-steered to a market economy provided favourable

conditions for the development of non-agricultural activity in rural areas. Alas, the opportunities for such development to take place have been limited by social problems, as well as by infrastructural and financial difficulties. In spite of this, rural areas have manifested dynamic growth in the numbers of non-agricultural economic entities over the last 10+ years. In this way, the role played by agriculture in the generating of farm income has declined, even in areas that were agricultural by tradition (Bański, 2003b).

Non-agricultural businesses are present at highest densities in the western voivodships of Zachodniopomorskie (Western Pomerania), Dolnośląskie (Lower Silesia), Lubuskie and Wielkopolskie, as well as in Mazowieckie and Śląskie (Upper Silesia). In turn, the lowest level of saturation with economic entities of this kind is to be noted along the eastern border, in the voivodships of Podkarpackie, Lubelskie and Podlaskie.

The greatest concentration of farms engaging in activity outside agriculture is to be found in the hinterlands of the large cities, as well as in areas attractive to tourists. Their numbers per 10,000 people of productive age generally exceed 1000. The largest group comprises entities rendering services or involved in production.

From among the activities outside agriculture, it is services that play the most important role, followed by trade and small-scale manufacturing. As of 2001, the structure to the business entities active in rural areas was as follows: 69.1% in the services and trade, 25.2% in industry and 5.7% associated with agriculture (in the servicing thereof or processing of its output). Services and small-scale manufacturing prevail in suburban areas, in which enterprises in construction, transport, repair and

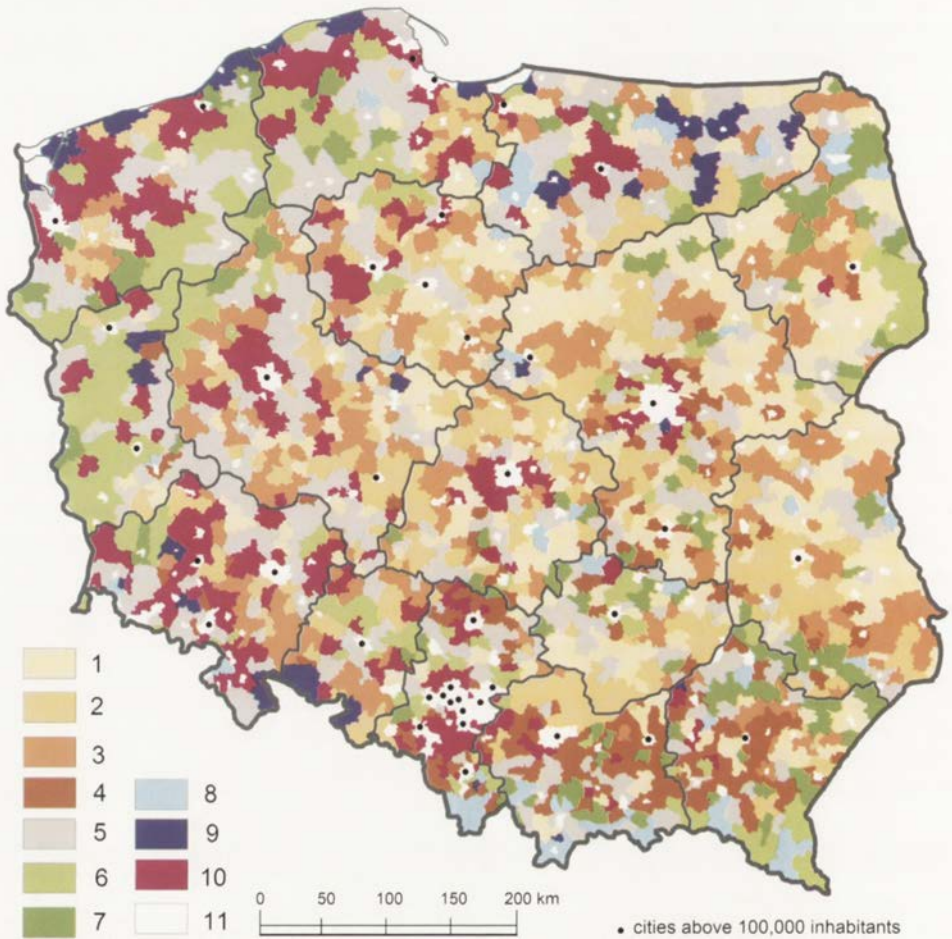


Figure 3. Functions of rural areas, 2000 (acc. to Bański and Stola, 2002b)

1 – non-commercial agriculture, 2 – intensive and commercial agriculture, 3 – mixed agriculture with shares of types 1 and 2, 4 – agriculture with a share of non-agricultural functions, 5 – mixed functions, 6 – forestry with a share of non-agricultural functions, 7 – forestry with agriculture, 8 – tourist and recreation with a share of forestry and agriculture, 9 – tourism and recreation with a share of non-agricultural functions, 10 – non-agricultural functions housing, services and other, 11 – towns and cities

wholesaling are most willing to locate. There is also a large share of service-type businesses in the gminas along the coast and in the mountains, as well as in the Mazurian Lakeland. In each case, it is the servicing of tourist traffic that is involved. Truly peripheral and weakly-developed

areas experience only limited growth of services, on account of a simple lack of potential clients/recipients.

Trade is a rapidly-developing sphere of economic activity in rural areas. When the state-owned or cooperative shops closed down, their places were taken by private



Photo 2. A new element in the rural landscape – a restaurant by the Zegrzyńskie Reservoir near Warsaw

trade. Thanks to the appearance of a large group of new shops, access to goods in the countryside has increased, as has the quality of what is on offer.

The last 10–20 years have brought intensive development of rural tourism. This is starting to be seen as an important branch of economic activity on the local, regional and national scales. According to the Ministry of Agriculture and Rural Development, in 1993 there were about 1000 household farms in rural areas offering tourist services, cf. 11,260 in the year 2000. Around half of the latter were agritourist farms, the remainder farms engaging in direct agricultural production. The number of agritourist farms is greatest in Małopolskie and Warmińsko-Mazurskie voivodships, and thus in areas prized from the natural, landscape and cultural points of view.

Recreation and “long-weekend” tourism may also be of greater significance in rural

areas of Poland. There is no slackening of interest in the building of “second homes”, of which a proportion later go on to serve as year-round residences. Indeed, the pressure imposed on certain areas by city-dwellers may become so great that farmland may go out of agricultural use and be designated for the building of summer residences, or even communities thereof.

Alongside agriculture, forestry is the primary economic function in rural areas. A little over 10% of all Poland’s gminas have a prevalent forestry function, but there is a marked concentration of these in the western part of the country, as well as in the Bieszczady Mts. (SE Poland) and Podlasie (NE). It is usual for forestry to function alongside agriculture here, as well as in areas attractive from the natural and recreational points of view. In connection with the planned afforestation of the poorest farmland, there will

be an increase in the economic significance of forestry in the years to come. Under the *National Programme for the Augmentation of Forest Cover (1995)*, some 700,000 more ha of land (mainly farmland) will have been planted up by 2020, a further 1.5 million ha in the even longer term.

While the state-owned or cooperative institutions formerly operating in trade and the services had their places taken by a dynamically-developing private sector, the same was not true of the small industrial enterprises which were generally unprofitable and simply went bust. Many studies confirm that this was the case, showing that the number of country-dwellers earning from this branch of the economy declined markedly in the 1990s. The causes were, not only the collapse of the aforementioned sources of employment actually located in rural areas, but also the (preferential) laying-off of village-based industrial workers employed in towns and cities (Sikorska, 2000).

In addition, there are too few new industrial developments of domestic or foreign origin in rural areas. A study by Domański (2001) points out that foreign investment in industry in rural areas has taken in 417 enterprises, representing 12% of all the foreign investments taking place nationwide. Foreign investors are above all interested in locating close to large cities.

Among more than 3 million economic entities in Poland, 673,000 were located in rural areas (Poczta and Przezbórska, 2002). There were most of these in the rural areas around the large cities, but only very few in the peripheral areas. The lowest level of saturation by such small businesses is present along Poland's eastern border.

The development of housing construction and technical infrastructure in rural areas

The size of the housing resource in rural areas grew in the post-War period, to peak in the 1950s as all the cottages and houses destroyed in the course of the War were rebuilt. Qualitative changes have accompanied the increase in the numbers of dwellings. Both new and existing buildings have been fitted out with sanitary and technical infrastructure, the result being a raised standard of living for inhabitants, and an improvement in their living conditions.

The construction of the post-War period was characterized by a change of materials. Wood gave way to bricks and air-bricks, wooden tiles and thatching to modern roofing materials. The architecture and appearance of residential buildings also changed. While more and more brick-built houses began to appear in the countryside as early as in the inter-War period, it was only after 1945 that quality began to change. The 1960s and early 70s saw a transfer of urban patterns of construction to rural areas. This urban fashion combined with a paucity of designs to ensure that rural areas obtained their own 2-storey "block" buildings with flat roofs normal enough in the city but quite alien to the rural landscape. As subsequent years favoured farm production, rural inhabitants grew richer, and opted to increase the sizes of their homes, as well as becoming involved with less-typical and more-varied forms of residential architecture (Photo 3). Still greater diversification is now taking place, though the attention of investors is



Photo 3. Qualitative changes in residential construction in rural areas – two houses from two different eras

now more and more focused on the quality of construction, and only to a lesser extent on size.

Among the different kinds of rural area, it is those adjacent to large urban agglomerations that are displaying the greatest development of residential construction at present. This is above all a consequence of the economic success these areas have experienced, their specific functional structure and the structure of their populations by profession, as well as migrational movements, i.e. an influx of people hitherto living in urban areas (Bański, 2005c).

The intensity of the building movement in suburban areas is a function of the size of the given urban centre and distance therefrom. This finds confirmation in the new building that has gone on in Lubelskie voivodship (Fig. 4). A clear impact of Lubelskie is to be noted on rural areas located up to 30 km from the city. Zones of enhanced building activity are also present

around other smaller urban centres, albeit with the radius not exceeding 10–15 km.

Thanks to amendments to the building regulations, developers have been given a freer hand to choose the size and shape of houses. While the homes of yesterday were nearly always of rectangular or square shape, there are now more and more with irregular designs. Their surroundings are also of different appearance: while once there might have been a couple of fruit trees, a flower bed and perhaps a small vegetable garden, today there are lawns and low planting, above all of dwarf coniferous trees and shrubs.

The change in economic functions has changed the appearance of the places people live and work. Farm buildings (barns, sheds and stores) are being taken out or experiencing a change of function (Photo 4).

And more and more of the built-up area now comprises fenced-off estates of single-family housing or free-standing residential buildings with a shed or garage.

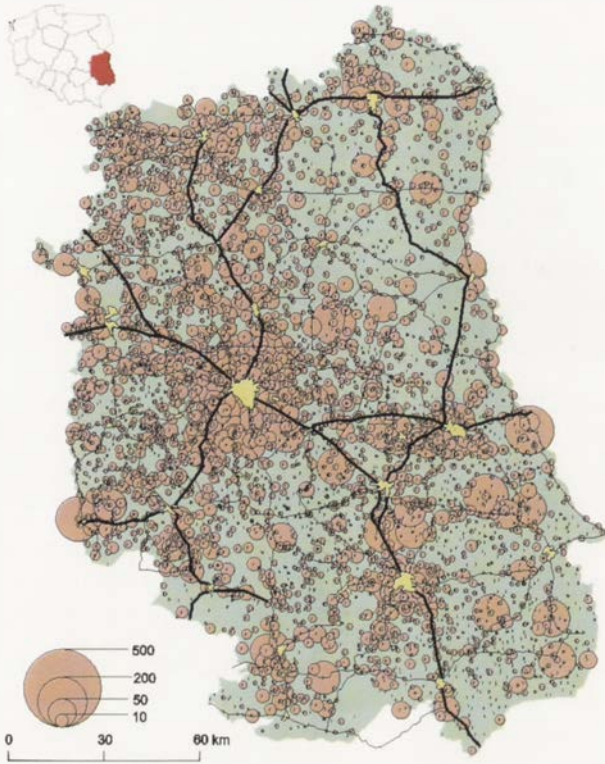


Figure 4. Granted planning permission in the rural areas of Lubelskie voivodship, 1995–2002 (acc. to Wesółowska, 2005)

Polish rural areas have long suffered from major shortfalls where technical infrastructure is concerned. However, the 1990s ushered in more major change, in particular thanks to the empowerment of local authorities in 1990. The extension and raised quality of the infrastructural networks was a priority task for this new local governmental tier and the years 1990–2001 brought a threefold increase in the length of the water-supply network in rural areas (cf. a 2.5-fold increase in the country as a whole), a 6-fold extension of the sewer network (cf. a doubling nationwide) and a 4-fold increase in the length of gas pipe-

lines (also cf. a doubling nationally). The number of telephone subscribers increased sixfold (cf. a 3-fold increase across Poland). Overall, then, the rate of development of technical infrastructure in rural areas has been markedly outstripping that in the country as a whole, albeit only because of the profound underinvestment taking place in the countryside in earlier years (Table 2).

The development of infrastructure was financed from local government sources, the state budget, the Agency for the Development and Modernization of Agriculture, the assistance programmes of the European Community (mainly PHARE and ISPA)

Table 2. The development of selected elements of technical infrastructure, 1970–2001

Type	1970	1980	1990	2001
Water mains (thousand km)	26.1	53.1	93.2	218.1
Sewer network (thousand km)	13.9	20.5	26.5	55.6
Gas pipelines (thousand km)	11.8	22.4	45.8	113.9
Wireline telephony (thousand subscribers)	1 070	1 943	3 293	10 934

Source: *Statistical Yearbooks of Transport in Poland*, Central Statistical Office.



Photo 4. An example of a change in economic function – a glasshouse converted into a warehouse for the storage of building materials

and the private funds collected together by the inhabitants of a given gmina.

From the point of view of increases in length, the most dynamic development is that of the water-supply network. Overall, the length there grew by 54,875 km in the years 1995–2003, representing a 66% increase. Likewise, the rate of investment in extending the sewer network increased markedly in the late 1990s and early 2000s. The length increased from 4428 km in 1995 to 26,365 km in 2004. Thanks to this, the ratio of length of the water-supply network to length of the sewer network decreased from 18.6 to 5.2 km (indicating that, as of 2004, there were 5.2 km of water pipeline for each km of sewer).

Outlays on wastewater treatment have increased in recent years. In rural areas, the system involved here began to be put in place – effectively from scratch – in the 1990s. It was then that most of the existing treatment plants were constructed. The analysis of gmina development plans suggests that the situation regarding the discharge and treatment of wastewater will improve further in the next few years.

The density of roads in Poland does not in fact depart from the European average, though there is of course a great need for modernization and upgrading to EU standards. It is well and widely known that Poland's roads are in a very bad state after long years of neglect, and also that roads were in no way adapted to meeting the needs of the dramatic development of road transport that actually took place. However, thanks to EU support from pre-accession and Structural Funds there has been and should be a year-on-year improvement. This is already visible in rural areas, in which an ever-greater number of gmina roads are coming under modernization.

Any spatial presentation of the outfitting of rural areas in basic elements of technical infrastructure reveals a country clearly divided into eastern and western parts. The situation in the former looks a lot less favourable than that in the latter, as a result

of a number of factors that include first and foremost the level of economic development, and the past history that underpins it. Through much of history, the western areas had better infrastructure. Furthermore, it was easier for the networks and systems there to develop, because the settlement network favoured that more, while the means of management were also quite different to those in the east. Indeed, the stronger economic base in the west also allowed local authorities to gain greater incomes, some of which they could then plough back into infrastructural investments requiring larger sums. Nevertheless, there should now be reason to hope that state assistance added to the funding being channelled in by the EU will provide for eastern Poland's accelerated development, thereby working to reduce the disparities that separate that region from western Poland.

The development of rural areas in the light of planning and strategic documents

Regional development and development of the country's spatial structures (including rural development) are very much shaped by the directions to activity of a societal or economic nature that are set out in the planning and strategic documents at different levels. At the central level, intensive work is underway as regards public consultations over the *National Development Plan 2007–2013* (2005), as well as the sectoral documents developed on the basis thereof, including one of fundamental importance to the development of rural areas in the

shape of the *Strategy for the Development of Rural Areas and Agriculture in the Years 2007–2013*, the *National Strategy for Regional Development* (2005) and the *Updated Concept for the Spatial Management of the Country*. In the next few years, these documents will be setting out the directions to the development of Polish rural areas and the differences to its spatial structure, as well as indicating i.a. the directions along which to resolve the many and varied problems faced by rural areas.

The *National Development Plan* (NDP) is a document of critical importance if full benefit from EU membership is to be drawn. This is particularly true regarding the utilization of the means on offer to Poland by the EU. One of the fundamental aims of the proposed NDP is the evening-out of levels of income and regional development. This is to lead to steady and stable economic growth in the country as a whole.

Where regional development is concerned, the NDP assumes the greatest dynamic to development characterizing the metropolitan areas, something that will undoubtedly enhance the country's spatial polarization and threaten a marginalization of rural areas. However, the impact will be softened to at least some extent by the transfer of developmental impulses to the hinterlands of the metropolises.

The *Updated Concept for the Spatial Management of the Country* models changes in Poland's spatial structure over the long term. The basic assumption influencing regional development greatly is the priority that effectiveness be achieved through equality. According to the report's authors, this is the essential

and only means by which civilizational backwardness might be escaped from. The document anticipates further polarization in the nearest future, as economic activity becomes yet more concentrated in metropolitan areas, while the surroundings are more and more marginalized. Foreseen in these circumstances are developed agglomerations and a so-called Polish pole of development in the central part of the country, as well as poor regions (mainly in areas once within the State Farms, or else in the east of Poland).

The *National Strategy for Regional Development* (NSRR) sets out the main objectives for regional development implemented in line with the government's regional policy. These objectives should be taken account of by regional authorities as they shape development. The leading goals of the country's regional development are: to raise the competitiveness of the voivodships; to increase their levels of social, economic and spatial cohesion, and to equalize opportunities for development. A document exerting a direct influence on the future of rural areas is the *Strategy for the Development of Rural Areas and Agriculture in the Years 2007–2013*, as drawn up at the Ministry of Agriculture and Rural Development. The *Strategy* denotes the main directions to rural development, and forecasts changes in rural areas over the medium-term (to 2020). It is in line with the reformed Common Agricultural Policy of the European Community, and takes account of Community-wide reforms of the policy on the development of rural areas. Alongside the main directions to development, the document

defines weaknesses and threats, as well as opportunities for the development of rural areas in Poland.

The overriding aim of the *Strategy for the Development of Rural Areas and Agriculture* is to raise the quality of life, and improve the working conditions, of country-dwellers by way of economic growth that takes account of environmental protection requirements. It is to this overall aim that the three principal objectives of the *Strategy* have been subordinated, i.e.:

- support for the sustainable development of rural areas,
- a raising of agricultural competitiveness,
- a strengthening of agricultural and food-industry processing with a view to the quality and safety of food being raised.

The first objective foresees implementation of the model of multifunctional development for rural areas and agriculture. Support for sustainable development in the countryside will be manifested through a diversification of economic activity ensuring alternative sources of income, as well as the shaping of agricultural output in line with the requirements that the natural environment be protected and the rural landscape preserved. In turn, the result of the raised competitiveness of agriculture will be an increase in its profitability. However, this will require modernization and changes in the model of production. The third goal will be attained as food-processing plants are modernized, above all to ensure their compliance with standards for quality and environmental protection requirements. Activity in support of the marketing and promotion of Polish farm output will also be of benefit.

A vision for Poland's rural areas

The working-through of contemporary social and economic processes and phenomena will reinforce the spatial differentiation of rural areas in Poland. Villages within or adjacent to metropolitan areas will lose their rural character in terms of the economic functions they serve, the structure of the populations that inhabit them and even the nature of the landscape. In essence, they will become inseparable parts of urban agglomerations. In turn, agricultural and tourist villages will see their leading functions reinforced, with a simultaneous enhancement of the second-ranked function. For example, agricultural areas will see an enhancement of the roles of fully-commercial farms with specialized farm output, but these will at the same time supply additional functions reflecting the economic activity of their inhabitants (agricultural and food processing, gastronomy, agritourism, crafts, etc.).

The next 10–20 years will bring an increase in the numbers of inhabitants of rural areas, as a result of outflows of population from urban areas. This phenomenon will assume particular dynamism near cities, as well as along the main transport routes. After a certain time-delay there may also be an increase in numbers of people in the peripheral areas already proving attractive to those in search of peace, a clean environment and a natural landscape. However, the process will not work to improve the age structure in these areas much, since those moving in will above all be people of post-productive age adapting their “second homes” for year-round habitation. The development

of eastern peripheral areas will depend on the state of economic relations with neighbouring countries, as well as their own developmental dynamics.

The level of education of the rural population – including of farm owners – will increase. Marked civilizational progress will ensue. Both technical and social infrastructure will have to match up to new (greater) challenges, and there will also be a rise in social awareness among country-dwellers, and hence a weakening of the so-called “country-cousin complex”.

While large urban settlements will become cosmopolitan in nature, with more and more foreign-born inhabitants, the Polish countryside will remain traditional in character, a kind of treasure-house of Polish cultural attributes and traditions.

There will be a decline in the significance of the agricultural economy in terms of both its share of generated GDP and the income structure of individually-owned farms in rural areas. Nevertheless, there will be no marked change in the agricultural nature of Polish rural areas as regards land-use and the landscape. The greater part of the land will remain in agricultural use, though the area put to such uses will decline year after year, the land of lowest quality being designated for afforestation.

Rural areas will make greater use of non-conventional energy sources than will towns and cities. EU funds should play an important role in development here, being subject to a shift of emphasis from the direct support of agriculture to the development of rural areas as such.

The declining role of agriculture where the income structure of the rural population is concerned will be accompanied by on-farm diversification. The significance

of commercially-viable farms will grow, albeit in irrevocable linkage with the environmental problems that modern production methods by their very nature entail. Equally, there will be a decline in the significance of farms producing on small areas of land using traditional methods. Some of these will remain in existence, confining themselves to "self-sufficient" supply, though they will gradually be eliminated from the market. The remainder will take on a multifunctional character and become family firms engaged in agricultural output (organic farms, farms producing traditional Polish food products, etc.) or involved in agricultural services (agritourism, existence as ethnographic farms preserving the valuable natural features of rural areas, etc.).

There will be a marked increase in the significance of non-agricultural activity, that will become the main source of income of domestic farms in rural areas. Besides "para-agricultural" activity, the main role will be played by services. The new job opportunities will be concentrated in urban areas and in gmina centres.

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Agriculture in Poland

Roman Kulikowski

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: r.kulik@twarda.pan.pl

Introduction

The production of food is one of the oldest manifestations of human activity in nature. Agriculture is also an important branch of Poland's economy, in turn offering non-productive functions that are of significance. In line with the "biological" nature of agricultural output, a significant influence on the trends characteristic of it, the level it achieves and the spatial differentiation it manifests is exerted by natural factors. Equally, agriculture is in itself a major factor influencing the state of the environment and shaping the rural landscape.

In line with the development of science and technology, the role of natural conditions in farming ceased to be the dominant one, the level of development manifested being ever more dependent on conditions other than those related to nature in a straightforward way. In Poland, both of the aforementioned types of factors in fact find significant reflection in the levels of development and specialization, as well as in the spatial differentiation of farm management.

Natural conditions for agriculture

Among the natural factors, the ones influencing the development of agriculture most are climate, soil, water relations and relief. Poland is characterized by a warm temperate climate, shaped under the variable influence of masses of oceanic air from the west and continental air from the east. The transitional-type climate and associated variability to the influx of air masses ensure that weather conditions vary from year to year. Problems for at least some of the wide range of plants grown in Poland are posed by the frequent ground-frosts of late spring, the early onset of autumn and the insufficiency of precipitation (especially in the centre of the country, where the total may not exceed 500 mm per year). Indeed, it is not only the absence of rainfall that has a negative influence, but also the nature of the precipitation that falls, and its distribution through the year. While most precipitation occurs in summer, this ostensibly favourable feature is made less so by the fact that rain often falls during storms with intensive runoff, ensuring that

root systems cannot make full use of the water. Moreover, the intensity of the rainfall during storms threatens soils with surface runoff; the mountainous, foothill and hilly areas of the south being particularly susceptible to this kind of erosion, along with the lakelands of the north.

A very important issue for agriculture is of course the length of the growing season. In Poland, the average number of days a year with a mean daily temperature above 5°C varies from 190 in the mountains and in the north-east, to 220–230 days in the west and south-west (Stola and Szczęśny, 2004). Such a growing season – when combined as it is with rather warm conditions – is suitable for most crops of the temperate zone, though some limits are imposed in the aforementioned north-east and Carpathians. Thus, for example, wheat and sugar beet can hardly be grown in the latter areas. Nevertheless, overall, the agroclimatic conditions in Poland are quite favourable, if varied spatially.

Soils are also obviously very important to agriculture. Those existing in Poland were in large measure developed on post-glacial sediments (sands, gravels and – more rarely – boulder-clays). Almost 2/3 of the country has zonal soils, with half of these in the moderately fertile brown earths category (brown and dusty soils), and around 25% the low-fertility podzolic earths soils. The intrazonal soils in turn cover around 25% of the country, these mainly being hydromorphic and half-bog soils – especially in northern Poland, as well as the alluvial soils present in the areas of the Vistula and Odra deltas, as well as along river valleys. The half-bog soils also include the

very fertile chernozems occurring in different parts of the country but on limited areas (c. 1% of all soils). The intrazonal category extends to the rendzinas arising on the calcareous substrata of the southern Polish uplands (just 0.9% of the country's soil in total).

The azonal soils include the fertile chernozems present in isolated pockets on the loess cover of southern Poland (and accounting for 1% of the total area), as well as the initial, rocky and skeletal soils occurring in mountainous areas.

The share of all soils included within the highest quality classes is small (Table 1), while the spatial variability to the quality of productive agricultural space is great (Fig. 1).

Table 1. Quality of soils

Class	Soil	Percentage of total soils
I	the best	0.4
II	very good	2.9
III	good	22.3
IV	average	39.8
V	poor	22.7
VI	very poor	11.9

Source: *Agricultural and Food Economy 1986–1990, 1992*, Central Statistical Office, Warsaw.

Most of Poland is plain or gently undulating land, so that the relief does not in general hinder cultivation. Only in the mountains and uplands of the south, as well as on some of the morainic elevations, does the relief favour soil erosion and demand especially-careful means of cultivating the land.

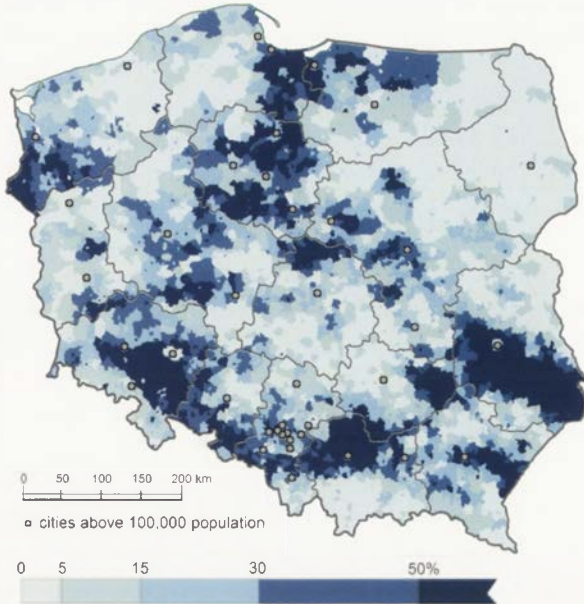


Figure 1. Percentage share of agricultural land with the highest quality index of land for agriculture (above 1.0)
Source of figures 1–16: *Agricultural Census, 2002*, Central Statistical Office.

The role of agriculture in the national economy

Throughout the post-War period, agriculture has been a very important branch of Poland's national economy. However, the proportion of the national income it accounts for has been in steady decline – falling from around 50% in the first post-War years to 12% in 1990 and just 2.9% of GDP in 2004. Furthermore, while agriculture was the main source of income for more than $\frac{2}{3}$ of the rural population immediately after the War, the figure today is around 21% (Wrzochalska, 2005). According to the Agricultural Census of 2002, the branch employed 2,091,000 people then (16.3% of all those in work), of which 23.1% confined their labour to their own farm. The rest were also obtain-

ing income from other sources. Almost 7% of gross fixed assets are located in the sector, though it only accounts for 2% of the overall level of expenditure in the national economy as a whole.

Poland has a very large potential where agricultural land is concerned. As more than half of the country is accounted for by farmland, from the point of view of overall area only France and Spain have more, accounting for more than 10% of the EU total. From the point of view of the share of the country's land area assigned to agriculture, Poland takes 8th place after Denmark, Greece, Spain, Ireland, Hungary and the UK (Bański, 2006).

A low level of pollution of the natural environment over most of the country, and especially its central and northern parts (Photo 2), represents a major attribute of Polish agriculture, and one which makes possible both the

Natural and human environment of Poland

production of “clean” food and an enhancement of the valuable features of rural areas overall.

A rather unique feature of post-War Polish agriculture was that, notwithstanding the communist regime in place, the greater part of farmland remained in private hands. Nevertheless, the policy of the (sometimes enforced) nationalization of agriculture, as pursued in the early 50s in particular, resulted in a marked rise in the share of all agricultural land included within either the State Farms or the production cooperatives. The process would also block progress in peasant agriculture for many subsequent years.

The transformation of the 1990s was characterized by two periods of deteriorating macroeconomic conditions where agriculture was concerned. The first years saw an end put to the state and cooperative sectors in Polish agriculture, as well as a serious limitation of eastern markets for its output. The second period – 1996–2000 – brought a marked worsening of the relationship between the prices charged for articles farmers needed to buy and those paid when their output was pur-

chased (Zegar, 2001). Such changes meant a decline in farmers’ incomes to just 40% on average of what those employed outside agriculture could expect (Orłowski, 2001).

The macroeconomic background impinging upon agriculture changed considerably with Poland’s accession to the EU in May 2004. Within a very short time (of just a few months) of Poland becoming an EU Member State, exports of agricultural and food products from Poland to Western Europe had increased by around 30%. The trend was maintained in subsequent months. Furthermore, some 1.4 million farmers began to receive direct payments under the Guarantee section of the Community’s EAGGF (*Polska Wieś...*, 2004).

Around 31% of all those employed in Poland are involved with the food sector. The fact that, of those employed in that sector, as many as 88% are in agriculture, attests to the relatively unprocessed nature of the products comprising Poland’s food economy, and hence to major differences with the corresponding sector in Western European countries. Within the food econ-



Photo 1. Rural farmyard in Warmińsko-Mazurskie voivodship

omy in Poland, agriculture accounts for 35% of total output, and for 27.7% of all investment outlays (*Polska Wieś...*, 2002).



Photo 2. Pomeranian agricultural landscape

Agrarian structure

The last 10–20 years have brought marked changes in the ownership structure in agriculture. There was almost complete liquidation of the State Farms, ensuring that the private sector extended its dominance over agriculture still more than had been

the case before. The share of all agricultural land that was on individually-owned farms rose from 71.7% in 1992 to 78.4% in 2004 (Photo 1). The Treasury was administering 16% of all agricultural land at that point, while the remaining 5.6% was in the hands of cooperatives, commercial-law companies or other business entities in possession of farmland.

Where actual use of the land was concerned, the private sector came to show yet-greater dominance over agriculture. Farms within that sector were utilizing some 94.5% of the total farmland area, leaving public-sector farms with just 5.5%. In fact, any slightly more significant influence of the public sector is largely confined to the north and west of the country, in association with the taking on by the Treasury of land within the former State Farms or under the State Land Fund¹.

However, the characteristic features of the individually-owned farms that prevail in Poland are small size and a high degree of fragmentation. Almost 60% of all such farms cover less than 5 ha (Table 2). These farms

Table 2. Agrarian structure. Number and area of individual farms according to the size groups, 2002

Size groups of farms in hectares	Farms		Arable land	
	number in thousand	%	area in thousand hectares	%
TOTAL	1 951.7	100.0	14 421.4	100.0
1–2	516.8	26.5	747.2	5.2
2–5	629.5	32.2	2 039.0	14.1
5–10	426.5	21.8	3 011.2	20.9
10–15	182.5	9.4	2 201.5	15.3
15–20	83.8	4.3	1 431.4	9.9
20–50	95.5	4.9	2 699.6	18.7
> 50	17.1	0.9	2 291.5	15.9

Source: *Agricultural Census, 2002*.

¹ The Treasury Agricultural Property Agency brought c. 4 million ha of agricultural land under its management.

are present everywhere, but are above all located in the south-east (Fig. 2). They nevertheless account for less than 20% of all farmland. In turn, the mere 10% of farms that cover more than 15 ha account for as much as 44.5% of the country's agricultural land, and are particularly widespread in the north (Fig. 3).

As has been noted, small overall size is not the only problem faced by Poland's farms. As much as 15% of the total area of agricultural land is included within farms owning ten or more separate and scattered plots, at times located rather far from the farmhouse. One positive side to this situation is the degree to which the Polish farming landscape remains a diverse mosaic of different land-uses. The small farms and their fields are cut across and interrupted by clumps of trees and grassy verges (Photo 3). There are many boundary strips serving as refuges for animals, including the arthropods and microorganisms beneficial to the environment in general and agriculture in particular.



Photo 3. Agricultural landscape from Matopolska vivodship

Employment in agriculture

As of 2004, agriculture was giving work to 2,094,200 people, or 16.4% of the entire Polish population. Moreover, the share varied greatly from region to region, being below 5% in the west, above 20% in the south-east.

Also as of 2004, the average figure for numbers of people working in agriculture per 100 ha of farmland was a rather high

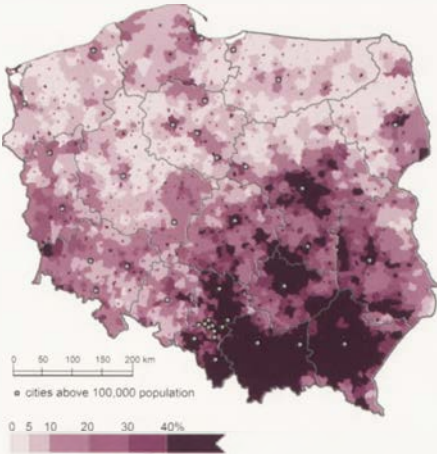


Figure 2. Percentage share of farms with the size of 1–5 hectares in the total agricultural area. Individual agriculture, 2002.

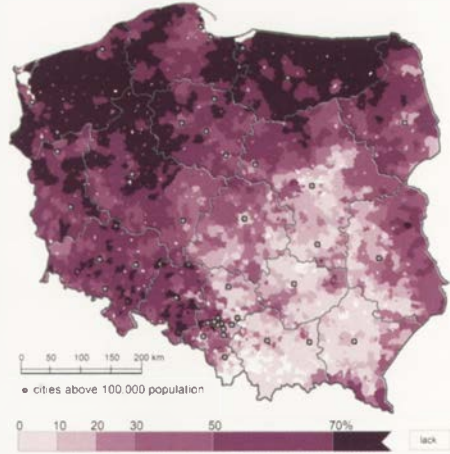


Figure 3. Percentage share of farms with the size of above 15 hectares in the total agricultural area. Individual agriculture, 2002

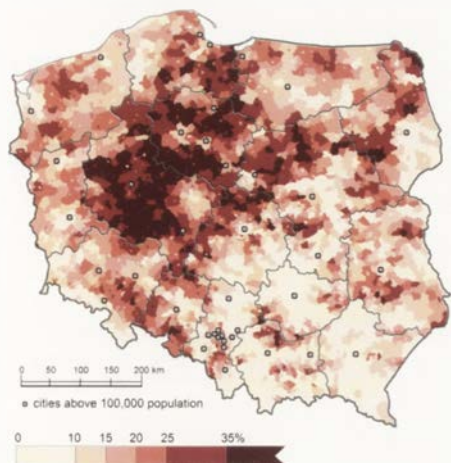


Figure 4. Percentage share of farm leaders with above primary education in the total number of farm leaders.
Individual agriculture, 2002

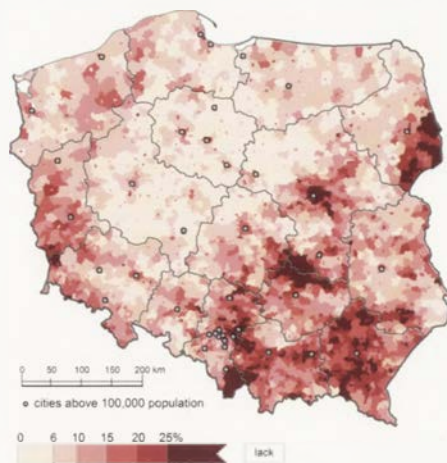


Figure 5. Percentage share of farm owners above 65 years in the total number of farm owners, 2002

12.8, with this national average masking regional variation of between 5 per 100 ha in some western and northern parts, and 25–30 down in the south-east.

Alongside these data for the numbers working in Polish agriculture (which some agricultural economists like Woś (2001) see as excessive), are telling figures pointing to the quality of that workforce. The 2002 Agricultural Census revealed that around half of all people running farms had no agricultural qualifications whatsoever. In turn, tertiary education of relevance to agriculture was possessed by just 1.2% of farm-managers, cf. 6.5 and 12.1% respectively with relevant secondary or vocational qualifications. Likewise, spatial differentiation of the aforementioned kinds also emerged in regard to the percentage of farm-managers who had taken their agricultural education beyond the primary level, the two ends of the spectrum being characteristic of Wielkopolska and the Kujawy region on the one hand, and Małopolska and the eastern borderland on the other (Fig. 4).

A further feature tending to detract from any positive assessment of the human resources in Polish agriculture is the sheer age of many farm-owners, in some regions of the country in particular. The post-War period as a whole has seen some 11 million-plus people move out of rural areas into the towns and cities. Since these have mainly been people of productive age, the out-migration has contributed to an ageing of the farming population, and the rural population in general. Once again, it is in south-eastern Poland (as well as some central parts) that the greatest proportions of farms being run or otherwise utilized by the over-65s are to be found (Fig. 5). A more favourable situation from the point of view of age structure applies where the level of agricultural technique is higher, and there is also only a small share of farmers of retirement age in the areas south of Warsaw specializing in orchard fruit-growing. Here at least, the incomes capable of being earned in agriculture are attractive enough to keep young people on the land.

The mechanization of agriculture

For a number of years after Second World War, the main source of traction available in Polish agriculture remained the horse. Now, however, in terms of notional units of pulling power available, 97.3% is mechanical, cf. less than 3% due to draft animals. As of 2004, there were 1,365,400 tractors in Polish agriculture, with an average output of 38 kW.

The numbers of tractors on particular farms tends to rise with average farm area such that, while those of 10 ha or less would have a single tractor, those covering 20–50 ha would have 2 each and those over 50 ha some 4 tractors or more.

A serious problem in the circumstances of the still highly-fragmented farms present in Poland is not so much that the number of tractors per unit area of farmland is low, as that there is a shortage on the land of the kind of low-horsepower machines best suited to work on the small plots and parcels actually being cultivated. Furthermore, a great many of the tractors that are still at work represent dated technology, having usually been produced some 15 or more years ago. Unfortunately, the current prices of new farm tractors are so high as to be well beyond the reach of most small farmers in Poland.

The use of mineral fertilisers and chemical plant protection agents

As fertilisers came to be sold at real market prices in the early 90s, there was an inevitable decline in their level of use – from an average of 164 kg NPK per ha of agricultural land in 1989/1990 to 80 kg in

the mid 1990s. Usage rose slightly thereafter to reach 99 kg per ha of farmland in 2003/2004. Nitrogenous fertilisers were the most important kind applied, accounting for almost 60% of the total amounts used. However, not all farms use mineral fertilisers – indeed there are many gminas in the regions of the Carpathians, Cracow-Częstochowa Jura, Sudetes, Lubuskie voivodship and Pomerania in which less than half of all farms apply them at all (Fig. 6).

As of 2004, the supply of pesticides expressed in terms of kg of active substance exceeded 0.4 kg per ha of farmland on average. However, a large proportion of the individually-owned farms were not then using any kind of plant protection agents at all, on account of the high prices being charged for them. The greatest proportions of farms applying them coincide with the areas in which agriculture is best-developed, i.e. Wielkopolska, Kujawy, the Chetmno-Dobrzyń area, the Silesian Lowland and upland areas of southern Poland.

Agricultural land-use

More than half of Poland is in agricultural use, while nearly 30% is under forest (Fig. 7). The last 10–20 years have brought major changes in the land-use structure pertaining in agriculture (Table 3). First and foremost, there has been a marked decline in the overall area of land used agriculturally, along with a simultaneous extensification manifested in a large decrease in the area of arable land and attendant rise in the area not sown with crops year

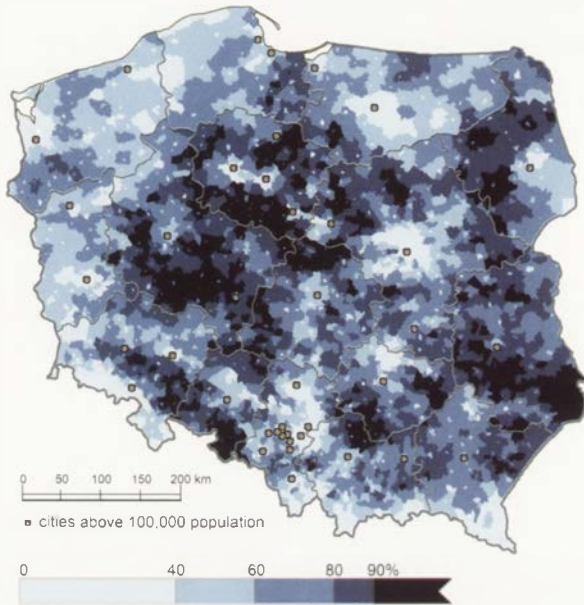


Figure 6. Percentage of farms use mineral manures in the total number of farms.
Individual agriculture, 2002

after year. The areas left fallow increased from 163,000 ha in 1990 to no less than 2,300,000 ha in 2002 (or 17.6% of all Poland's arable land). The subsequent two years brought the launching of EU direct payments, and with them a tendency for farmers to once more limit exclusion of land from cultivation. The effect was a decline in the area left fallow back to some 1.4 million ha.

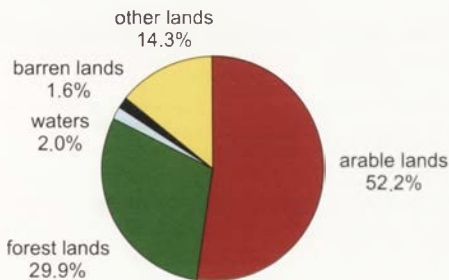


Figure 7. Land use structure, 2005

The decline in the area of farmland was largely a product of ongoing urbanization and extension of the settlement network, as well as the designation of some poorer-quality farmland for afforestation. Alongside the aforementioned marked increase in the area of cropland sown with cereals, there were also major changes in the shape of a very large fall in potato cultivation (in both absolute and relative terms); (Table 4) – this linking up to a significant extent with the end being put to pig-breeding on small farms. A further – definitely unfavourable – recent change as regards crop structure has involved the very major decline in the area under fodder crops. This is connected with the reduced profitability of cattle-rearing, as well as the clear withdrawal from the keeping of this kind of stock on small farms.

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Table 3. Structure of agricultural land use, 1990–2004

Agriculture land	1990		2000		2004	
	thousand ha	%	thousand ha	%	thousand ha	%
TOTAL	18 539	100.0	17 812	100.0	16 327	100.0
Arable land	14 311	77.2	13 683	76.8	12 685	77.7
Orchards	269	1.4	257	1.4	277	1.7
Permanent grass land	3 959	21.4	3 872	21.7	3 365	20.6
Meadows	2 427	13.1	2 503	14.0	2 390	14.6
Pastures	1 533	8.3	1 369	7.7	975	6.0

Source: Central Statistical Office.

Table 4. Structure of cropland, 1990–2004

Cropland	1990		2000		2004	
	thousand ha	%	thousand ha	%	thousand ha	%
TOTAL	14 242	100.0	12 408	100.0	11 285	100.0
Grains	8 531	59.9	8 814	71.0	8 377	74.2
Wheat	2 281	16.0	2 635	21.3	2 311	20.5
Rye	2 314	16.2	2 130	17.2	1 549	13.7
Triticale	562	3.9	695	5.6	1 058	9.4
Barley	1 174	8.2	1 096	8.8	1 014	9.0
Oats	747	5.2	566	4.6	520	4.6
Grain mixtures	1 169	8.2	1 478	11.9	1 461	13.0
Corn for seed	59	0.4	152	1.2	412	3.7
Potatoes	1 835	12.9	1 251	10.1	713	6.3
Industrial crops	999	7.0	788	6.3	887	7.9
Sugar beets	440	3.1	333	2.7	297	2.6
Rape seed	500	3.5	437	3.5	538	4.8
Fodder crops	2 342	16.4	913	7.4	738	6.5
Corn for silage	324	2.3	163	1.3	290	2.6
Other crops	535	3.8	642	5.2	570	5.0
in it: field vegetables	255	1.8	248	2.0	208	1.8

Source: Central Statistical Office.

After arable land, it is meadows that represent the second most important category of agricultural land-use. The area they occupy has not declined greatly over the last ten or so years, and their distribution remains closely linked with that of river

valleys on the one hand, and mountains on the other (Fig. 8). In contrast, the area of pasture contracted considerably during the period (Table 3). The greatest shares of pastureland (accounting for 40–50% of land in agricultural use) characterise

gminas of the north-east (particularly in the Biebrza and Narew Valleys), as well as some in the Carpathian and Sudety Mountains.

The area under orchards has not changed much since 1990. The distribution is markedly clumped, however (Fig. 9). The most important fruit-growing region in terms of output is that to the south of Warsaw, extending between Piaseczno, Warka and Grójec. This accounts for little more than 1% of the country's farmland, yet supplies more than $\frac{1}{3}$ of its fruit. A second orchard region, albeit producing much less, is centred on the Vistula Valley near Sandomierz, while a third area important for fruit-growing is in the Carpathian Foothills region around Stary Sącz and Nowy Sącz.

A characteristic feature of the large commercial orchards is the tendency for these to be dominated overwhelmingly by apple trees (Photo 4). Poland is the world's number-three producer of apples, accounting for about $\frac{1}{5}$ of total produc-

tion in an EU of 25 Member States. Furthermore, many of the orchards in the aforementioned regions are managed in a very modern way. Changes ongoing there in recent years have entailed the introduction of new, shorter-growing varieties of fruit tree, which are grown at higher densities than before. There has also been a certain tendency for fruit-growing to be linked with other types of production (e.g. of flowers or mushrooms).

A noteworthy trend observable post-1990 in relation to arable land was the marked fall in the area sown with crops (Table 4). Where the breakdown of species planted was concerned, the main changes entailed a large increase in the share being taken by cereals (if with a small decline in the absolute area they occupied), as well as very marked absolute and relative declines for potato and fodder-crop cultivation. Favourable changes involving the planting of cereals are the increase in the share of crops of greater value in the feeding of livestock (like wheat and triticale) at

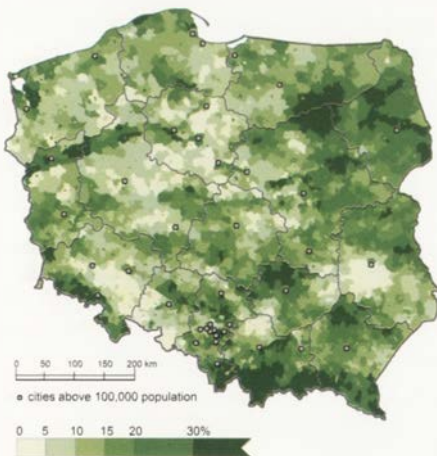


Figure 8. Meadows as a percentage of the total agricultural area. Total agriculture, 2002

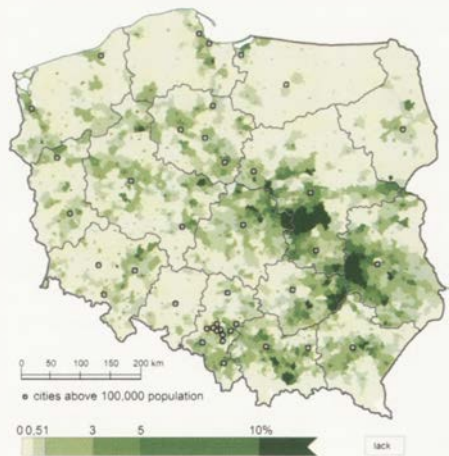


Figure 9. Orchards as a percentage of the total agricultural land. Total agriculture, 2002

the expense of rye and oats – in both relative and absolute terms.

Following a long period in which rye was dominant, the years from the early 1990s saw wheat become the most important cereal crop grown in Poland. Very much in line with the species' exacting requirements where soils are concerned is a distribution of wheat-growing linked to the presence of high-quality productive agricultural space (Figs. 1 and 10). Only to a lesser extent is growing of this species associated with the areas in which agricultural technique has assumed a higher level of sophistication.



Photo 4. Commercial apple orchard

In second place among the cereals in terms of the area planted is rye, whose soil and climatic requirements are less exacting than those of wheat. The species is resistant to low temperatures and its grains show greater disease resistance. Downsides are the lower value as animal feed and lesser yields than with wheat. As of 2004, Poland was the world's number-one producer of this cereal, which is mainly cultivated in the central part of the country and in eastern Mazowsze.

The next positions among the cereals in terms of areas planted are taken by cereal hybrids, triticale, barley and oats. The greatest share of sown land under hybrid forms is the 28.6% noted in Podlasie voivodship – in connection with this part of the country being more intensively specialized in dairying than any other (Kulikowski, 2005).

Large amounts of triticale are grown in Wielkopolska, Kujawy and Mazowsze. The area under this crop have grown greatly in recent years, frequently at the expense of rye and oats.

The main areas of cultivation of barley in Poland are in turn Kujawy and some upland areas of southern Poland, in which some of the output is put to industrial use (in the production of brewers' malt); as well as Podkarpackie, in which the main uses are in human consumption and as animal feed.

Among the remaining cereal crops, a rather greater proportion of the total area sown is now taken by maize, though the species has requirements as regards soil and thermal conditions that are too exacting to make Poland a really suitable place for its cultivation.

There has also been a marked curtailment of the habit of growing buckwheat and millet. While these were grown on around 170,000 ha in the 1950s, the corresponding figure today is c. 36,000 ha in total.

The root crops grown over the largest areas of Poland are potatoes. They are part of the staple daily diet of Poles, as well as being a primary component of the fodder given to livestock, especially pigs. Nevertheless, the area growing potatoes is only one quarter as great as in 1960, though Poland remains one of the world's

leading producers of the crop – taking fourth place in terms of the amounts harvested. As recently as in 1990, the proportion of all cropland that was under potatoes was twice as great as it is today (Table 4). The spatial configuration associated with the cultivation of potatoes has also changed. The areas formerly showing a very marked prevalence of potato-growing in the east-central part of Poland and in central Pomerania have now disappeared, their place taken by a new heartland for cultivation of the species in the south-east. The large share of cropland taken by potatoes in the latter region is connected with the aforementioned fragmentation of farms there, as well as with the importance of growing to meet own needs. This is also an area with a high rural population density as compared with other parts of the Polish countryside.

Among the industrial crops, sugar beet and rape play very important roles in Poland. As in the case of wheat, the cultivation of sugar beet (Fig. 11) is con-

centrated in areas of the highest-quality productive agricultural space, as well as in the vicinity of sugar beet factories. The last 15 years have seen a gradual confining of the area under sugar beet, though harvests have grown nonetheless.

The cultivation of rape took in about 500,000 ha (5.0%) in 2004. Areas with greater shares (10%+) of sown land devoted to this crop are present in western and northern Poland, where they coincide with the distributions of the former State Farms assigning considerable significance to rape-growing.

Among remaining industrial crops, tobacco was being grown over just some 10,300 ha in 2002 (Photo 5). However, almost 40% of the entire area under it is concentrated in the upland part of the Lublin region, while remaining centres of tobacco-growing are located to the north-east of Cracow, as well as in several gminas in parts of the north-east within the Lower Vistula Valley.

Quite widespread in the 1960s, the growing of fibre crops (flax and hemp)

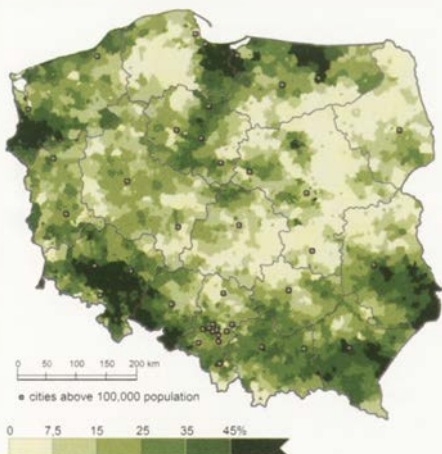


Figure 10. Wheat as a percentage of cropland. Individual agriculture, 2002

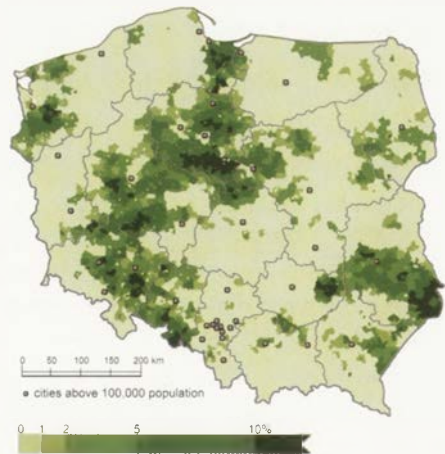


Figure 11. Sugar beets as a percentage of cropland. Individual agriculture, 2002

is now confined to some 5000 ha only, $\frac{3}{4}$ of this in the southern part of Lublin voivodship.

Fruit and vegetables are playing an ever-more important part in the Polish diet. As of 2004, the field cultivation of vegetables was taking place on some 1.8% of all cropland. Nevertheless, the activity is seen to be concentrated in the zones around the large agglomerations, most especially Warsaw and Cracow. There are thus a few gminas in which vegetables are grown in between 30 and 60% of the land given over to arable farming. A further striking feature of the distribution of vegetable-growing nationally (Fig. 12) is the degree to which it is concentrated in the Vistula Valley, and thus on the fertile alluvial soils located there.



Photo 5. Tobacco plantation

The field cultivation of vegetables is supplemented by growing under cover. As of 2002, just 6300 ha of Poland was devoted to this kind of cultivation. Nevertheless, the crops in question are of importance, since they supply consumers with much-needed vitamins and microelements in the winter and early-spring periods. The average figure for the cultivation of vegetables under cover

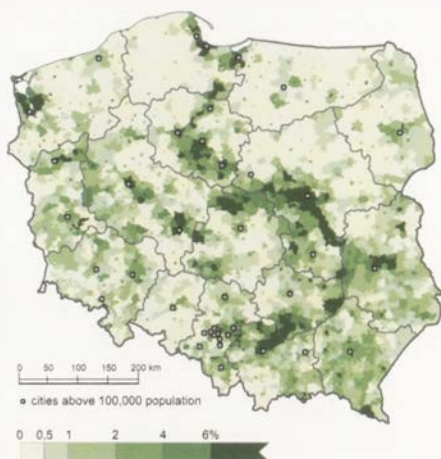


Figure 12. Field vegetables as a percentage of cropland. Individual agriculture, 2002

in Poland is of a little over 400 m² per 100 ha of agricultural land. However, the indicator assumes its highest levels in areas devoted to the specialized growing of peppers, these being located in southern Mazowsze. In some gminas there, the figure rises to between 18,000 and 34,000 m² of under-cover cultivation per 100 ha of farmland. Very high values (of 23,000 m²) also characterise the gmina of Dwikozy, in which large food-processing plants are located.

In 2004, fodder crops accounted for 7% of the total area sown. The dominant species within the group are legumes, alongside relatively large shares of fodder roots. The area under pasture crops has declined to just one-third of its original level in the last 15 or so years (Table 4). Noting the important role these species play in rotations and in the enrichment of the soil with nitrogen from the air, this phenomenon can only be considered an unfavourable one.

Livestock raising

According to data in the 2002 Agricultural Census, not quite half of all agricultural land is now devoted to activity connected with livestock production. In 2004, the division of livestock-raising accounted for 47.2% of global output, and for 61% of the output from commercial agricultural production. In structural terms, livestock-raising is dominated by the two branches of cattle- and pig-rearing, albeit with poultry-rearing for meat and eggs also playing a major role.

The last quarter-century has brought a major fall in the number of head of livestock, especially cattle and sheep, in Poland (Table 5). Changes in the number of head of pigs over the last 10 or so years have followed trends different from those noted in the case of cattle, being dependent on the twin factors of trading conditions (prices of pork) and the so-called "pig cycle". There was also a decline in the number of head of large livestock per 100 ha of farmland – from 60.3 units in 1990 to 45 in 2004

(where 1 unit = 500 kg). Spatial differences in the intensity of involvement in livestock rearing – as depicted using the above index – are presented in Fig. 13.

Cattle

Cattle-rearing worldwide is devoted to the twin purposes of milk and meat production. In Poland, the former aim prevails, such that, as of 2004, it accounted for 18.5% of commercial output, cf. just 4.5% in the case of beef.

There has been a steady decline in the number of head of cattle in Poland since the mid 1970s, though the trend has assumed particular dynamism over the last quarter-century (Table 5). As of 2004, there were only 42% as many cattle as there had been in 1980. Such a large reduction in the national herd reflected a marked curtailment of cattle-rearing on small farms, as well as the aforesaid post-1990 closure of the State Farms. A further underlying factor was the declining profitability of the small herds capable of being maintained on small farms. The latter, under individual

Table 5. Number of farm animals

Years	Cattles			Pigs		Sheeps	
	thousand of heads	number of heads per 100 hectares of agricultural land	percentage of cattles in herd	thousand of heads	number of heads per 100 hectares of agricultural land	thousand of heads	number of heads per 100 hectares of agricultural land
1980	12 649	66.8	47.1	21 326	112.6	4 207	22.2
1985	11 055	58.7	50.0	17 614	93.5	4 837	25.7
1990	10 049	53.7	49.0	19 464	104.0	4 159	22.2
1995	7 306	39.2	49.0	20 418	109.6	713	3.8
2000	6 083	34.2	50.9	17 122	96.1	362	2.0
2002	5 533	32.7	51.9	18 629	110.2	345	2.0
2004	5 353	33.0	50.5	16 988	104.0	318	1.9

Source: *Agricultural Census, 2002*, Central Statistical Office.

ownership, have had such limited possibilities to invest in their holdings that the challenge of keeping milk in conditions that match modern hygiene standards has proved in essence insuperable, ensuring that those who sought to hold on to their dairy cattle were in any case unlikely to find a market for their produce at dairies.

Nevertheless, cattle remained still present on 48% of Polish farms covering more than 1 ha, though there were just 1–2 animals on almost half of such farms. The herds numbering 20 or more beasts in turn accounted for more than $\frac{1}{3}$ of the total number of cattle in the country.

The very steep decline in the number of head of cattle nationally between 1980 and 2004 was also associated with a halving of numbers of cattle per 100 ha of farmland (Table 5).

According to data from the 2002 Agricultural Census, individually-owned farms supported 93% of the national herd of cattle, though the small farms of up to 5 ha (while constituting as many as 58.7% of all farms) had only 12.5% of Poland's cattle. The distribution of cattle in the sector is illustrated in Fig. 14, the greatest numbers of animals per unit area of agricultural land on individually-owned farms being recorded in Wielkopolska, northern Mazowsze, parts of the foothill areas and Podlasie. A region of the particularly intensive raising of cattle in Poland, which has only taken shape in the last 10 or so years, is the western part of Podlaskie voivodship. Dynamic development of the activity has here been shaped by the development of dairying, in part under the influence of injections of foreign capital. A national average of 33 head of cattle per 100 ha of farmland in 2002 compared with some 60 throughout Podla-

sie, and with as many as 90 in the western part of that region. Certain individual gminas there even had as many as 120 head of cattle per 100 ha of agricultural land.

The fact that cattle-rearing is largely directed at dairying is made clear by the large share cows take in the national herd of all cattle. From 2000 onwards, the figure has tended to exceed 50%. While a fall in the number of cows (from 3.5 million in 1990 to 2.8 million in 2004) went hand in hand with the decline in numbers of all kinds of cattle, there was a simultaneous marked increase in average yields of milk per cow (from c. 3000 litres a year in the period 1991–1995 to 4100 in 2004).

There are considerable differences in numbers of cows per 100 ha of agricultural land from region to region, ranging from less than 5 over large areas of the Pomeranian Lakeland, Lubuskie region, Silesian Lowland and Warsaw hinterland, up to around 70 head in some parts of Podlasie.

Pigs

A second very important branch of livestock production in Poland involves pigs (Fig. 15). Pig-rearing was engaged in by 39% of farms in 2002, albeit with more than half having small herds of between 1 and 9 animals. As of 2004, pork accounted for 21.4% of commercial agricultural output, this representing a dominant 59% share in the country's overall production of meat that year. The size of the national herd of pigs has fluctuated markedly (Table 5). As with cattle, so also in the case of pigs, the last 10 or so years have brought the biggest withdrawal from rearing activity on the small farms, while there has been a considerable development of the keep-

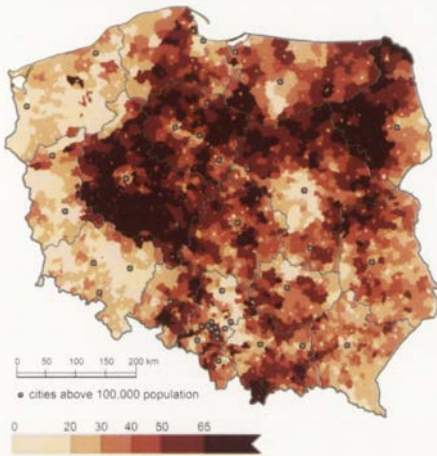


Figure 13. Number of conventional (large) animal units per 100 hectares of agricultural land. Individual agriculture, 2002

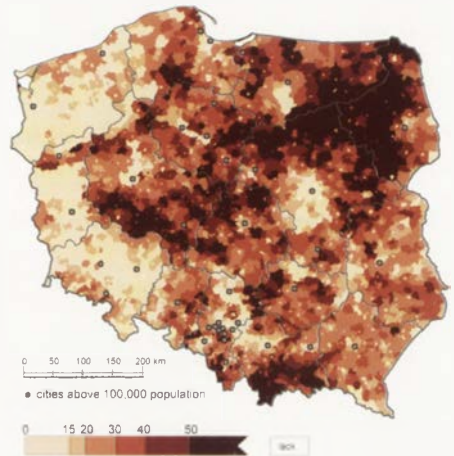


Figure 14. Cattle. Number of heads per 100 hectares of agricultural land. Individual agriculture, 2002

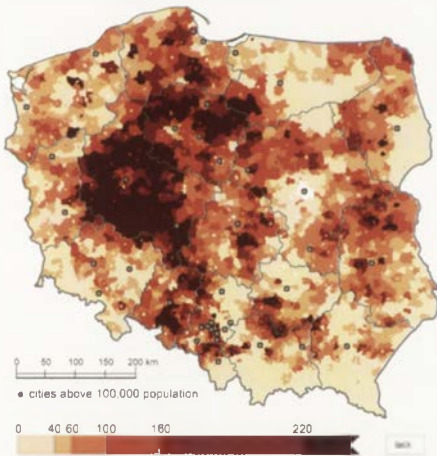


Figure 15. Pigs. Number of heads per 100 hectares of agricultural lands. Individual agriculture, 2002

ing of pigs in large herds on large farms (if not one large enough to compensate for the decline in numbers on small farms). The individually-owned farms of average area in excess of 15 ha – which represent 43% of the total – account for 53.2% of the national herd of these livestock.

The last 25 years have also brought considerable variations in numbers of pigs calculated per unit area of agricultural land, *inter alia* in connection with the overall decline in the area of agricultural land nationally. Furthermore, the differences in numbers of pigs from region to region were very great as of 2002 (Fig. 15). The numbers expressed per 100 ha of farmland varied from 1–2 in suburban areas around Warsaw specializing in market gardening, via 15–20 in foothill areas of the Carpathians and Sudetes, up to in excess of 230 in Wielkopolska and the Kujawy region. Record stocking levels of between 800 and 1200 were in turn present in some of the gminas of Wielkopolska. The figures for numbers of pigs per unit area in this region are thus comparable with – or even greater than – those noted in some parts of Belgium and The Netherlands.

Other branches of livestock production

After cattle- and pig-raising, a very important branch of livestock production in Poland is that connected with poultry. The share this branch takes in overall commercial output of livestock increased from 13.3% in 1990 to 24.0% in 2004. In the latter year, poultry farming for meat accounted for 16.1% of commercial livestock breeding, cf. egg production at 7.9%. The recent rise in the significance of poultry over the last decade or so is connected, not only with the development of this branch, but also with the large aforesaid decline in the number of head of cattle and in the level of production of beef.

The major role where the production of poultry is concerned is assigned to hens (representing 80% of all birds kept). The activity is rather evenly distributed across Poland, with more than half of all farms having a flock of more than 50 hens. An important role in poultry production is also being played by the large-scale battery farms located in several different parts of the country. As many as 81% of poultry hens are kept along with more than 10,000 others. In turn, only a very small number of hens per unit area are kept in the mountainous part of southern Poland.

The other species of domestic fowl playing a more significant role in production include turkeys, geese and ducks. Nevertheless, taken together, these only account for a few per cent of the total numbers of birds being raised in Poland.

Data from the Agricultural Census of 2002 show that there were more turkeys in Warmińsko-Mazurskie voivodship than anywhere else (38.5% of the national total). The voivodships of Wielkopolska and Lubuskie

took the next positions in the ranking. In turn, more ducks and geese are raised in the Wielkopolska region than anywhere else.

The economic characteristics and results of agricultural production

Of all the individually-owned farms in existence in Poland in 2002, only 30% declared agricultural activity as their main source of income. Not unnaturally, the likelihood of farming being such a mainstay increases with average size of holding, such that more than 90% of farms over 20 ha constituted their owners' main source of upkeep. According to Zegar (2001), farmers' incomes declined by some 15–17% between 1990 and 1999, while the incomes of all employees showed a 14% increase over the same period. The two subsequent years saw farmers fare even less well in terms of income, and the effect was a resignation from agricultural production on the part of many farms. In fact, Central Statistical Office data for the years 1996–2002 reveal a c. 12% decline in the number of individually-owned farms actually engaging in agricultural activity. The many reasons for this include the aforementioned decline in income, as well as severe disproportions between the inflation characterizing the articles farmers had to buy in order to farm and the (limited) change in the prices they could expect for their produce. Furthermore, the period of systemic change of the 1990s also generated difficulties with the export of Polish food products to Eastern Europe, while domestic consumption fell, ensuring problems on the domestic market.

According to the 2002 Agricultural Census, the total output of Polish agriculture that year was worth 55.7 billion zlotys, or some 9% less than in 1990. The degree to which output was commercially viable, i.e. the share of total production that was of a commercial nature, actually declined from 62.5% in 1990 to 50.1% in 1995, albeit with a subsequent rise back to 64.5% in 2004. This marked decline in commercial agriculture reflected the crisis accompanying the onset of economic restructuring, as well as the closure of the State Farms, whose indices were generally much higher than on individually-owned farms.

Of the 1,951,000 individually-owned farms existing in 2002, around $\frac{2}{3}$ were supplying the market with their output. However, just 6% of farms could be classed as highly-

commercial, in that the total value of what they were able to sell exceeded 50,000 zlotys in the year. Only 2.8% of farms had income of this kind in excess of 100,000 zlotys (i.e. 33,000 US dollars). The main concentrations of such commercially-viable farms (earning 50,000 zlotys or more) were in Wielkopolska, Kujawy, Żuławy and certain gminas in Podlasie (Fig. 16). The lowest levels of commercial viability in turn characterized the small farms of the south-east.

At the same time, around 10.6% of all farms (particularly in the aforementioned south-eastern region) were producing solely to meet their own needs, with no surplus capable of being sold on the market.

The changes in the structure to agricultural production occurring over the last 10 years or so have above all entailed a small increase in the role of crop

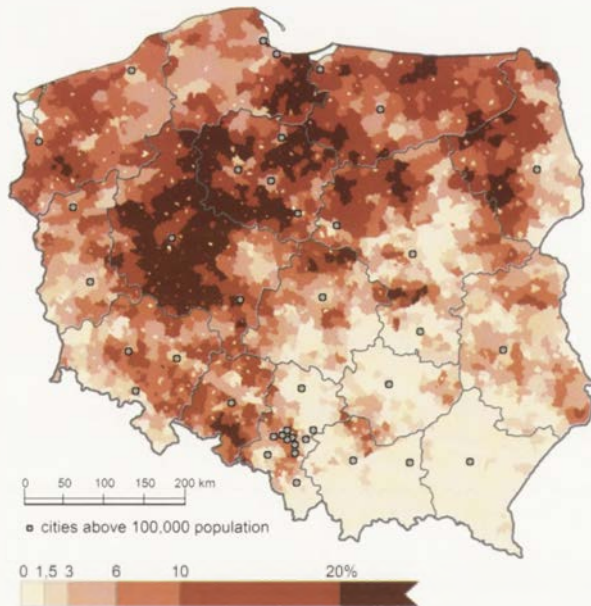


Figure 16. Percentage share of individual farms with the value of commercial agricultural production above 50,000 zlotys in the total number of individual farms, 2002

production, as well as changes concerning commercially-viable livestock rearing. The latter change has mainly involved shifts away from the raising of beef cattle (from 15.5% in 1990 to 6.2% in 2002) and pigs, as well as marked increases in the role of dairying and poultry production. The factors underpinning these changes include a large fall in the number of head of cattle kept (as very much associated with the closure of the State Farms), as well as – in part at least – a declining consumer interest in beef sparked by the presence of BSE among cattle in certain Western European countries.

Where the structure of commercial crop-growing is concerned, it has been possible to note small increases in the shares taken by the cultivation of cereals (mainly wheat) and the growing of fruit. The shares accounted for by industrial crops (especially sugar beet) have in turn declined.

Summary

In the context of a European Community agricultural policy that aims to support biodiversity in agriculture and more environmentally-friendly rural areas, the agriculture currently being pursued in Poland would need to be assessed very positively. The differentiation to ways in which agricultural land is used combines with farms of various sizes separated by belts of "natural" vegetation to ensure that agriculture in Poland has many valuable features improving the environment in rural areas and exerting a very positive influence on the attractiveness of the countryside. The agricultural land in Poland in general (and

in its central and northern parts in particular) displays a low level of environmental contamination, ensuring that the food it produces may be regarded as "pure". This feature has already underpinned a considerable post-accession increase in the value of exports of Polish food products to Western Europe.

Nevertheless, the systemic changes ushered in in 1989 markedly worsened the macroeconomic climate in which Polish agriculture operated, with things only improving somewhat at the end of the 1990s. In the meantime, agricultural output had declined, most especially in relation to livestock farming. A further contributory factor here was the closure of the entire system of State Farms, which had previously been major holders of livestock, especially cattle. Only in the years since 2000 has there been a slow rebuilding of output to the levels preceding the period of restructuring. Where commercial production was concerned, the previous level was even exceeded from 2002 onwards.

The cessation of state-sponsored agriculture in the early 1990s also engendered change in the structure of ownership in farming, itself a cause of knock-on changes in the way land was put to use. These first and foremost entailed an increase in the share of all land in private ownership, as well as a rise in the proportion of all farmland that was being leased.

In the period of restructuring of the 1990s, there was a rather universal withdrawal from agricultural production by the small farms, as well as a simultaneous very marked increase in the area over which cultivation had been abandoned at least temporarily (from 1.1% of arable land in 1990 to 17.6% in 2002.). Howev-

er, following Poland's accession to the EU and the consequent introduction of direct payments to agriculture, this process of leaving land fallow became rather more confined. As of 2004, fallows accounted for 12.2% of arable land.

Comparisons of the levels of output per unit area of land or labour (as made by Kulikowski, 2004) reveal that Poland is still far behind the 15 Member States of the pre-enlargement EU in terms of the efficiency with which its farmers produce food.

Nevertheless, the first year or so after accession to the EU have already been marked by a considerable growth of interest in Polish agricultural and food products among consumers in Western Europe. Any sustaining of this interest may, if combined with structural funding for the development of rural areas and direct payments to farmers, have a positive influence in raising the level of Polish agriculture in the future and bringing about positive change in general.

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Manufacturing, mining and energy supply

Bolesław Domański

Institute of Geography and Spatial Management

JAGIELLONIAN UNIVERSITY

e-mail: b.domanski@geo.uj.edu.pl

The nineteenth-century industrialization of Polish territory was very uneven and led to a general contrast between more-industrialized western regions and less-industrialized eastern parts of the country. The major concentration of manufacturing and mining appeared in the south-western regions: Upper Silesia based on coal, steel and zinc production, and the Sudety Mts. in Lower Silesia based on textiles. Two main cities of western Poland, i.e. Wrocław (in Lower Silesia) and Poznań or today's Wielkopolska (Greater Poland) developed as important industrial centres with diversified structure, including strong machinery production. The region of Wielkopolskie was also characterized by significant manufacturing activity in numerous medium-sized and small towns. In central and eastern Poland, industry tended to concentrate in major cities and larger towns. The most important industrial district was that of Łódź (textiles). The 1930s brought investment in military-related production in several small and medium-sized industrial centres in what is now south-eastern Poland.

The economic policy of the communist government after Second World War put strong emphasis on industrialization, in particular the production of steel, armaments and heavy machinery, as well as the extraction of mineral resources. This resulted in the development of energy-intensive, technologically backward industries characterized by high employment, low productivity and widespread environmental neglect. The Soviet Union and other communist economies were the main trading partners; coal, copper and sulphur the primary export commodities. Both manufacturing and mining were dominated by large state-owned enterprises, while the private sector was negligible. Despite ideological proclamations, the spatial disparities existing previously were reproduced, albeit with a strengthened role for Upper Silesia supplying coal and steel; and a few new medium-sized industrial centres appearing on the basis of raw materials, e.g. in the Legnica-Lubin copper district in the south-west.

Industrial change post 1989

Fundamental changes began in 1989. There was a considerable (33%) decline in industrial output in the shock phase of the transformation in the years 1989–1991, followed by fast production growth. The value of industrial production in Poland increased 2.5-fold between 1991 and 2004; the compound growth rate (7.1% annually) being higher than in any European economy except for Ireland (the average growth rate in the 15 countries of the 'old' European Union was 1.3%). The above was stimulated by rising domestic consumption and growing exports, and underlain by a fundamental transfer of ownership. At the same time, far-reaching structural and qualitative changes have been taking place in the entire sector. The highest growth concerns computers, plastic and rubber products, publishing and printing, electronics, electrical machinery, precision instruments, motor vehicles, paper and non-metallic mineral products. Many of these industries have attracted considerable foreign investment; while the motor vehicle, electrical machinery, electronics and furniture industries generate significant exports. The structure of Poland's industry is moving towards an increased share of medium-technology and basic consumer goods at the expense of raw materials, simple semi-finished goods (e.g. steel, textiles) and military-related products, which were dominant under communism. The extraction of hard coal and sulphur fell by half or more, the production of copper and lignite remaining stable. The production of electricity is still based on hard coal and lignite. The share of tech-

nologically-advanced industries is low vis-à-vis Western Europe, but is growing faster than average. Private companies account for 93% of employment in manufacturing now; while state ownership still dominates in the extraction of resources and in energy supply. Another new process is the rise of the small and medium-sized firms – an element missing from the industrial structure under communism.



Photo 1. Turoszów power plant (based on lignite) with new sulphur scrubbers

The structural shift in Polish industry finds expression in the spectacular growth of Polish exports to Western Europe and the changing structure to those exports. Manufacturing exports to Germany or the United Kingdom now exceed imports from these countries. Machines and transport equipment constitute about 40% of these exports; while the share of raw materials,

fuels and foodstuffs has fallen from 40 to 12% since 1989. The increase in Polish exports, of more sophisticated goods in particular, reflects substantial improvement in the quality of products, as made possible by better organization, management and technology. Quality standards are also demonstrated by a multiplying number of firms with certificates for ISO 9000 norms; better environmental standards are shown by certificates for ISO 14001 norms and a profound reduction in air pollution.

Poland, like other communist countries, had a higher share of the economically-active population in manufacturing and mining (above 30%) than Western European countries, except for Germany. This reflected low industrial productivity and general underdevelopment of the tertiary sector. Manufacturing employment decreased by more than 30% in the years 1990–2004, and the workforce in mining has been reduced by 65%. The contraction of employment as an effect of "offensive restructuring", including improved skills, increasing productivity and production growth, must be distinguished from labour shedding as a result of the collapse of enterprises or plant closure. The decline in industrial employment led to a high unemployment rate in some regions and towns, despite the creation of many new jobs in expanding consumer and producer services. Manufacturing, mining and energy supply represent 23.5% of the economically-active population in the country now, while contributing 26.6% of GDP.

Foreign direct investment in Poland grew steadily throughout the 1990s, reaching \$6–10 billion annually, about half of which has come into manufacturing. The size of the Polish market and faster growth

of demand than in the EU have motivated the bulk of foreign investment in the production of food products and beverages, chemical, rubber and plastic products, construction materials, publishing and printing. The domestic market has also been an initial target for investment by car and electrical machinery manufacturers. At the same time, more and more Polish factories have become principal producers of certain components or final goods for the European market. Such specialized plants are becoming integrated within the Europe-wide production network, and direct or indirect relocation of manufacturing activity from Western Europe is taking place here as part of a broader spatial reorganization strategy pursued by large corporations. The relatively skilled, adaptable and low-cost (on the European scale) labour force constitutes a crucial resource, which allows investor's quality standards to be met and a healthy improvement in productivity achieved. Geographical proximity to the West European markets is another important condition behind this relocation. Some transnational corporations have decided to open their R&D centres in Poland in recent years, e.g. ABB, Philips, Lucent Technologies and Delphi. There is also a group of plants in Poland that are locked into simple sub-contracting relationships with foreign companies, manufacturing labour-intensive goods for exports, for example in the clothing industry. This activity may have a more temporary character, as may some assembly activities (both domestic and export-oriented).

All in all, the fast growth of production, rising productivity and exports manifest enhanced competitiveness of Polish enterprises, and are therefore leading to

a narrowing of the gap to Western European countries. The better position of Polish industry in the European economy vis-à-vis its situation in the communist era is a result of both successful development of numerous indigenous private companies and foreign investment.

Regional differentiation of industrial development

The spatial distribution of manufacturing and mining to a large extent reflects historical patterns shaped in the past. Western and southern Poland remains more industrialized than eastern and central regions, except for metropolitan areas and the traditional metal and machinery industrial district of Kielce. In the north of Poland, a relatively high share of industrial employment rather reflects weakness of the service and agricultural sectors (finding expression in high unemployment), than strong industrialization. Industrial centres are mainly situated along the Vistula river and in the major port cities of Szczecin and Gdańsk-Gdynia (Fig. 1).



Photo 2. Industrial zone in Warszowie (Śląskie voivodship)

The processes which led to recent changes in the spatial distribution of industrial activity were successful or unsuccessful restructuring of the existing industrial base, foreign investment and local entrepreneurship. The restructuring of local and regional industry was strongly influenced by its branch structure, such that areas with a high share of traditional industries (like textiles, armaments, steel or coal), were in a more difficult situation. Regions and towns characterized by a diversified industrial structure usually fared much better.



Photo 3. General Electric Power Controls in Kłodzko (Lower Silesia)

Spatial distribution of foreign investment

Nearly 60% of foreign manufacturing capital has been invested in four voivodships: Mazowieckie (with Warsaw), Śląskie (including Upper Silesia), Dolnośląskie (Lower Silesia) and Wielkopolskie. Little capital is found in the north, even less in eastern Poland (especially Podlaskie and Lubelskie voivodships) and in areas adjacent to the Polish-German border (Zachodniopomorskie and Lubuskie). All this means that foreign investors have been reinforcing what were already the strong-

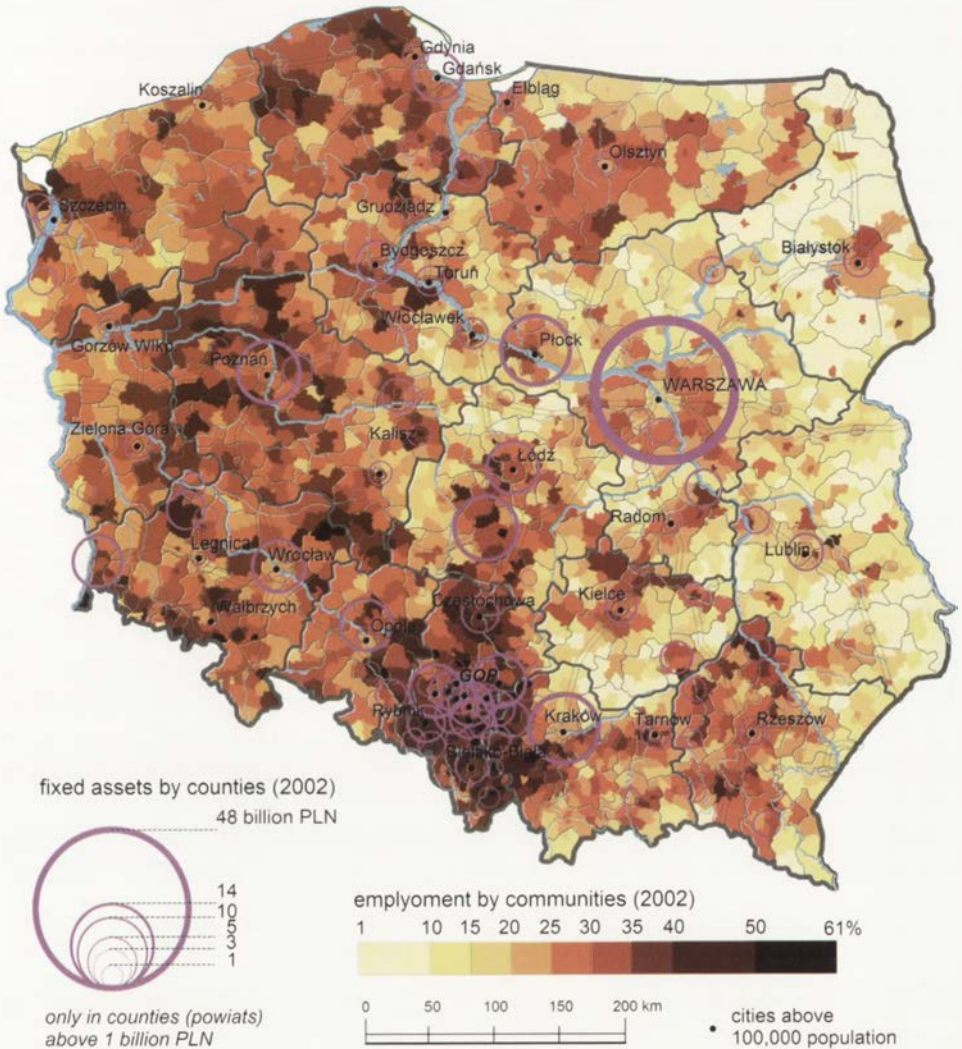


Figure 1. Employment and fixed assets in manufacturing, mining and energy supply, 2002 (by Przemysław Śleszyński)

est, most-developed regions. This results, first, from the fact that most of the capital comes to existing plants, and second, from the spatial concentration of greenfield investment (new factories). Foreign capital tends to be concentrated in metropolitan areas especially. This reflects large investment in both the main cities and their

surrounding areas, particularly in the case of new plants. About 80% of greenfield investment has been located in the metropolitan areas of the 11 largest cities. The trend towards the location of new factories within the metropolitan zones is most evident in the vicinity of Warsaw and the western cities of Poznań and Wrocław, and to

a lesser extent near Cracow and Gdańsk. Thus foreign capital reinforces the overall importance of metropolitan areas vis-à-vis more peripheral medium-sized industrial centres, and facilitates the development of new industrial places around the main cities. There is a contrast between capital-intensive investment in metropolitan regions and more labour-intensive activity in non-metropolitan areas.

Since the bulk of capital is invested in manufacturing various goods for the home market, there is a strong preference for location of new factories in Warsaw and the vicinity in central Poland, as well as in the western and southern regions, where a greater population and a stronger economy are to be found. Large plants with strong export and/or import relations are often located in Wielkopolskie and Dolnośląskie voivodships. Eastern and northern regions compare unfavourably in terms of access to both domestic and Western European markets. The poor quality of the Polish transportation system makes access to main roads very important. The A4 Berlin/Dresden-Wrocław-Katowice-Cracow motorway, which is the first road allowing for swift transport between Poland and Western Europe, is one of the major factors behind the location of many new factories in southern Poland. Heavy investment in Warsaw, Upper Silesia and other industrial areas with high wages and strong unions proves that the quality of labour and opportunities to select employees in a large labour market are more important than weak unions and low costs. On the whole, the social and environmental conditions in old industrial districts do not discourage foreign manufacturers. All things considered, the size of the market, good

accessibility and a large pool of skilled labour can explain the metropolitan investment by foreign companies.

Special economic zones

Special economic zones (SEZ) were introduced in Poland in 1995 in order to attract investment and new jobs to depressed industrial areas and some peripheral underdeveloped regions. However, by the end of 2005, special zones have been established in more than 130 towns. As a result, special economic zones have lost the aspect of an instrument of a regional policy, created to support problem areas, and have become an almost standard form of public aid for companies regardless of their location.

Only a few zones have received more substantial investment. The greatest amount of capital came to Śląskie and Dolnośląskie, in each of which more than 15,000 new jobs were created in plants located in SEZs. The influx of two billion dollars into the Katowice economic zone that comprises subzones in several towns of Upper Silesia (mainly Gliwice and Tychy) has been significantly influenced by the early location of General Motors. Most of the investment here is car-related. All of south-western Poland which has attracted the vast majority of large foreign factories located in SEZs, benefits from the size of the regional market (9 million people in three voivodships) and a convenient location, including the new motorway. Mielec in the south-east (Podkarpackie voivodship) is one of a few medium-sized towns where new foreign investment brought diversity to the local economy, while an economic zone helped to alleviate high unemployment (a bankrupt aircraft factory). Fiscal incen-



Photo 4. Special economic zone in Tychy on the outskirts of Upper Silesian Industrial Region

tives offered in economic zones cannot overcome poor accessibility and distance from the market, especially in northern Poland (Fig. 2).



Photo 5. General Motors factory in Gliwice (Upper Silesia)

Local entrepreneurship

The metropolitan areas not only attract foreign capital, but also show intensive development of small and medium-sized indigenous firms and a major expansion

of the tertiary sector. This enables them to enjoy the lowest unemployment, in fact lower than indicated by official data due to extensive unrecorded activities. It is evident that eastern regions show more limited entrepreneurship than other parts of the country (Fig. 3). The differentiation in activity of small and medium-sized industrial enterprises can be accounted for by a higher standard of living in western Poland and in metropolitan areas. It may also be related to the age structure – eastern Poland suffers from the low share of young people. Last but not least, there are areas with long-term, culturally-based traditions in the specialized manufacturing of certain products. For example, there are a large number of clothing enterprises in the region of Łódź, shoe firms at Mysłków (Śląskie voivodship) and furniture producers at Kalwaria Zebrzydowska (Małopolskie voivodship).

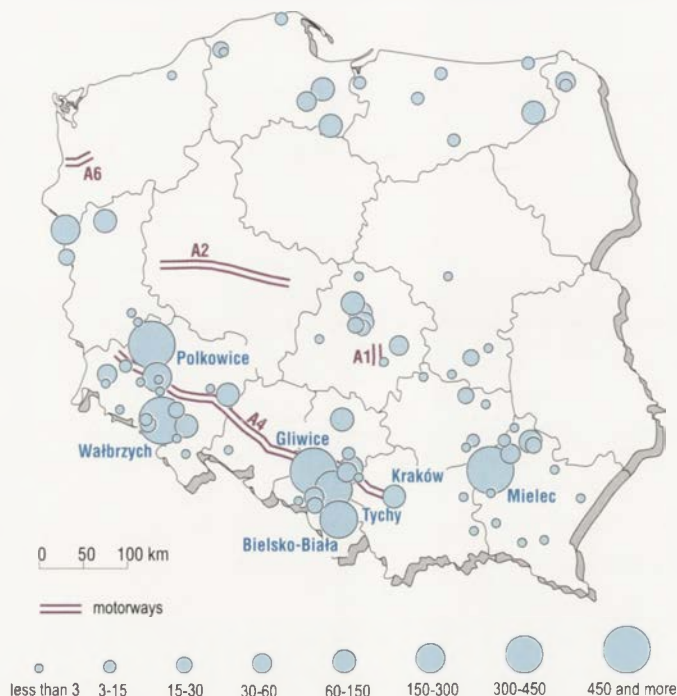


Figure 2. Investment in special economic zones, 1996–2004

(acc. to: Gwosdz J., Jarczewski W., Huculak M., Wiedermann K., 2005, *Specjalne strefy ekonomiczne w Polsce. Założenia a praktyka* [in:] Domański B., Gwosdz K. (eds.) *Dziesięć lat doświadczeń pierwszej polskiej specjalnej strefy ekonomicznej. Mielec 1995–2005*, Institute of Geography and Spatial Management, Jagiellonian University, Cracow, pp. 17–38).

Major industrial districts

The Upper Silesian Industrial District remains the largest industrial conurbation in the country. Employment in the coal and steel industries has decreased by more than 250,000 since 1989 here, but the jobless rate is still below the national average. Good accessibility and a large pool of skilled labour attract considerable foreign capital, especially in automotive production. The development of many other industries is stimulated by the large regional market. All this contributes to diversification of the economic structure of the region, together with rapidly grow-

ing services. Air pollution is no longer an acute problem, but there is a long way to go before the devastated landscape is altered. There is significant differentiation within the region; with successful towns like Katowice and Gliwice with their strong producer and consumer services, educational institutions, and new investment contrasting with those plagued by closed collieries, e.g. Bytom and Zabrze. The neighbouring industrial districts of Bielsko-Biała (to the south) and Częstochowa (to the north) used to rely on textiles, but have developed into areas of diversified industrial structure. Bielsko-Biała is now one of the most prosperous industrial centres in the coun-

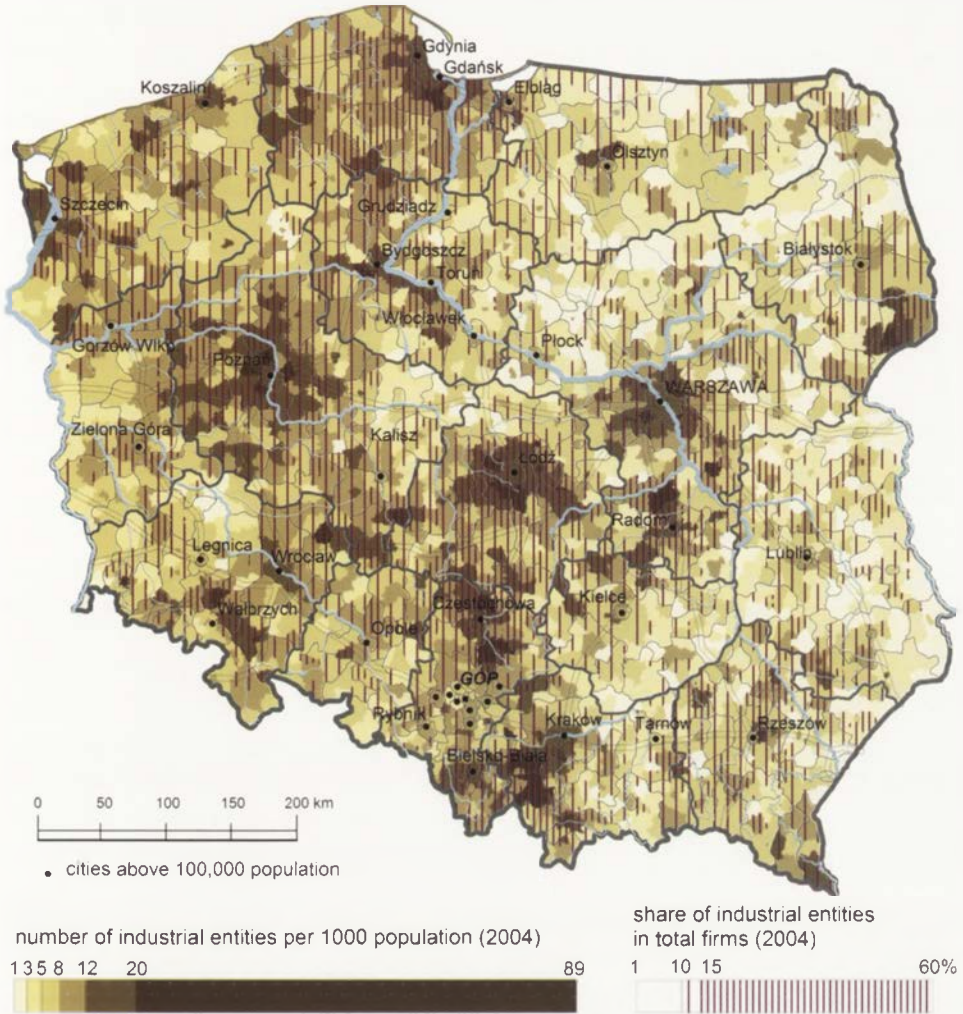


Figure 3. Industrial entities by communities, 2004
 (by Przemysław Śleszyński)

try, including the large Fiat-GM Powertrain engine factory and numerous car-component producers.

A new and striking phenomenon is a rise of a distinct regional automotive cluster in southwestern Poland in the last decade. This includes Upper Silesia, Bielsko-Biała (both Śląskie voivodship) and many medium-sized and small towns of Lower Silesia (Dolnośląskie voivodship)

and comprises numerous car-component factories. Many of these are foreign greenfield investments post 1996, including the Toyota and Volkswagen engine plants. These supply the Fiat (Tychy) and General Motors (Gliwice) assembly plants in Upper Silesia and/or Volvo (buses) in Wrocław and Volkswagen (commercial vehicles) in Poznań; however the majority of production is exported. South-western Poland

Natural and human environment of Poland

constitutes part of the broader Central European regional concentration of automotive production that also takes in the Czech Republic and increasingly Slovakia.



Photo 6. Toyota Motor Manufacturing Poland in Wałbrzych (Lower Silesia)

There is also other new industrial investment in Lower Silesia (Dolnośląskie), mainly in the Wrocław metropolitan area, e.g. a huge new LG investment project. The area north of Legnica is the main producer and exporter of copper in Europe. The old industrial district of the Sudeten Mts. in the same voivodship suffers from high unemployment, however, as many small towns have been severely hit by the collapse of old textile plants.

Wielkopolskie consists of the metropolitan area of Poznań and many small and medium-sized towns. Most of the industry in this region has adjusted to market conditions successfully. Various manufacturing branches are found here. The role of the region is especially important in the production of machinery, electrical engineering and electronics, pharmaceuticals as well as food processing. The main European production site of lighting equipment Philips is found at Piła north of Poznań. The surroundings of Poznań constitute the

highest concentration of greenfield industrial investment in Poland away from the Warsaw metropolitan area. The strip mining of lignite, which is burnt at large power plants, has developed near Konin in the eastern part of the region.

The western border voivodships of Lubuskie and Zachodniopomorskie go together with the north of the country in representing a lower level of development than Wielkopolskie and Dolnośląskie voivodship, and lack larger industrial concentrations except for Szczecin and Gdańsk-Gdynia on the coast. The latter are well-known for their shipyards, but in fact comprise a mix of industries. New foreign investment in electronics has been located on the outskirts of the Gdańsk metropolitan area, at Kwidzyn and Tczew. Non-metropolitan northern areas are characterized by export-oriented production of furniture, wood products and paper; a large Michelin tyre factory is situated at Olsztyn (Warmińsko-Mazurskie voivodship).



Photo 7. Repair shipyard at Świnoujście near Szczecin

The eastern regions of Podlaskie and Lubelskie voivodships are the least industrialized parts of Poland. They have a high share of fragmented private agriculture

with hidden unemployment, their development being hindered by depopulation and the consequent shortage of young, educated people. Food processing is the most important industry, with clothing, furniture and construction-materials production in some places. Białystok and Lublin stand out as relatively prosperous service-related and industrial centres.

The metropolitan area of the capital city of Warsaw is undoubtedly the principal winner in the Polish transformation. This is largely a result of the expansion of producer-, and to some extent consumer, services, but the region has also gained huge new manufacturing investment. The latter has primarily taken place in small towns and villages in a broad zone around Warsaw, west and south of the city in the main. This may be attributed to the good accessibility, skilled workforce and large regional market. The investment took place in all sorts of industries; albeit with relatively limited development occurring in car-component production in comparison with south-western Poland. The development of medium-sized industrial centres situated farther from Warsaw varies; some have thrived, e.g. Płock with the largest Polish oil refinery, others have experienced crisis, e.g. Radom (armaments, leather). The industrial district of Bydgoszcz and Toruń, situated down the Vistula river, has retained its position. Chemical and food industries are among the chief branches in this region.

The old textile region of Łódź, which used to be the biggest industrial agglomeration in central Poland, experienced significant decline in the early years of transition from communism to capitalism. Later on, it managed to benefit from the advantages of a large city and its loca-

tion on the main roads in the centre of the country, attracting new investment into various industries. The largest area of lignite extraction with a major power plant is situated at Bełchatów, south of Łódź.

The northern part of Świętokrzyskie voivodship is among the oldest industrial areas in Poland, traditionally specialized in metal, machinery and armaments manufacturing. Whereas the main town of Kielce with machinery and car-related production remains a viable industrial centre (the same is true of cement-making in its surroundings), the industrial base of several other towns has dwindled. These had relied on a single large factory, quite often a military-related producer, built or expanded during the Cold War arms race.

Structurally-unsustainable dependence upon large armament manufacturing plants was also typical of some medium-sized towns in the south-eastern voivodship of Podkarpackie voivodship. The town of Tarnobrzeg suffered from the dying-out of sulphur mining. Successful industrial centres include Rzeszów with its Pratt & Whitney engine plant, and a new suburban cluster of domestic producers of aircraft-related components (Aircraft Valley) and the town of Krosno with a large manufacturer of glass products and numerous furniture makers.

The neighbouring Małopolskie voivodship comprises the metropolitan area of Cracow, with a diversified mix of industries typical of metropolitan areas. The city has attracted a couple of R&D centres of transnational corporations. At the same time, it is home of the second largest steel plant in the country, now belonging to Mittal Steel, together with some steel plants in the Upper Silesia Region. There are local

clusters of metal, furniture and wood-product firms in the south-western parts of Małopolskie voivodship.

Conclusion

All things considered, the increasing competitiveness of Polish industry since 1989 manifests itself in a fast rate of growth, higher productivity, better quality of products and enhanced export capability. Manufacturing growth in Poland rests on the rising standard of living (consumption) and exports to Western Europe. The advance of private producers has been vital, as these actively sought new markets and achieved a higher productivity than their communist predecessors were able to provide. The role of culturally-embedded entrepreneurship cannot be overlooked here; its roots visible in informal social and economic activity in the 1980s. The size of the home market and earlier international personal contacts, including those related to the sizeable Polish émigré population and the widespread temporary work abroad, were also significant. Foreign investment also contributes to this growth. The long-term effects of this investment will depend on the share of high-value added production, long-term stability of investment and the 'embeddedness' of foreign companies through local supplier networks. There is greater economic dependence of Polish industry on global markets and decisions taken abroad. Poland's share in world exports is still low and the overall trade balance negative, however.

From the spatial perspective, the most important feature of industrial develop-

ment of Poland since 1989 has been the rapid growth of the metropolitan areas of major cities. A substantial part of the industrial base of these cities has been successfully restructured, while new factories were located in surrounding towns and villages. This has been furthered by both development of local companies and location of new factories by domestic and foreign investors. The developed regions, metropolitan areas in the main, benefit from their growing, diversified economic base, international contacts, and increasing social well-being. Partners for co-operation can be found more easily here, and so investments are more likely to become regionally embedded. At the same time, the role of the old polycentric industrial districts has been diminished, though differently in various districts. Upper Silesia has managed to engross substantial investment in new branches of manufacturing; these in part replacing coal-mining and steel-making, which no longer dominate in the region. The same is to some extent true of the textile region of Łódź. The most serious crisis hit the Sudeten industrial district. The underdeveloped eastern and, in part, central regions (outside metropolitan zones) have experienced sluggish growth or stagnation. A serious crisis has struck some small and medium-sized industrial towns, which relied on single industries, or still worse one factory. The importance of local structures and trajectories of development manifests itself in the fact that prosperous towns and pockets of unemployment or stagnation are often found next to each other in both declining and growing regions.

Retailing and services

Andrzej Kowalczyk

Faculty of Geography and Regional Studies

WARSAW UNIVERSITY

e-mail: akowalczyk@uw.edu.pl

Waldemar Wilk

Faculty of Geography and Regional Studies

WARSAW UNIVERSITY

e-mail: wwwilk@uw.edu.pl

Introduction

At the moment the process of systemic transformation in East-Central Europe began, the retailing and services sector in Poland differed considerably from those present in other communist countries (excepting Hungary). In the first place, a relatively large share of all retail had remained in private hands throughout the period from 1945. This was particularly true of small-scale retail in fruit and vegetables, the sale of sweetstuffs like ice-cream and cakes, and the buying and selling of certain manufactured items like clothing and household equipment. In the second place, certain types of services had also remained private, as in the case of some medical services, technical and basic services (plumbing and electricians, for example), construction, personal services (hairdress-

ing and flower-selling), car repair, etc. All of this ensured that Polish entrepreneurs were at least somewhat prepared to operate in a market economy, even if they did have to make major adjustments to their approach to the customer or client, their cooperation with suppliers and customers, marketing, etc., having previously operated in the conditions of an economy of shortage (Kornai, 1980) that had had its many disadvantages, but also certain advantages, from the private entrepreneur's point of view.

Following the breakthrough of the late 1980s, the range of services on offer from the private sector was augmented by notaries' and solicitors' offices and educational establishments at almost all levels. It is now possible to observe tougher and tougher competition between public- and private-sector entities, commencing with educational services and going all the way

Natural and human environment of Poland

through to healthcare protection, radio and television.

A very important area of change became the raising of the technological level of service-sector enterprises and the attempts made to bridge certain of the technological gaps harking back to the days of the centrally-planned economy. Emerging as helpful in the adjustment of what was on offer to more or less decent standards was the appearance on the Polish market of many major service-sector firms from Europe and beyond. Significant amounts of investment were put in – most often in the form of FDI – by multinationals active in such areas as banking and insurance, telecommunications and retailing. Over such a short period, changes in telecommunications services were sufficient to allow for the emergence of the very widespread phenomenon of the call-center or accounting or financial-services center of regional or even Europe-wide reach. This is true of the structures of an ever greater number of important enterprises.

The result of the combined impacts of privatization processes, foreign investment and the broad development of home-grown entrepreneurship was – over what was really a rather short period of time – an altered structure of the service sector in terms of both quality and quantity. A further factor of importance to the development of the market for many services was of course a steady increase in the wealth of citizens, who – in cities in particular – were more and more able to permit themselves the luxury of purchasing specialized services.

There is no way that a few sentences here may adequately describe the changes ongoing in the services sector as a whole. It has thus been necessary to focus on a couple of selected examples that give an idea of the most important features to the newly-developing structures in areas where rapid growth and specific transformations have been observed. What will be involved here, in consequence, are the changes in retailing, banking services higher education and gastronomy.

Table 1. The largest foreign investors in the services sector, end of 2004

Firm	Position in ranking of investors	Country of origin	Branch of the economy	Invested capital (million USD)
France Telecom	1.	France	Telecommunications	4 470
EBRD	2.	Multinational	Banking, capital investments	4 000
KBC Bank	4.	Belgium	Banking, insurance	1 743
Metro Group	5.	Germany	Retailing and wholesaling	1 508
HVB	6.	Germany	Banking	1 336
Citigroup	7.	USA	Banking, insurance	1 300
Tesco	8.	United Kingdom	Retailing	1 300
Vivendi Universal	10.	France	Telecommunications	1 243
Unicredito Italiano	12.	Italy	Banking	1 200
ING Group	16.	Netherlands	Banking, insurance	990

Source: Polish Information and Foreign Investment Agency (PAIZ), www.paiz.gov.pl.

Retailing

Always listed among the service-sector activities subject to significant change in recent years is Poland's trade, and most especially retailing. This reflects the important changes that have occurred in functioning, in regard to ownership change, size structure, outfitting with high technology, the role of foreign concerns and many other aspects.

A specific feature of retailing in Poland is that private enterprises predominate, accounting for over 99.5% of all shops and almost the same proportion of sales space (*Rynek...*, 2003, Table 15). While the public sector still accounted for nearly 64% of total retail sales in 1990, this figure had fallen to just 2% by 2002. In the same period, the number of shops in the public sector declined from over 14,000 to under 1800 (out of around 450,000 in total). There has also been a steady increase in the role of shops owned by foreign companies.

Nevertheless, what continues to be a specific feature of retailing in Poland (cf. countries of Western Europe) is the large share of all shops that are independent. There has so far been only a limited degree of concentration of sales. As of the end of 2004, the share of FMCG (fast-moving consumer goods) accounted for by the so-called "modern" distribution channels (hypermarkets, supermarkets and discount stores) was only up to 41–42%¹.

As a result of the reorganization of chains of megastores, as of 2004, the sale of consumer goods was being engaged in in Poland by around 240 hypermarkets (only 16 Polish; Fig. 1), 960 supermarkets

(c. 500 Polish) and more than 1350 discount stores, almost all of them associated with foreign capital (*Przeciąganie liny...*, 2005). It is in this very reorganization of the megastore network, among super- and hypermarkets and discount stores, that it is possible to observe the greatest influence of foreign enterprises on the shape of retailing in Poland.

The discount chains have been showing particularly rapid growth. At the end of 2004, just six networks had more than 1350 stores, compared with c. 800 in January 2001. The largest example (*Biedronka*; Photo 1) had just 50 stores at the time of its takeover by a Portuguese operator in 1997, while it now has more than 740.



Photo 1. A store of the Biedronka discount chain in Busko-Zdrój (Świętokrzyskie voivodship)

Away from the chains of large stores, it is possible to note examples of consolidation activity among the smaller housing-estate shops of the "convenience store" type (Table 2). These are usually networks integrated around a single leading enterprise, though they sometimes operate on a franchise formula.

¹ *Strategic Report – Distribution FMCG 2005*, GfK Polonia (after: *Handel*, no. 5–6/2005).

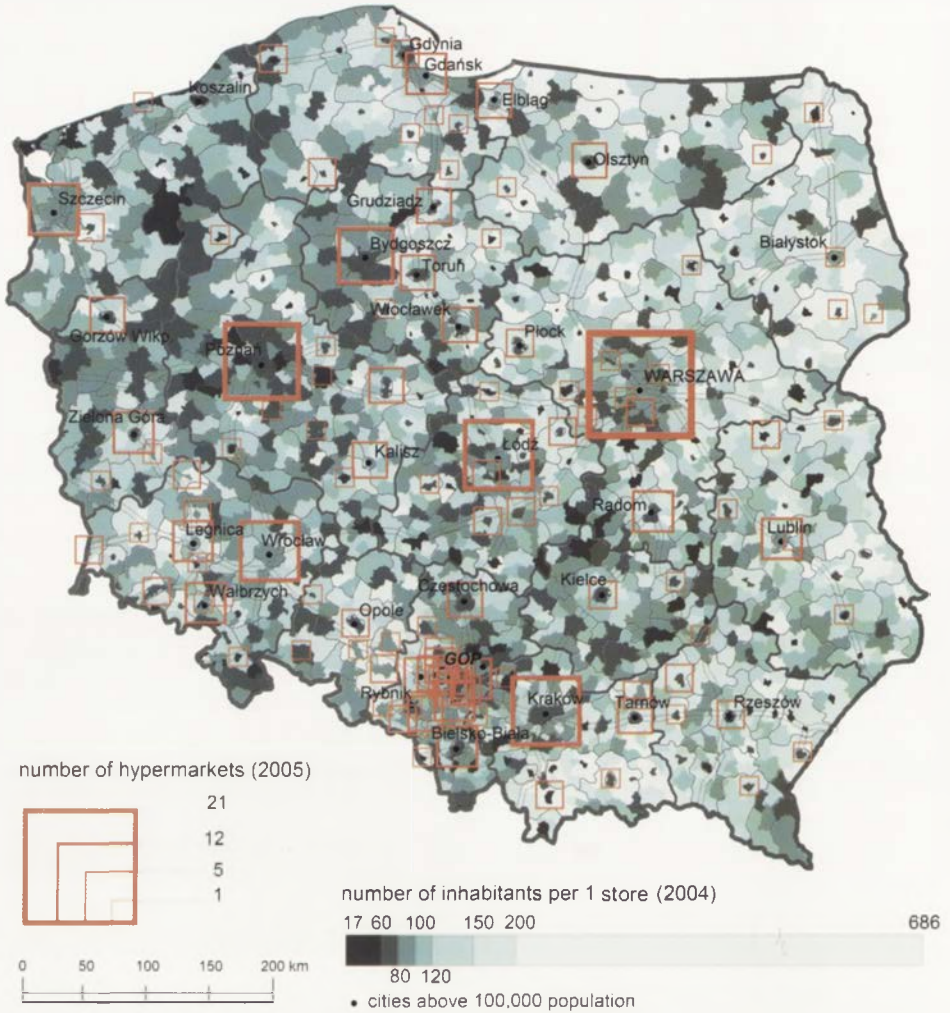


Figure 1. Retail services, 2004/2005
(by Przemysław Śleszyński and Waldemar Wilk)

Prevalent among the largest operators in terms of numbers of shops are those formed several years ago now, often by wholesaling firms. Of such a nature is the 1800+shops Abc chain formed by Eurocash Sp. z o.o. and having more than 80 wholesale outlets distributed across almost the entire country. Also displaying strong linkage with a single wholesaler are the stores of the Groszek chain (the whole-

salers' *Eldorado*, whose owners also run the chain of *Stokrotka* supermarkets, *Nasz Sklep* and *IGA*). Some of the chains (like *Chata Polska*) have not yet come into possession of their own distribution networks, though their numbers of stores are increasing rapidly (Fig. 3).

The chains currently encompassing at least several hundred stores take in virtually the whole country. A particular dynamism is

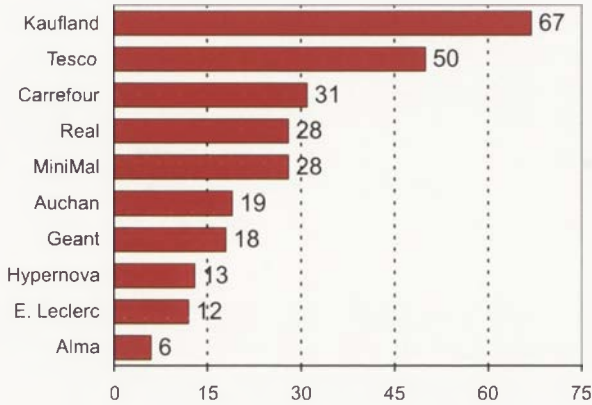


Figure 2. Largest hypermarket chains, 2004
(acc. to *Supermarket News*, no. 13/2005)

being demonstrated by the chain of small *Żabka* shops, which has extended from just 7 in 1999 to more than 1360 today. In turn, the integration of so many shops within the *Lewiatan* system is made possible

by, among other things, a holding structure with 10–20 regional branches (Table 2).

The regional nature and scale of operations of many of the supermarket chains studied is made clear by the numbers of

Table 2. The largest chains of small shops* (integrated and with franchises)

Name of chain	Number of shops	Mean area of sales floor per shop (m ²)
<i>Abc</i>	1 781	80
<i>Polska Sieć Handlowa Lewiatan</i>	1 597	92
<i>Żabka</i>	1 160	48
<i>Sieć 34</i>	909	120
<i>Nasz Sklep</i>	366	120
<i>Polska Sieć Handlowa L.D.</i>	331	148
<i>Graszek</i>	284	130
<i>Sklepy F.J.</i>	160	182
<i>Euro Sklep</i>	159	215
<i>Nasze Sklepy</i>	146	133
<i>Chata Polska</i>	143	166
<i>IGA</i>	142	220
<i>Sieć Handlowa Delikatesy Centrum</i>	136	189
<i>Polska Sieć Handlowa Detal</i>	101	119

* mean sales-floor area of a shop in the chain is below 250 m².

Source: *Handel*, 9 (136), 12th May 2004; information from the firms.

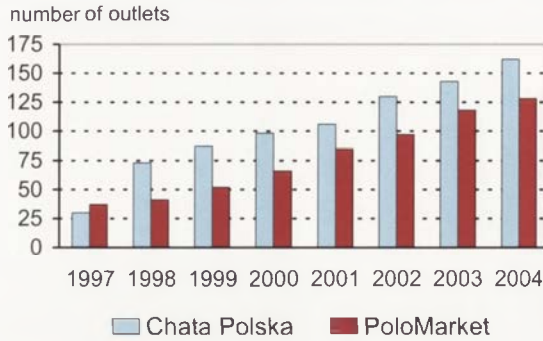


Figure 3. Development of the *Chata Polska* (Polish Hut) grocery chain of convenience stores and of *PoloMarket* supermarkets, 1997–2004 (acc. to www.chatapolska.pl and www.polomarket.pl)

branches in each that may be met with in the given place that is often the seat of the operator. Thus the *Piotr i Paweł* chain has 6 stores in Poznań, for example, *Stokrotka* 7 in Lublin, and *Berti* as many as 9 in Szczecin. The situation looks similar with the system of *Aldi* stores (11 in Lublin), *PoloMarket* (14 in Toruń and 7 in Inowrocław), or *MarcPol* with its 30+ shops in Warsaw. A location strategy of this kind undoubtedly has an influence on the spatial range of impact of the network as a whole (Wilk, 2005).

The next few years should bring an intensification of integration phenomena in Polish retailing. In line with the trends



Photo 2. A shop of the *Żabka* chain in Warsaw's housing estate

already observable, it will be ever commoner for shops belonging to different kinds of network to be met within smaller urban areas (Fig. 4). Necessitating this, if nothing else, is the fact that, as the market is saturated with large-scale superstores, attempts are naturally being made by the same operators to organize networks of smaller ones.

Banking services

It was not so long ago that certain analysts were stating how unlikely it was that Poland would develop a system of financial institutions similar to those in the West (cf. Caselli and Pastrello, 1992). Nevertheless, while as always being characterized by certain market-specific features, Poland does have banking services at a level not departing greatly from counterparts in the Member States of the “old” EU. Among the reasons for this far-reaching change is the strong presence on the Polish market of financial institutions originating in Western Europe or the USA (Table 1). At the end of 2000, the number of branches of banks with a prevalence of foreign

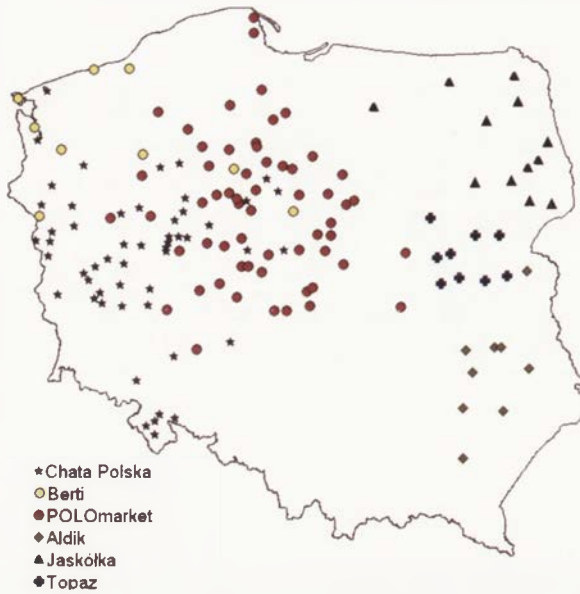


Figure 4. Selected regional retail networks, 2005

capital exceeded the number of domestically-owned banks.

The ongoing consolidation of the banking-services sector is to be observed, with further mergers and takeovers, leading to an increased concentration of the services in question. As of the end of 2004, there were 54 commercial banks in operation in Poland (of which only *Bank Gospodarstwa Krajowego* was state-owned), as well as 596 cooperative banks. The number of commercial banks has now gone down to 54 (from 87 in 1993). Capital consolidation has been accompanied by the reorganization of the system of bank branches. While the commercial banks had fewer than 1600 of these in 1996, by 2004 that number had passed 3700, albeit with the majority of these being concentrated in the largest cities.

As of 2004, the commercial banks together gave work to more than 122,000

people, cf. 27,600 in the cooperative banks. However, employment in the banking sector has been declining for at least 5 year now. The market remains relatively small, with the entire system having assets of around 132 billion euros at its disposal at the end of 2004, i.e. the equivalent of 61% of Polish GDP (*Sytuacja finansowa...*, 2005).

A rather specific feature of the Polish market is its relatively dense network of cooperative bank branches. However, from the mid 1990s onwards, these banks also underwent a marked consolidation enforced by the poor condition of many individual banks. The period 1994–2004 saw the number of such banks decline from 1600+ to less than 600 (Fig. 5). In 1999 alone, more than 400 banks merged, while the period 1994 to 2004 inclusive saw over 880 banks involved in mergers, while some 120 went out of business.

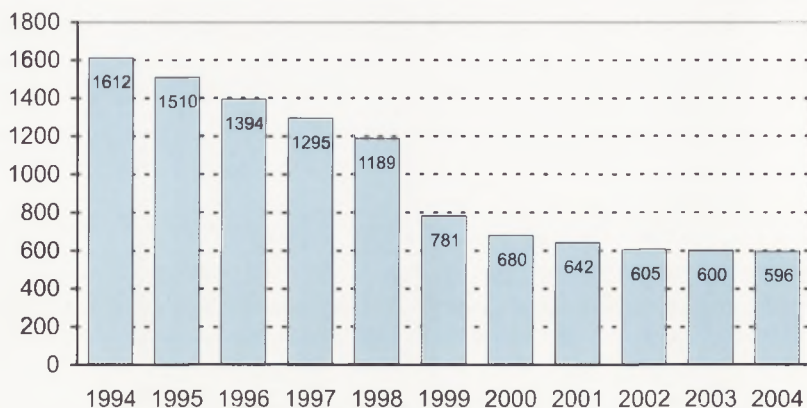


Figure 5. Changes in number of cooperative banks, 1994–2004 (acc. to Narodowy Bank Polski – National Bank of Poland)

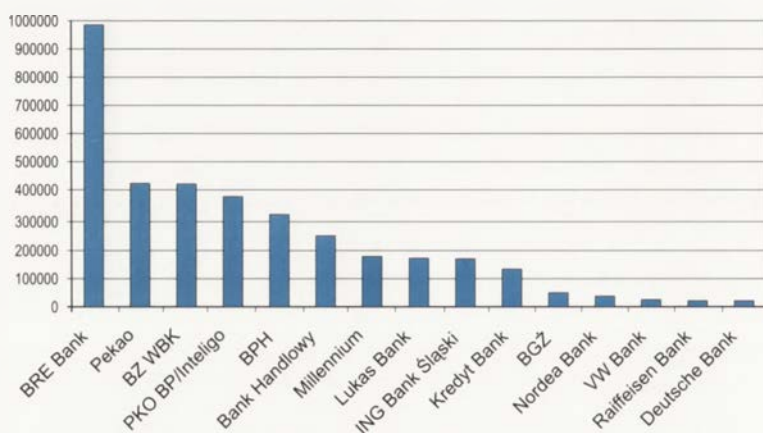


Figure 6. Banks with the largest numbers of on-line accounts, 2005 (acc. to financial portal www.money.pl)

However, the change in the number of independent cooperative banks was not associated with any change in the numbers of branches serving clients. The number in 2004 was almost the same as that in 1996, at close to 1900 branches.

Technological changes, the modernization of bank branches and the extension of the range of services on offer

have all been leading to the development of electronic banking and spread of credit and debit cards. While there were 1.8 million e-bank-accounts at the end of 2003, the figure exceeded 3.5 million by the end of 2005². As of 2004, there were close to 17 million banking cards in circulation, most being debit cards (only 12% credit cards). Bank clients had more

² www.money.pl/banki, 12.10.2005

than 8000 cash machines at their disposal, most of these located near bank branches, or else in the areas where people concentrate most (airports, stations, shopping centres, etc.). In spite of the rapid development of different forms of banking services, the reorganization of bank networks and the promotion of e-banking, there remained around 1/3 of the adult population not using the services of any bank branch.

Higher education

The transformation ongoing in the Polish economy aroused the educational aspirations of young people, who were looking to find places for themselves on the labour market. The years from the early 1990s on were characterized by a marked increase in the numbers of higher education establishments of both a state-run and (in particular) a non-public character. The range of courses and subjects that could be studied developed, and

there were constant increases in the numbers studying, something that worked to even out opportunities for young people, as tertiary studies became more widely available – even in the smaller towns.

As was noted above, an ever-larger group of non-state institutions has been appearing alongside the state facilities in higher education. While the first of these did not open until 1991, just five years later the numbers of higher-educational establishments in the private sector were greater than in the public. As of the beginning of 2006, some 430 such institutions were in operation in Poland, c. 300 of these non-public³. The founders of the latter include associations, foundations (including international) and natural persons. Normally these are small institutions, in which several hundred students are in education. Thus, as of the year 2004/2005, there were c. 580,000 students in private schools, or just 30% of the national total (Fig. 7). A characteristic feature of the non-public

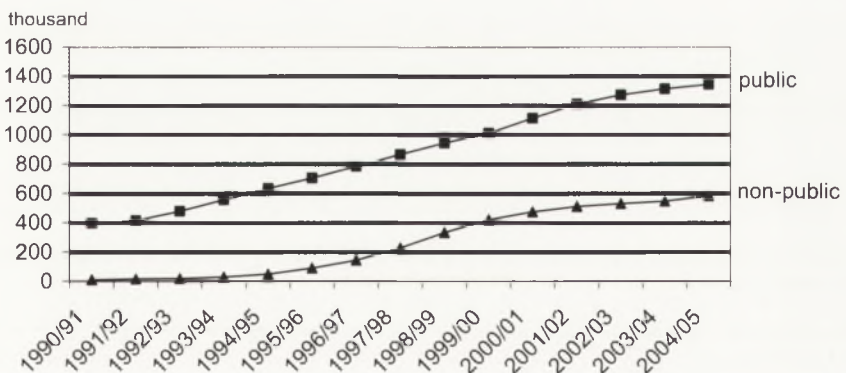


Figure 7. Students, 1990-2004
(acc. to *Szkoły wyższe w Polsce, 2005*,
Central Statistical Office, Warsaw)

³ www.mein.gov.pl/szk-wyz/wykaz, 10.03.2006

schools is a dominant profile connected with economic issues (management, marketing, finance and banking).

The total numbers studying have increased almost four-fold in the years since 1990, from just 400,000 then to more than 1,900,000 in 2004. This has been associated with an increase in the index for participation in higher education from around 13% in 1990 to 22% in 1995 and as much as 48% today. The greater part of these students are still being catered for by the 120+ state-run institutions in higher education: as of 2004, these accounted for 1,344,000 (or 70%) of the 1,926,000 students. The public-sector institutions are also becoming more and more involved in paid-for forms of (evening, weekend or extra-mural) education, this augmenting the traditional form extended to day students.

The 18 universities remain Poland's largest institutions in tertiary education. They currently have in excess of 500,000 students between them. They are followed by the 93 Schools of Economics, with their c. 390,000 students, and the 22 higher technical schools with 340,000 students. Higher vocational schools have also existed since 1997, and there are now more than 180 of these, catering for more than 200,000 students.

At 9000 or so, the number of foreign students in higher education in Poland remains small, mainly as a result of the limited numbers of courses being run in foreign languages. The foreign students account for less than 1% of the total in higher education.

While the leading public establishments are all in Poland's main cities, their non-public counterparts can now be found

in many smaller urban centres across the country. Nevertheless, there remains a concentration in Warsaw and the other capitals of Poland's 16 voivodships. Some 70 establishments offering tertiary education have their seats in the Polish capital, while further places in the ranking are taken by Cracow, Wrocław and Poznań. However, institutions of the kind are now located in more than 100 of Poland's towns and cities (Fig. 8).

Warsaw again leads the way where the numbers studying are concerned (in excess of 270,000). However, Cracow, Wrocław, Poznań and Łódź each account for more than 100,000 students, while the cities in the 8 subsequent places together educate some 40,000 people. It will be hard to maintain this state of affairs in future, however, if for no other reason than that ever smaller year-classes are now reaching the age at which they would seek to embark upon higher studies. This process is already ensuring stiffer and stiffer competition and rivalry between establishments when it comes to attracting new students.

Gastronomy

Gastronomy is one of the service sectors that began to develop very rapidly in Poland from 1989 onwards. Before that time, the country had differed from other CEEC countries (leaving aside those of the former Soviet Union) in having rather weakly-developed gastronomic services, notwithstanding the fact that at least some of these had never left private hands. Efforts to explain this state of affairs usually revolve around the structure

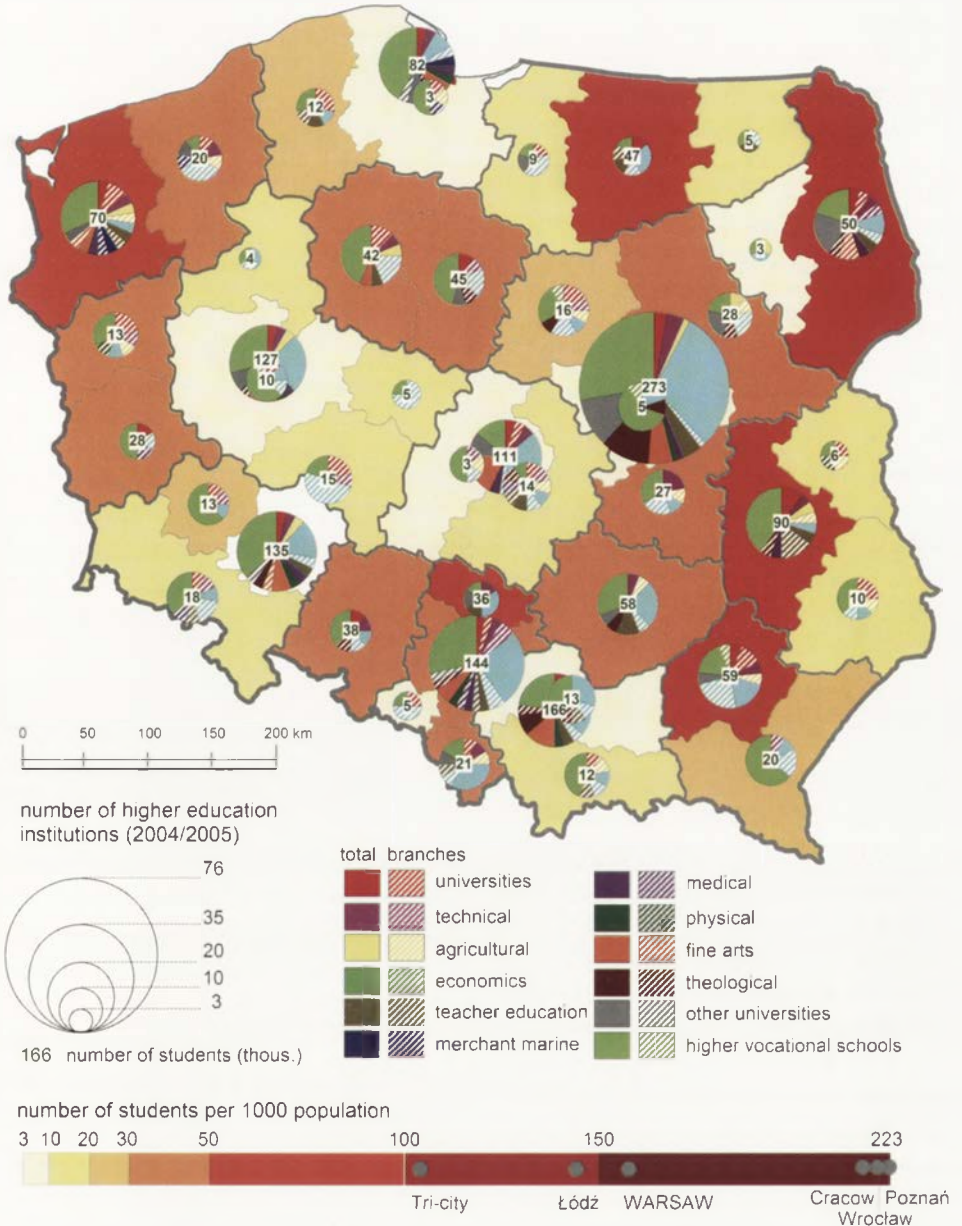


Figure 8. Higher education institutions and students, 2004/2005
(by Przemysław Sleszyński)

of Polish society (wherein a relatively high proportion is rural), a lack of development of certain cultural habits, a low level of wealth, etc.

It is thus true to say that a great breakthrough has taken place in this area of life in post-1989 Poland. In the first place there has been a development in quantitative terms, with the share of all food sales accounted for by gastronomic outlets increasing from 7.8% in 1990 to 10.8% in 2000 (Sala, 2004). This coincided with an increase in the number of restaurants, bars, etc. from 31,034 in 1989 to 88,067 in 2000. Furthermore, gastronomy continued to witness very clear progress as regards the quality of service, range of food on offer, aesthetics, etc. Thirdly, foreign firms providing gastronomic services have come on to the Polish market, and fourthly – Poles have begun to develop a taste for the cuisine of other countries, thereby sustaining a dynamic development of ethnic restaurants and bars (initially Vietnamese and Chinese, later also Arab and Turkish).

Any more penetrating analysis in what follows has had to be confined to just a few phenomena which hopefully characterise the present situation where services in Poland are concerned. The issues involved are the expansion of foreign chains, the development of Polish gastronomic networks similar to foreign ones in terms of what they have to offer and their organization, and the appearance of initiatives seeking to promote Polish culinary tradition.

The expansion of foreign networks offering gastronomic services

It is worth noting that the first foreign firm to appear on Poland's gastronomic market – in association with Swedish capital – was *Dania Fast Food*, which began to distribute buns, frankfurters, hamburgers, etc. to kiosks scattered across the larger cities and supplying "fast-food" in 1991. Though they still exist (having no fewer than 7 regional distribution centres in 2005), they were eclipsed rather rapidly as the global chains came in.

Today's undoubted leader on the Polish market is then the *McDonald's* global concern, which first appeared in Poland in 1992 (opening 3 restaurants that year). By 2005, this had grown to 208 restaurants, of which as many as 36 were in Warsaw. Overall, the outlets and other facilities associated with *McDonald's Polska Sp. z o. o.* employed some 10,000 people (or 60–80 per restaurant on average), while the value of the investment put in between 1992 and 2005 inclusive reached 650 million zł.⁴

Another foreign concern easily visible on the Polish market is *American Restaurants Holdings NV* (otherwise *AmRest*), which encompasses *Kentucky Fried Chicken (KFC)*, *Pizza Hut* and *Ice*Land*. It manages 30 KFC restaurants in the Czech Republic, as well as outlets in the three aforementioned categories across Poland⁵. Located within the "casual dining" segment of the market, the KFC restaurants appeared here in 1993, but had grown to 71 in number by 2004. In turn, the first *Pizza Hut* pizza restaurants

⁴ www.mcdonalds.pl, 25.09.2005.

⁵ Probably for this reason it is based in Wrocław, close to the Polish-Czech border.

opened in 1992, operating out of the then still-new 5-star *Marriott Hotel* in Warsaw city centre. As of 2004, there were 57 such restaurants nationwide (42 operating independently and 15 alongside *Kentucky Fried Chicken*)⁶.

To be mentioned among other foreign chains of restaurants demonstrating a particularly high level of activity in Poland is *TelePizza Poland*, associated with Spanish capital and also having the firm's pizzerias in the Czech Republic subordinated to it from 2004 onwards.⁷

However, for all that the *McDonald's*, *Kentucky Fried Chicken*, *Pizza Hut* and *Telepizza* chains proved capable of establishing themselves solidly on the Polish market, several world potentates in the same field did not. The first – initially very active – foreign chain to withdraw from Poland was *Burger King* (operating here in the years 1991–2001 inclusive). Another firm “lost” was the *Domino's Pizza* chain (present here from 1994–2002 inclusive).

Alongside the clear “winners” and “losers” on the Polish market are foreign chains whose expansion has remained much more limited, leaving a final assessment of their status a problematical one. Examples here would be the American restaurant chain *TGI Friday's*, the *Pizza San Marzano* pizzerias and *Dunkin' Donuts*.

Yet a further category would concern the chains only just venturing on to the Polish market, such as the *Tchibo Coffee Bar*⁸ and the rather similarly-profiled *Coffeeheaven International*, the first firm from Poland to be noted on the London Stock Exchange⁹.

In summary, the 10–15 years of experience since Poland's systemic transformation began have been enough to make it clear that the country's market represents not that easy a territory on which foreign concerns specializing in gastronomy may operate. After an initial period of dramatic expansion, a consolidation phase set in just a few years later, this turning into stagnation or even regression in certain cases. Some foreign concerns were simply not able to cope with the very stiff competition put up by other foreign corporations on the one hand, but also on the other by lesser restaurant chains (often Polish) and even a whole series of individually-owned bars, cafes and restaurants.

The appearance and development of Polish chains rendering gastronomic services

Domestic chains with offers and operations resembling the foreign ones

In response to the dramatic expansion of foreign gastronomic chains, the mid

⁶ It is interesting to note that, when *Pizza Hut* and *Kentucky Fried Chicken* restaurants first appeared in Poland, they were associated with the quasi-Mexican style outlet *Taco Bell*. This was, however, closed down on account of its limited popularity. In contrast, from 1999 the so-called “ice-bars” of *IceLand* came into operation, there being 22 of these by 2004. In total, the restaurants of *American Restaurants Holdings NV* in Poland employ around 5000 (www.kfc.com.pl, 20.09.2005, www.pizzahut.com.pl, 20.09.2005, www.amrest.com.pl, 20.09.2005).

⁷ www.telepizza.pl, 15.09.2005

⁸ www.tchibo.pl/bary.html, 17.09.2005

⁹ www.coffeeheaven.en.com/home/html, 22.09.2005. Outside Poland, this was present in 2005 on the Czech Republic market (3 outlets) and in Latvia (7). The plan for 2006 is to open the first cafes in Bulgaria and Romania, followed in later years by Lithuania, Ukraine, Slovakia and Hungary, as well as Estonia, Croatia and Slovenia.

1990s saw the first home-grown Polish initiatives seeking to establish chains of restaurants that nevertheless operated along similar lines to the foreign models.

The idea of founding a network of average-quality restaurants that could offer clients meals resembling oriental cuisine while at the same time meeting the requirements for the so-called “casual dining” establishments appeared in 1993, the brains behind it being explorer-entrepreneur Tomasz Morawski (*alias* Tom Maltom). The first restaurant of this new chain, dubbed *Sphinx*, was opened in Łódź in 1995. New restaurants began to appear quite soon thereafter, but all the time in line with an interesting and original location strategy that continued to ignore Poland’s capital city over the next several years. This phenomenon reflects the late-1990s saturation of the Warsaw market in gastronomy (cf. that of other towns and cities) with restaurants and bars offering Arab and Turkish dishes (Kaczorek and Kowalczyk, 2003). The presence of the new chain in Warsaw would doubtless have been sufficient to ensure the *Sphinx* restaurants a lesser reputation for novelty and innovation than they turned out to develop in the smaller agglomerations. In terms of both number of outlets and turnover, *Sphinx* was by 2004 the number-three chain in Poland (after *McDonald’s* and *Pizza Hut*). By 2005, they had 64 restaurants in 34 towns and cities. They were employing around 1200, had 6000–6500 places for diners, and

were serving 350,000–400,000 of them each month¹⁰.

The *Pizza Dominium* chain appeared in 1993 and rapidly began to open pizzerias that specialized in home deliveries. As of 2005, there were 32 in Poland and 1 abroad (in Moscow). The firm’s plans in turn call for the establishment of new outlets in Russia and Ukraine, as well as in London and New York,¹¹ along with *Kowalski Drive* bars in Cracow¹².

Chains offering traditional Polish cuisine

In 2003, as the May 1st 2004 day of Poland’s accession to the EU loomed ever larger, a public debate broke out regarding the need to take steps to win protection for any food-industry products from Poland that might gain recognition as regional products with protected designation of origin.

A further example of initiatives seeking to preserve Poland’s culinary traditions may be seen in the chain of restaurants belonging to famous Cracow restaurateur Jan Kościuszko (known as the *Chłopskie Jadło* group – the official English translation being “Peasant Food”). This began life in 1995, with the opening of a first restaurant offering traditional Polish dishes at Głogoczów (by the very busy Cracow-Zakopane road). The reference to the traditions of Polish cooking was enough to ensure that the restaurant received the very prestigious

¹⁰ www.sphinx.pl, 30.09.2005; *Sphinx w naturciu*, Food Service, 4, pp. 16–18.

¹¹ www.pizzadominum.pl, 01.10.2005.

¹² At this point, mention might also be made of an idea appearing a few years ago in Poland, whereby fast-food outlets of the *McDonald’s* type would include on their menu some meal more in line with the traditions of Polish cuisine and given the working title of the *McKiełbaso* (a kind of sausage) – the idea also gained acknowledgement in the product called *WieśMac* in Polish.

Teraz Polska ("Poland Now") award that very same year, this being conferred by the President of Poland upon products considered of value in promoting the country. Noting the geographical distribution of the *Chłopskie Jadło* group (an 8-restaurant chain by 2005, plus stands in 10–20 supermarkets), it is possible to discern the owner's consistently-developing strategy of opening outlets: (i) in or close to places representing major tourist attractions – as in Cracow's Old Town and Zakopane (though less so in the case of the Warsaw restaurant), (ii) by roads of importance (especially to tourist traffic) e.g. at the aforementioned Głogoczów (between Cracow and Zakopane) and at Poczesna near Częstochowa (on the Katowice–Warsaw/Łódź route). These two factors, combined with a persistent

referring back to the traditions of Poland's rural cuisine (even in a magazine entitled *Na chłopski rozum* published since 2001) and the commencement with catering services from 1999, have ensured the status of the *Chłopskie Jadło* group as a fine example of gastronomic activity largely targeted at those interested in culinary tourism (Kowalczyk, 2005)¹³.

Another chain seeking to draw on Poland's culinary heritage is *Leśne Runo*, which appeared in the year 2000 at the initiative of *Towarzystwa Przyjaciół Polskiej Kuchni* (The Society of Friends of Polish Cuisine). By 2005, there were 6 *Leśne Runo* restaurants along the country's main roads (and concentrating to a large extent on dishes with wild mushrooms, desserts with bilberries and raspberries, and so on). This denotes



Photo 3. Country-style restaurant in central Poland

¹³ www.chlopskiejadlo.com.pl, 15.09.2005.

a targeting of motorized tourists, foreigners among them, who are particularly keen to visit the Mazurian Lakeland. Further confirmation, were it needed, is that all of the restaurants are adjacent to the petrol stations of *PKN Orlen* (Poland's largest distributor of fuels) or *Statoil*¹⁴.

The objective of promoting Polish dishes has also been set by the authorities in certain regions or at local level, as well as those otherwise involved in the promotion of tourism¹⁵.

The region of Poland cultivating culinary tradition to the greatest extent on a day-to-day basis, and thus starting to be perceived as an "own brand" where the tourist trade is concerned, is the north-east of the country, i.e. Podlasie (part of eastern Podlaskie voivodship) in general, and the area around Suwałki in particular. Drawing an ever greater following among Poles and foreign tourists, the Podlasie cuisine boasts, not only its specifics in gourmet terms (entailing both the choice of products and the way they are processed), but also a cultural background of its own reflecting the region's role as a meeting point for the culinary traditions of Poland, Lithuania, Belarus and the Tatars. Survey research carried out by a website

has revealed that the dishes considered most representative of Podlasie are: the layered cake known as *sękacz* (indicated in 43.5% of cases), the potato dish known as *kartacze* (29.4%), the potato-bake *babka ziemniaczana* (12.9%), and the typically Lithuanian lentil-stuffed *pierogi* known as *soczewiaki* (14.1%).¹⁶ Further traditional foods put forward as specialities of the region include the *Herbowe* soured cucumbers made to the same recipe in Kruszewo since 1925, cold meats (in the shape of Lithuanian *kindziuk* and country sausages), cakes (notably the aforementioned *sękacz* baked in Sejny by a local family since 1890), and above all potato dishes (*babka ziemniaczana* and the grated-meat-and-potato loaf known as *kiszka ziemniaczana*). Attesting to the original nature of a Podlasie cuisine that is worthy of special treatment is the recognition as a regional product under EC law of what is called *pierekaczownik*, multilayered *pierogi* of Tatar origin stuffed with meat, onion and pepper and attaining diameters of 30 cm and weights of around 3 kg¹⁷.

Another case of the promotion of local culinary traditions might entail the 2001 appearance in the Podhale region (the mountain foothills area located

¹⁴ www.lesneruno.pl, 05.10.2005. In 2004, the aforementioned *Towarzystwo Przyjaciół Polskiej Kuchni* took on the *Stajnia Polska* chain with its 30 riding centres across Poland – the aim being to promote and support tourism on horseback.

¹⁵ For example, in 2003, the Association (based in Piecki in the Mazurian Lakeland) was joined by the authorities of Mrągowo county in issuing a tourist map marking the locations of 40 agritourist farms, restaurants, etc, specializing in the serving of local dishes (Title: *Wiejskie jadlo. Mapa kulinarna powiatu mrągowskiego*, Stowarzyszenie Na Rzecz Rozwoju Turystyki Wiejskiej in Piecki and Powiat Office in Mrągowo, Piecki and Mrągowo, 2003). This shows that the dishes most often on offer in this part of Poland are the traditional country fare of different kinds of *pierogi* (mainly with wild mushrooms, bilberries and meat), wild mushroom soup, *babka ziemniaczana* and potato pancakes, and dishes with fresh or smoked fish.

¹⁶ www.produkt-regionalny.org, 20.09.2005.

¹⁷ www.produkt-regionalny.org, 20.09.2005; www.wrotapodlasia.pl, 05.10.2005; KIKA, 2004, *Podlaskie rarytasy*, supplement entitled *Podlasie w stolicy*, *Gazeta Wyborcza-Białystok*, 02-03.2004 r., pp. 4, 6, 8 and 10.

administratively within southern part of Małopolskie voivodship) of the *Oscypek Trail*. As of 2005, this linked together 15 places (mainly shepherds' huts) at which the special smoked sheep-milk cheese of the above name is made. The idea may yet gain further popularity, since around 100 Podhale households are currently considered to be involved in making *oscypek*, as well as the soft white cheese *Podhale bryndza*, also made from ewe's milk (Jasiński and Rzytki, 2005).

Similar trends are beginning to emerge in other regions. Thus, in Lower Silesia (Dolnośląskie voivodship), around 100 producers have come together to form a group marketing "Heather honey from the Lower Silesian Forests". The phenomenon is particularly visible in those parts of Poland that retain a quite distinct culinary tradition, i.e. Silesia (in which the cooking resembles that across the border in parts of Germany and the Czech Republic), around Poznań (dishes of the Wielkopolska region again recalling those of Germany), in the Cracow area (the cuisine of what is known as Małopolska making some reference to Austria and in particular – in the Podhale region – to that of Slovakia), around Warsaw (Mazovian cuisine) and to the north of it (in the Kurpie region), as well as in areas adjacent to the cities of Gdańsk (Kaszuby cuisine) and Lublin.

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Poland's systemic transformation has been accompanied by several distinct trends from the point of view of the development of services, especially in retailing and gastronomy:

– A near-complete privatization of what pre-1989 had been in state or coopera-

tive hands to a large extent (gastronomy) or partially (retail trade).

- The involvement in the running of outlets offering gastronomic services of people not having previous experience of this kind (especially in rural areas, as at agritourist farms).
- Entry on to the Polish market of large foreign corporations running extensive chains of outlets, be these in banking or gastronomy.
- The appearance (generally singly but sometimes latterly in sufficient numbers to create small local or regional networks) of an ever greater number of shops (notably grocers') or restaurants/bars offering ethnic cuisine – of European nations but more often of East Asia and the Middle East.
- The appearance of initiatives to cultivate, promote and develop traditional Polish cooking (as well as the cuisine of nations present today or in the past on Polish territory, e.g. Jewish).

All of the aforementioned phenomena have been ongoing simultaneously, ensuring that retailing, banking services, gastronomy and many other types of service-sector activity in Poland have come to differ less and less from the similar services being rendered in other European countries. Where there are still differences, this does not necessarily imply that the services available here are offered at a lower level of quality.

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Tourism

Marek Więckowski

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: marekw@twarda.pan.pl

Introduction

Sporadic examples of foreign travels by the inhabitants of Poland were to be noted from the time the Polish state first came into existence. These were mainly trips in the nature of pilgrimages, or else journeys made in the name of diplomacy and trade; these being augmented from the 14th century on by stays passed in other countries for the purposes of higher education. Another of the earliest forms of tourism related to spa visits – Cieplice Śląskie and Łądek (Lower Silesia) were known for this as early as in the 13th century. Sightseeing tourism began to develop in the late 18th and early 19th centuries, while the latter era brought ever-more-frequent trips of the more typical recreational kind. These were again mainly associated with spa towns (i.a. at that stage Krynica, Busko Zdrój, Iwonicz, Szczawnica and Ciechocinek, and later also Zakopane). It is back to the 19th century (and also earlier) that there dates the development of coastal resorts (Sopot, Kołobrzeg, Świnoujście and Międzyzdroje). Tours of the mountains also began to devel-

op at that time, and it was there that a true beginning to Polish tourism can be said to have been made. The key date is 1873, for it was then that Poland's first organization catering for tourism *Galicyjskie Towarzystwo Tatrzańskie* (the Galician Tourist Society) came into existence. This became the Polish *Tatra Mountains Society* in 1920. A rapid development of tourism took place in the inter-War period, but that was brutally interrupted by Second World War. Subsequently, tourist traffic was concentrated in the spa areas of the Carpathians, in the Warsaw area and along the coast.

Under communism it was inevitably domestic tourism that prevailed, and to a very large extent tourism of an organized nature. The organizations *Polskie Towarzystwo Turystyczne* and *Polskie Towarzystwo Krajoznawcze* came back into existence, only to merge in 1950 to form the *Polskie Towarzystwo Turystyczno-Krajoznawcze* (PTTK, or the Polish Tourist and Country-Lovers' Society). This organization operates to this day, albeit with a much lesser role currently than in the past. In the 1970s and 1980s, the trips organized by the PTTK

were participated in by almost 10 million people – cf. just 1 million at the end of the 1990s. Trips and stays in holiday homes were also supported by the Workers' Holiday Fund (*Fundusz Wczasów Pracowniczych*) established in 1949, as well as by large tourist offices.

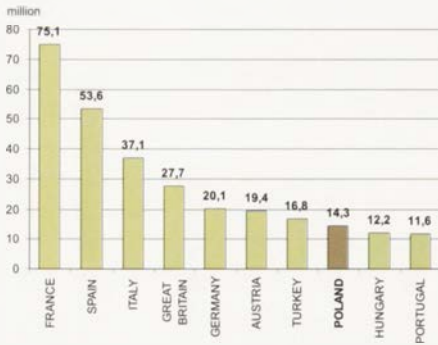


Figure 1. Number of foreign tourists in selected European countries, 2004 (acc. to data from World Tourism Organization)

Individually-organized trips have become more and more popular since 1989. Rest-and-recreation tours, as well as sightseeing trips, are organized by an ever-large number of travel agencies. Likewise, the significance of the private sectors has increased in relation to the overnight accommodation base, the trips on offer and the variety of travel agencies. Thanks to this liberalization, to the opening of borders and easing of visa restrictions, and to full access to passports and foreign currency, there has been a marked growth of tourist traffic both to and from Poland. New organizations created include *Polish National Tourist Office*, *Polish Chamber of Tourism* and other governmental bodies or NGOs whose aims include the promotion of tourism in Poland and beyond.

Currently, tourism is indicated as one of the sectors capable of ensuring dynamic economic growth in Poland, while at the same time limiting the consequences of any changes that need to be made. It is at one and the same time a tool by which to address the unemployment problem taken note of in many government documents and development strategies at voivodship level which put it even in first place. Under the *Strategy for the Development of Tourism in the Years 2001–2006*, adopted by the Government, the main aim of state policy in this field is supposed to be to improve the competitiveness of what Poland has to offer tourists nationally and internationally. Favouring this will be an expansion of the attractions at regional level and in general, *inter alia* through the presenting of the country's cultural and natural heritage, improved accessibility to the foreign and domestic tourist markets, activation at the administrative levels of the voivodship, poviát and gmina, and an enhancement of the roles of regional and local tourist organizations where the shaping and development of the possibilities on offer are concerned. The Strategy for the development of tourism further assumes that tourist development can only progress where the principle of sustainable development is adhered to, with simultaneous respect extended to the rights of nature protection and protection of the environment. Regional programmes for the development of tourism must therefore take full account of the capacity of the environment to absorb tourist traffic, as well as the need for it to be utilized sustainably and to show a preference for forms of tourism that favour biodiversity conservation.

Poland's place within European tourism

The isolation, marginalization and political blockade that communist Poland was subjected to ensured that the significance of international tourism was always very much limited. After Second World War, the tourist traffic bound for the communist countries was very effectively controlled. While there was the odd period with rather more intensive tourist traffic, it was really only after 1989 that freedom to cross the borders virtually at will reappeared. Likewise, after the very major political, social and economic changes that took place in Central and Eastern Europe, the significance of Poland as a destination for tourists began to increase markedly. In 1990, some 3.4 million visits by foreigners were made. Currently, Poland is a destination for upwards of 14 million tourists annually, placing it at the top of the second ten world tourist destinations, and in 8th place in Europe. The record year of 1997 brought 19.5 million tourist visits.

The numbers visiting Poland are obviously much higher. The figure obtained for the number of border crossings made in 2004 is 62 million (cf. 89 million in record year 1999) – for tourist traffic see the chapter by T. Komornicki.

The causes underpinning this development are very complex and do not simply reflect the opening of borders and increased mobility. Purchasing power parity and the level of earnings ensure the existence of transboundary movements and tourism of a "commercial" nature. Also to be mentioned are improved accessibility, the quality of the overnight accommodation base and offer made available to tour-

ists, and other services. Heritage cities are gaining in significance, as are attractive natural environments under protection (like the Mazurian Lakes and Carpathians) and history-related factors (e.g. the sentiment Germans still feel for Poland's "regained territories").

Tourism is a social phenomenon that has considerable spatial implications. The intensiveness of tourist traffic varies greatly across Europe, with more than 2/3 of all those engaged in it heading for the western and southern European countries. The world's largest tourist region – the Mediterranean Basin – receives more than 360 million visits a year. This intensively visited area also extends northwards to take in the rest of France, the Alpine countries, the Benelux countries and the UK and Norway. Indeed, in the last 10 or so years it has also extended eastwards to include Poland, Hungary and even a couple of tourist centres in Russia. Poland can in no way match the leading European destinations of France, Spain or Italy when it comes to tourism, not can it really compete with these or other countries when it comes to the most popular form of tourism encapsulated by the abbreviation of "the 3 S" (Sea, Sun and Sand).

Within the EU, tourist activity depends mainly on the dynamics to regional clientele (be these domestic or international, or – as in the decided majority of cases – from neighbouring countries). Tourists from neighbouring countries represent 76% of all foreign tourists coming into Poland, and as much as 94% of those making day-visits. Polish tourism remains very much dominated by domestic traffic, the share of the total it accounts for being among the highest in the EU. At the

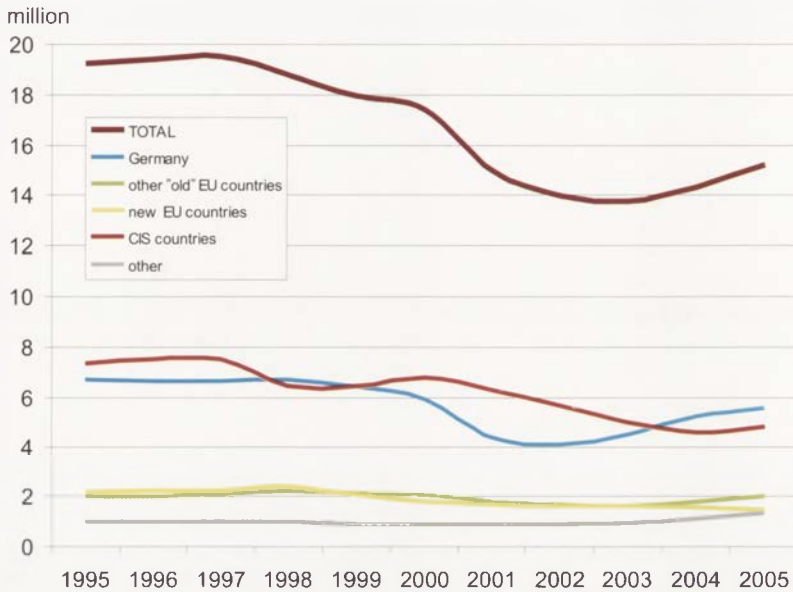


Figure 2. Arrivals of foreigners to Poland, 1995–2005 (acc. to data from Institute of Tourism in Poland)

registered tourist objects, some 83% of the total are from within Poland (cf. 86% in Germany, 78% in Sweden and 73% in Finland) (Fig. 2, Fig 3).

The main tourist attractions

Thanks to its rich and long history, Poland can boast a wealth of heritage and monuments. The most precious of these have been entered on the UNESCO List of World Cultural and Natural Heritage. Many are outstanding natural objects, but where cultural heritage is concerned, the items listed and representing major attractions for domestic and foreign tourists at the same time are:

- Cracow's Old Town – entered on the list in 1978,
- The Wieliczka Salt Mine and Museum (1978),
- Oświęcim (Auschwitz), the largest of the concentration camps established by the Nazis (1979),
- Warsaw's Old and New Towns (1980),
- the Białowieża Primeval Forest (1980),
- Zamość historical centre (1982),
- Toruń – the complex of Mediaeval architecture (1997),
- Malbork – the castle of the Teutonic Knights (1997),
- Kalwaria Zebrzydowska – the Bernardine monastery complex with stations of the cross (1999),
- Jawor and Świdnica – Evengelical "Peace Churches" from the 17th century (2001),
- Binarowa, Blizne, Dębno, Haczów, Lipnica Murowana and Sękowa – wooden churches in Małopolska (2003),
- Łęknica, Mużakowski Park – a landscaped park from the early 19th century (2004).

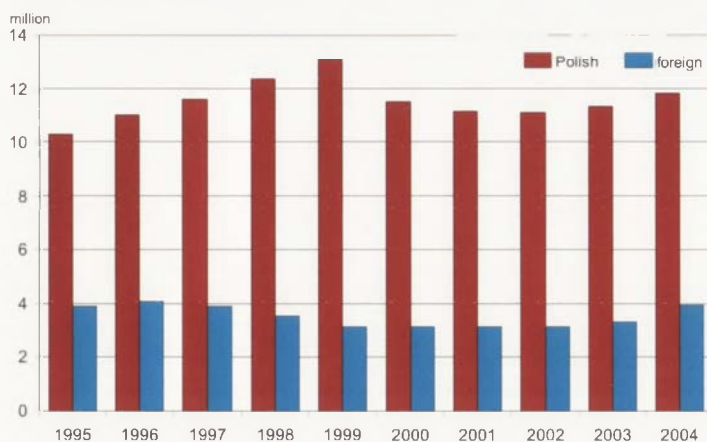


Figure 3. Tourists using accommodation, 1995–2004
(acc. to data from Institute of Tourism in Poland)

Poland further features a number of attractive features significant on the European scale and capable of drawing tourists from across the continent, if not the world, i.e.:

- wild nature – an attractive landscape and the possibility of seeing animals (i.a. in the Bieszczady Mts., Polesie, the Białowieża Forest, Biebrza Valley and the Mazury region),
- the chance to sail or navigate along rivers and canals (also taking a raft along the Dunajec river in the Pieniny Mts. kayaking and canoeing along the Brda, Czarna

Hańcza, Drawa and Krutynia rivers, and making trips along the Elbląski Canal),

- a range of heritage buildings (including but not solely those on the World Heritage List),
- historic city centres (i.a. of Cracow, Warsaw, Gdańsk, Wrocław and Poznań),
- cultural events (i.a. in Cracow, Warsaw, Łódź, Żelazowa Wola and Łańcut),
- castles and re-creations of mediaeval tournaments (e.g. at Golub-Dobrzyń),
- “wooden Poland” (e.g. at the village of Chochołów and in Podlasie, or else at outdoor museums in such places as



Photo 1. Cracow (Kraków) – Market Square and Mariacki church



Photo 2. Wieliczka Salt Mine near Cracow

Natural and human environment of Poland

- Sanok, Kluki, Wdzydze Kiszewskie and Ciechanowiec),
- horse-riding,
- spa and health-resort tourism (at Międzyzdroje, Świnoujście and Kołobrzeg, as well as in the Sudetes and Carpathians),
- places of pilgrimage (assuming ever-greater significance for foreigners in relation to places associated with the life and work of the late Pope John Paul II – i.e. Cracow, Wadowice and the area. The Sanctuary of the Mercy Mother of God in Częstochowa has also assumed international significance).



Photo 3. The beach on the Baltic Sea in Dziwnów (Western Pomerania)

Poland of course possesses many other spots attractive from the point of view of tourism. In addition to those mentioned above, there are a number of places that have primarily been of importance to the domestic customers, but have recently come to be discovered by foreigners as well. Nationally, the most significant attractions are related to:

- mountain tourism (i.a. in the Tatra, Pieniny, Bieszczady and Karkonosze Mts.),
- ski tourism (i.a. at Zakopane, Szczyrk, Krynica, Szklarska Poręba, Zieleniec, Karpacz and Czarna Góra),

- health tourism (at the many spas like Kudowa Zdrój, Krynica, Rabka and Ciechocinek),
- pilgrimage tourism (to Częstochowa – Jasna Góra, Kalwaria Zebrzydowska, Grabarka, Licheń, etc.),
- speleological and climbing holidays (in the Tatras, the Cracow-Częstochowa Upland, the Karkonosze and Rudawy Janowickie Mts.),
- water sports (in the Lakelands and on the coast, etc.),
- sightseeing tourism (e.g. in the Wielkopolska region),
- agritourism (in the Podlasie, Roztocze, Pomeranian and Mazury regions, among others),
- archaeological tourism (e.g. at Biskupin, Krzemionki Opatowskie, etc.).

Places attractive from the point of view of nature (most especially the protected areas) have a particular role to play within Polish tourism. One area referred to already is the Białowieża Forest protected within the Białowieża NP. This is the only primeval forest area left in the European lowland. The Biebrzański (Biebrza) NP, protecting one of Europe's largest marshland areas, is also unique, obtaining tourist income from kayaking/canoeing and birdwatching. A similar role is played by the Narwiański (Narew) NP and the "Ujście Warty" (Warta Mouth) NP, though these are rather potential (than current) magnets for tourism at this stage. The two coastal National Parks represent massive tourist attractions. Indeed, they are visited by such numbers that a threat is posed to nature in summer. Słowiński NP is close to the major seaside resort of Łeba, yet it is obliged to protect Europe's 3rd highest



Photo 4. Hel Peninsula on the Baltic Sea

coastal dunes, plus lagoons and forest, generating a very important habitat for birds. Similarly, Woliński NP on Wolin Island (Poland's largest island) receives more than 1.5 million tourist visits and is close to the German border and the two large coastally-located health-resorts of Świnoujście and Międzyzdroje. Naturally-valuable areas within that Park include sea-cliffs nearly 100 metres high, an area of sea and the delta of the Świna.

Even more thronged by visitors are the National Parks in the mountains. Poland's number one natural attraction – the area of the Tatra Mts. – receives around 3 million visits a year. This is the only Alpine-type area in Poland and is also well-known abroad. The nearby Pieniński (Pieniny Mts.) NP has been a destination for tourists since the 19th century, its main attraction being the chance to raft through the gorge of the Dunajec river (something that around 600,000 tourists do each year). The National Park in the Karkonosze Mts. (the

highest in the Sudetes) receives 1.2 million visits a year, while that in the Świętokrzyskie Mts. (Poland's oldest fold mountains topped by rock fields) is also popular. The Bieszczady Mts. (in Bieszczadzki NP) have mountain meadows known as poloninas on their tops and play host to some 300,000 tourists annually, while 250,000 frequent the Stołowe Mts. (Poland's only table mountains of weathered sandstone carved by nature into shapes that resemble people, animals and plants).

Where the inhabitants of the large cities are concerned, weekend and sight-seeing tourism is engaged in in neighbouring National Parks, like Kampinoski NP, which actually borders on to Warsaw. It absorbs some 1 million+ visits a year. The Wielkopolski NP close to Poznań is even more popular, attracting 1.2 million visits, while Ojcowski NP near Cracow takes c. 400,000. Kampinoski NP protects extensive areas of forest, dunes and marshes, while Ojcowski NP includes

protects part of the Cracow-Częstochowa Upland – one of the most interesting geographical regions in Poland, featuring a karst landscape with many caves, limestone rock formations and an interesting vegetation. Its tourist attractions include a number of castles and castle ruins situated picturesquely within the natural landscape.

Tourist management

The most important element in tourist management is the overnight accommodation base, which is still in large measure the legacy of the communist period. As of the 1950s, there were some 30,000 places in overnight accommodation, but in consecutive decades the number rose steadily to exceed 900,000 in the 1980s. The majority of the objects involved were rest and recreation centres associated with places of mass employment and often open in the summer only. The 1990s and first years of the 21st century saw many of the old, outdated centres closed down or renovated. Thus the numbers of both centres and accommodation places has been in decline, and the accommodation base is thus adequate for neither the increasing numbers of visitors nor the growing demands and expectations they bring with them. As of 2004, there were 6972 units in Poland offering some 584,600 overnight accommodation places. A positive aspect concerns an increase in the number of these that are of European standard. The numbers of hotels or hotel-like institutions in 2004 was 2139 (1202 true hotels), with 165,300 places (cf. 50,000 in 1980 and 71,000 in 1994).

The accommodation base is not distributed evenly (Fig. 4). The most objects

and rooms are in the voivodships of Western Pomerania voivodship (108,000 places), Pomerania (87,000) and Małopolskie voivodship (65,000). The majority of tourist centres arose in earlier centuries (mainly the 19th), above all on the coast and in the mountains. Away from such large cities as Cracow, Warsaw, Wrocław, Poznań and Gdańsk, the main tourist areas in Poland are on the peripheries and close to the borders. The main locations for the overnight accommodation base are along the coast and in the Sudetes and Carpathians. Other important regions for tourists are the lakelands and uplands.

Fortunately, the distribution of the tourist base in large measure coincides with tourist traffic in terms of both its intensity and distribution (Fig. 5).

The significance of tourism to the economy

While spending by foreign tourists amounted to nearly \$9 billion in 1997, the income has been in decline since, with no real bottoming out until 2003 and beyond. There is probably now something of an upturn, with the 2004 figure back up to an estimated \$5.8 billion, or the equivalent of 4.5% of GDP (Fig. 6).

Since 1990, there has been a marked decline in the role foreign tourism plays in the overall value of exports. At the start of the transformation period, the sector was still a very important one in proportionate terms, accounting for more than 20% of total exports (see Table 1). As of 2004, income from tourism was worth just 6.1% of the value of exported goods and services.

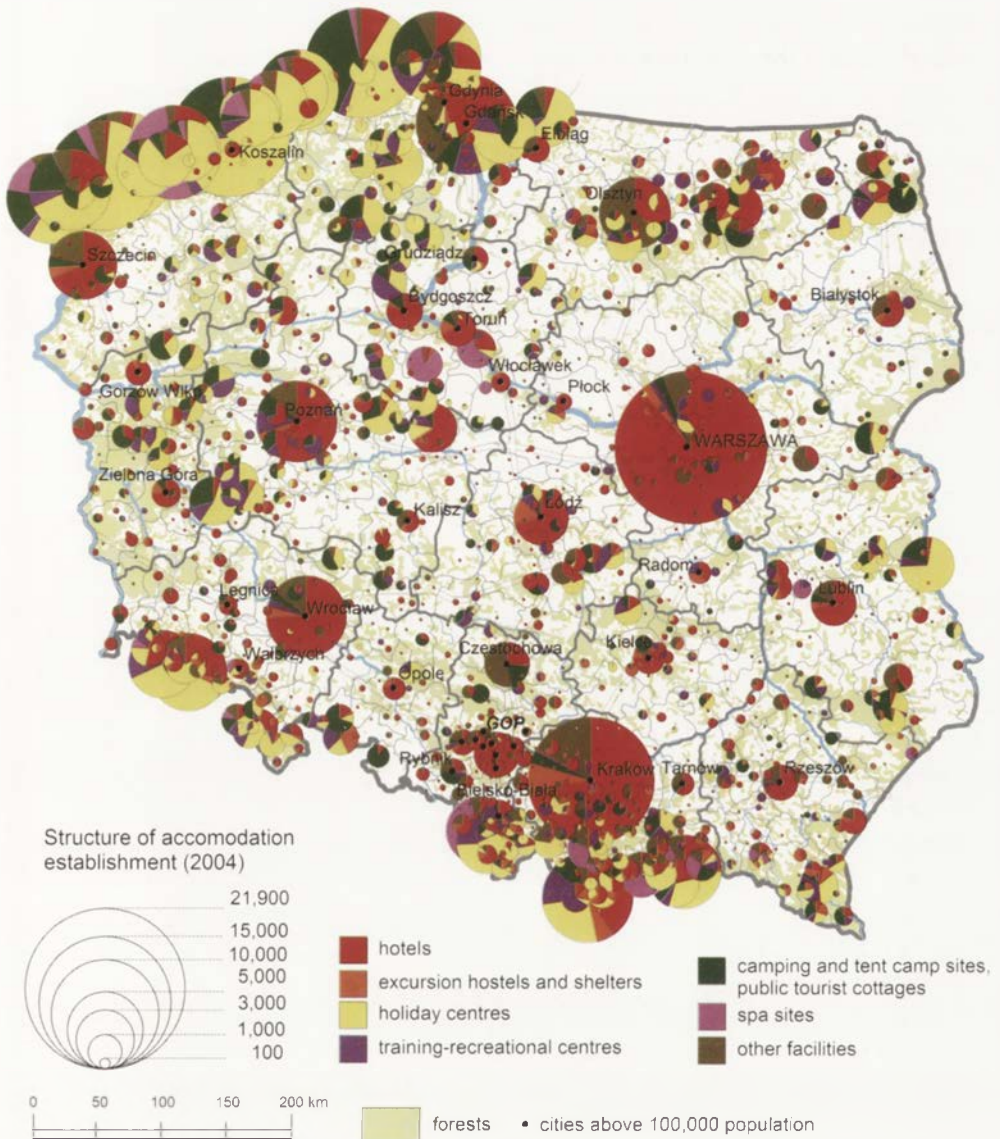


Figure 4. Structure of accommodation establishment by communities (gminas), 2004 (by Przemysław Śleszyński)

As of 2003, the enterprises included within Section H "Hotels and restaurants" employed 214,300. Of this total, Mazowieckie voivodship accounted for 15.6%, followed by Śląskie (13.1%), Małopolskie (10.6%), Wielkopolskie (8.5%), Dolnoślą-

skie (8.4%) and Pomorskie (8.2%). Together, these voivodships accounted for 137,800 people, two-thirds of all those employed in Section-H firms. There were fewest involved in the Podlaskie, Świętokrzyskie and Opolskie voivodships. The numbers working

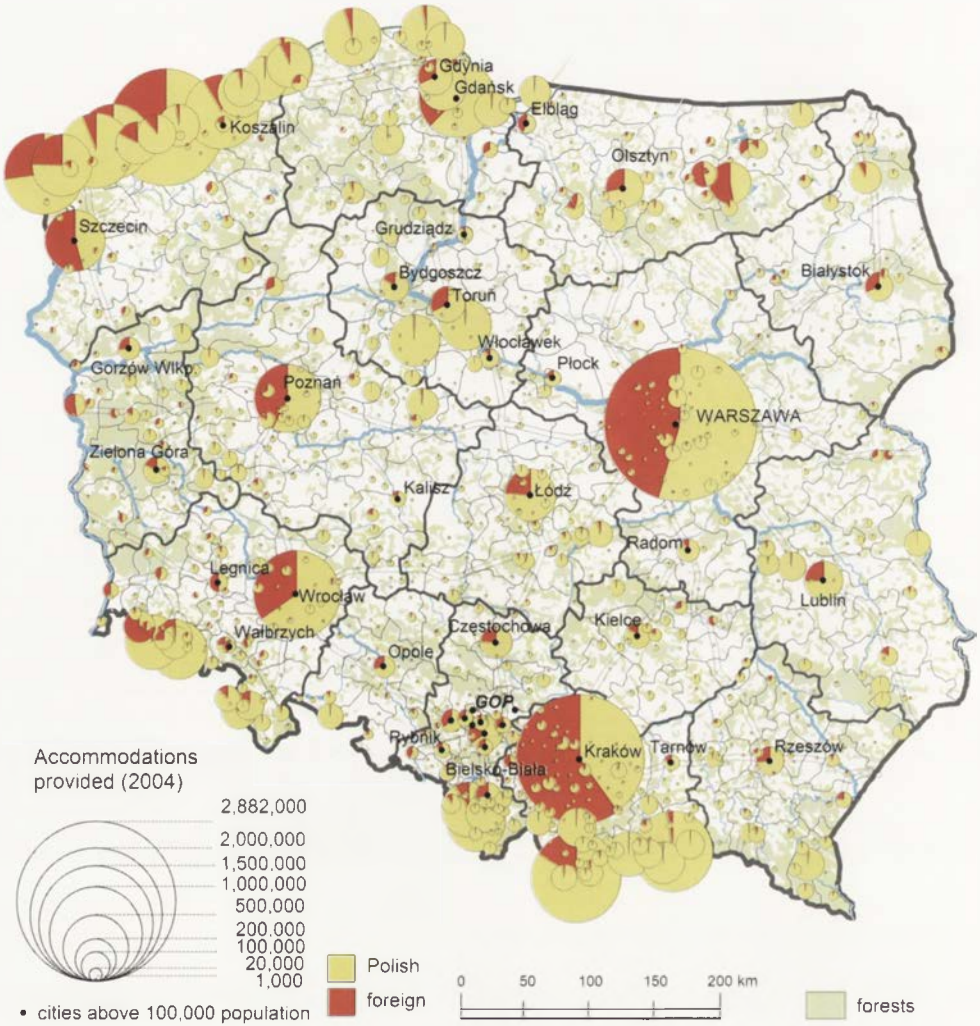


Figure 5. Accommodations provided by communities (gminas), 2004 (by Przemysław Śleszyński)

in tourism, especially indirectly, are much greater. Estimates speak of figures between 600,000 and 1 million.

More than 2800 travel agencies were registered in Poland in 2004. These were concentrated in voivodships whose populations have the greatest potential to go on visits and tours and/or are themselves

characterized by the presence of features of major tourist interest. There are most such offices in Mazowieckie voivodship (501 – or 17.6% of the national total for businesses registered to engage in this kind of activity). The dominant position of this voivodship reflects the fact that many travel agents' have their representative

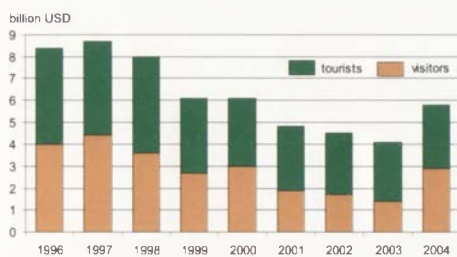


Figure 6. Spending by foreign tourists, 2004 (acc. to data from Institute of Tourism in Poland)

offices in Warsaw, even when their economic activity actually takes place somewhere else. The voivodship in second place where the number of tourism-related business entities is concerned is Śląskie (396, i.e. 13.9% of the total), followed by the voivodships of Małopolskie, Dolnośląskie and Wielkopolskie. These five leading voivodships account for 60% of all the agencies.

Poland has made quite a dramatic appearance on the tourist map of Europe

and is rapidly consolidating its position. Where the Europe-wide market is concerned, tourism in Poland is mainly directed at shopping, city-breaks, coastal tourism and health-resort tourism. Also of major significance are pilgrimages and business travel. Poland also has natural landscapes and a wealth of wildlife on offer, in association with the development of ecotourism and tourism for walkers and hikers. Poland's accession to the EU made it still easier for Poland to be visited from the rest of Europe. In the last several years it has become more or less the norm for the Dutch to go skiing in the Karkonosze Mts. in winter, for the Germans or Danish to come for the weekend for some kind of health treatment, or to drop into Szczecin or the vicinity. Thanks to the low-cost airlines and increasing range of overnight accommodation, as well as marketing activity beyond Poland, it is also ever-more usual for European tourists to visit Cracow or Warsaw for a couple of days.

Table 1. Spending by foreign tourists and their role in relation to exports, 1996–2004

Year	Value of exports (million USD)	Spending by foreign tourists (million USD)	Spending by tourists as a percentage of the value of exports (%)
1996	37 304	8 444	22.6
1997	39 646	8 679	21.9
1998	43 307	7 946	18.4
1999	38 423	6 100	15.9
2000	46 301	6 092	13.2
2001	51 416	4 815	9.4
2002	56 777	4 491	7.9
2003	72 173	4 069	5.6
2004	94 960	5 786	6.1

Source: Bartoszewicz and Skalska, 2005.

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The transport system of Poland in a period of transition

Zbigniew Taylor

Institute of Geography and Spatial Organization
POLISH ACADEMY OF SCIENCES
e-mail: z.taylor@twarda.pan.pl

The paper is intended to outline the nature of Poland's transport system in a period of economic-political systemic transformation. The system consists of road, urban, rail, port, inland and maritime water, and air subsystems. The paper deals with the physical, spatial and institutional characteristics of the system, describing past and present problems of national transport. There are great differences in the scope of changes among the various modes of transport.

Poland – a bridge between East and West?

Down the centuries, the territory of what is today Poland was located at the intersection of routes linking Eastern and Western with Northern and Southern Europe. Indeed, Poland is located in Central Europe, between natural transport barriers – the Baltic Sea in the north and the mountain ranges of the Sudetes and the Carpathians in the south.

Thus, the country's transport network potentially creates an opportunity for convenient connections between the markets of the European Union in the west and the Commonwealth of Independent States (CIS) in the east, as well as between Scandinavia and the countries of Central and Southern Europe. Polish territory includes four of the fundamental trans-European transport corridors (plus branches) determined to exist in the course of the Second Conference of European Transport Ministers held on Crete in 2002 (Fig. 1). Corridor I leads from Helsinki via Riga and Kaunas to the city of Warsaw. This is so-called *Via Baltica* route. There is also a branch of the Corridor from Riga via Kaliningrad to Gdańsk (the so-called *Via Hanzeatica*). Corridor II runs from Berlin via Warsaw to Moscow and Nizhniy Novgorod in Russia. Corridor III leads from Berlin via Wrocław to Lviv and Kiev in Ukraine, also embracing a branch from Dresden to Wrocław. Finally, Corridor IV runs from Gdańsk via Katowice in Upper Silesia to Žilina in the Slovakia. Additionally,



Figure 1. Routes of Trans-European Corridors in Poland as outlined during the Second Crete Conference of European Ministers of Transport, 2002

it also embraces two branches – one from Grudziądz to Poznań, and the second from Katowice to Ostrava and Brno in the Czech Republic. Moreover, two other corridors are proposed. The first one runs from Świnoujście in north-westernmost Poland on the Baltic Sea coast, via Zielona Góra to Prague in the Czech Republic, while the second (the so-called *Via Intermare*) con-

nects Gdańsk (via Warsaw) with Odessa on the Black Sea coast (*Aktualizacja raportu ...*, 2003).

In the European context, Poland is a medium-sized country inhabited by about 38.2 million people. In use in this area are 20,250 km of rail lines, giving an average network density of 6.6 km per 100 km². 60.4 per cent of standard- and broad

gauge lines are electrified. The road network embraces 379,500 km, of which 66 per cent of roads are paved and 34 per cent dirt. Among the hard-surfaced roads only 522 km were motorways, with other dual-carriageways accounting for even less – just 233 km. The average public-road density was 80.7 km per 100 km² (2004).

Despite an undoubtedly convenient geographical location, Poland has not so far proved able to take advantage of this. One obstacle is the poor condition of the country's transport infrastructure. The road network is relatively lacking in links of a superior standard, especially motorways and dual-carriageways, to the point where no comprehensive system has yet been established. High-speed railways are also lacking. Only a few lines allow for journeys at speeds of up to 160 km/h, including the Warsaw/Berlin, Opole/Wrocław and Warsaw/Katowice sections. With the exception of a few modernized stretches, the remaining rail infrastructure is under a process of ongoing depreciation. The state and level of usage of the Odra waterway would also have to be described as unsatisfactory. If relevant undertakings are not engaged in, it is possible to envisage the important transit routes being hosted by the Czech Republic and Slovakia, or else the Baltic Sea, instead of Poland.

Road transport

Cars were in short supply in Poland until 1989. Indeed, the very opportunity of buying a car was confined to a select, most-privileged group within society. A predominance of domestically-manufactured cars was also to be noted.

It was only after 1989 that the socio-political changes in Poland allowed for free development of individual car ownership (Table 1). The years 1995–2004 brought annual increases of 2–5 per cent in absolute numbers of road vehicles. Taking into account a sharp decrease in the numbers of motorcycles and mopeds owned, the real increase in the number of cars is huge and accelerating. However, because of the relatively low socio-economic status of society, almost 37 per cent of cars are 16 years old or older, frequently also second-hand, with many used automobiles being imported on a case-by-case basis from the much richer Western European countries.

Unfortunately, the number of cars purchased is not in line with the growth of road infrastructure. The relative increase in the road network is lagging much behind the increase in the number of vehicles on Polish roads. A serious problem is the virtual lack of dual carriageways and motorways (Fig. 2). Average annual growth at the rate of several dozen kilometres does not solve the problem. In place thus far are the A4 motorway from Cracow to Wrocław (Photo 1), a small stretch at the junction of the A4 and A18 motorways, an even shorter segment of the A4 near



Photo 1. A4 motorway near Wrocław city



Figure 2. The network of major roads, 2005

the German border, and the Polish segment of the Berlin/Szczecin A6 motorway. On the route of the A2 motorway there is also a stretch between the towns of Konin and Nowy Tomyśl. Even worse is the situation of the A1 motorway, so far confined to a short segment near the city of Łódź. According to the information provided by the governmental agency called the General Directorate for National Roads and Motorways (www.gddkia.gov.pl), the total mileage of motorways under construction is 284 km, including: the Stryków/Konin

stretch of the A2, the Wrocław/Krzyżowa part of the A4 (upgrading the former German motorway), and the Krzyżowa/Olszyna stretch of the A18. Overall, when account is taken of currently constructed and planned motorways, the total length should one day increase to 2085 km.

In line with the low level of funding available, a great further problem is the maintenance (or de facto the continuous depreciation) of the surfaced roads that are in place. Checks on the technical con-

dition of vehicles are also unsatisfactory, especially when it comes to the frequently-overloaded lorries exerting such a very negative impact on the condition of Polish roads.

A further specific feature is the very large number of accidents on Polish roads (Table 2). Especially worrying are the numbers injured and killed, which far exceed the averages for European countries. According to the report on safety on Polish roads (www.cbr.home.pl), the 2001 total for fatalities per 100,000 inhabitants was twice as great as in Norway or The Netherlands, these countries having the lowest rates in Europe. Even worse is the ratio of fatalities per 100 road accidents: 10 per 100 accidents, which is five times as many as in Austria, Switzerland or Germany, for example. This is particularly worrying, taking into account the fact that the index of motorization remains only half as high in Poland as in the aforementioned countries. 34 per cent of victims are pedestrians, cf. the EU-15 average of just 15 per cent. Even worse are the results for cities. Among European capitals such as Berlin, Stockholm, Vienna, Oslo, Amsterdam, Brussels, Dublin, Prague and Budapest, Warsaw takes a disgraceful first place in terms of fatalities in road accidents 2001 saw 123 persons killed, including 74 pedestrians. In none of the other cities mentioned did the average number of victims exceed 70. When the number of casualties is re-expressed per 100,000 inhabitants, the index for Warsaw is 3 to 4 times as high as those for Amsterdam, Vienna or Berlin. To cap it all, the injuries sustained by victims in Warsaw are much more severe than in the other cities.

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An important and characteristic phenomenon is the liberalization and privatization of road transport, especially seen in freight traffic with its absolute dominance of private carriers. Several thousand small freight-carrying firms have been created since the 1990s. At the end of the 1980s there was a decrease in goods traffic and a split of the large firms serving various sectors of the national economy into smaller and medium-sized enterprises. In practice, there has been a privatization of the whole sector serving large, formerly state-owned industrial plants. A characteristic feature has been the takeover or purchase of rolling stock by its previous drivers, or by newcomers to the business. The process has been facilitated by the fact that previous owners of lorries remained the main customers for the newly-created enterprises. There is also a disadvantage to the process. The lorries taken over have been much used. On the other hand, the emergence of a large number of new carriers created a situation of competition among them which resulted in a rationalization of costs. Also the overstaffing very characteristic of the former system disappeared. According to estimates, there are 60,000 to 90,000 firms dealing with transport activity. Of course, not all of these engage in this sort of activity professionally. In transport there is a (c. 80%) predominance of small firms employing up to 9 staff. These provide over 50 per cent of operational work in freight traffic. The share of smaller firms owning up to five vehicles is gradually decreasing, the largest group now comprising enterprises with 6 to 9 vehicles (Kaczor, 2004).

In the case of inter-urban passenger traffic, the hitherto-monopolistic State Road

Table 1. Registered road vehicles and tractors, 1988–2004 (in thousand)

Vehicles	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
TOTAL including	8 214	8 596	9 041	9 860	10 207	10 437	10 858	11 186	11 766	12 284	12 709	13 169	14 106	14 724	15 525	15 899	16 701
cars	4 519	4 846	5 261	6 112	6 505	6 771	7 153	7 517	8 054	8 533	8 891	9 283	9 991	10 503	11 029	11 244	11 975
buses	90	91	92	87	86	86	87	85	85	82	81	79	82	82	83	83	83
lorries and road tractors	919	977	1 045	1 151	1 212	1 235	1 307	1 354	1 431	1 487	1 563	1 683	1 879	1 979	2 163	2 313	2 393
ballast and agricultural tractors	1 129	1 175	1 192	1 183	1 183	1 192	1 215	1 212	1 228	1 247	1 261	1 225	1 253	1 257	1 294	1 322	1 317
motorcycles	1 464	1 411	1 357	1 236	1 134	1 068	1 008	929	876	842	820	804	803	803	869	845	836

Source: based on Central Statistical Office's publications: (1) *Transport – wyniki działalności*; (2) *Mały rocznik statystyczny*; (3) *Rocznik statystyczny* (various years).

Table 2. Road accidents, 1988–2004

Accidents	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
TOTAL	37 538	46 338	50 532	54 038	50 990	48 901	53 647	56 904	57 911	66 586	61 855	55 106	57 331	53 799	53 559	51 078	51 069
Fatalities (persons)	4 851	6 724	7 333	7 901	6 946	6 341	6 144	6 900	6 359	7 310	7 080	6 730	6 294	5 536	5 827	5 640	5 712
Injured persons	43 626	53 639	59 611	65 242	61 047	58 812	64 573	70 226	71 419	83 169	77 560	68 449	71 638	68 205	67 498	63 900	64 661

Source: (1) www.stat.gov.pl; (2) *Rocznik statystyczny* (various years).

Transport (PKS) has been divided into about 175 independent firms. Some of these have thus far remained state enterprises, while others are companies wholly belonging to the Treasury, or ones now privatized and owned by former staff. Eleven former PKS firms are wholly or partly owned by *Connex Polska* – as part of the international *Connex Group* belonging to the French firm *Veolia Environment* (www.connex.info).

Local PKS enterprises have to match the competition of private independent carriers operating with mini-buses. At the beginning these operated with Polish-made *Nysa* mini-buses, but later on in rather larger ones of foreign origin, e.g. *Mercedes*, *Iveco* and others. In many cases the competition of the independent carriers has not been fair: they have operated without publicized timetables, often leaving halts just before scheduled bus services. Nowadays, many regions of the country have independent carriers serving well-developed mini- and midi-bus networks. Often they complement the services provided by PKS firms which started to use similar smaller buses on less-burdened lines. In the area of the mountainous Podhale region, for example, the independent carriers operate very frequently, sometimes even every 15 minutes. A great intensity of passenger traffic is also visible in some conurbations in which rail services are inadequate, for example in the Lublin region in eastern Poland.

By and large, there is a downward trend for collective passenger traffic. This is due to the disappearance of factory-organized collective bus traffic and the enormous growth in the number of private cars. Altogether about 70 per cent of all passengers are carried on roads (Kaczor, 2004).

Urban transport

As a result of the increase in private motorization, the significance of collective urban transport is declining steadily (Table 3). This is a disadvantageous phenomenon, since public transport is much more environment-friendly. Moreover, individual transport is responsible for much of the congestion in urban areas.

Public operators dominate in urban areas. The work is mainly done by state-owned enterprises, as well as companies with the only share held by local authorities. Only in some centres are municipal carriers augmented by private operators offering transfer services (e.g. in Warsaw and Upper Silesia). Only in very few cases has urban transport been privatized. For example, in the city of Tczew, all shares in Urban Transport were purchased in 2001 by *Connex*, while in Kalisz 20 per cent of the shares in bus services have been taken up by the British Southern Vectis plc. Despite a relatively widening and growing spectrum of offers, there is no greater interest on the part of private firms in buying into city public transport.

Altogether there are 14 tram networks in Poland, including the ones in Łódź and Upper Silesia which also have a suburban character. The number of trolleybus networks has decreased in the last few years. Only recently, trolleybuses have disappeared from such cities or towns as Warsaw, Dębica and Słupsk. At present trolleybuses serve communities in Lublin, Tychy and Gdynia (including via one inter-city line to Sopot). The main role in urban transport is therefore played by buses (Fig. 3).

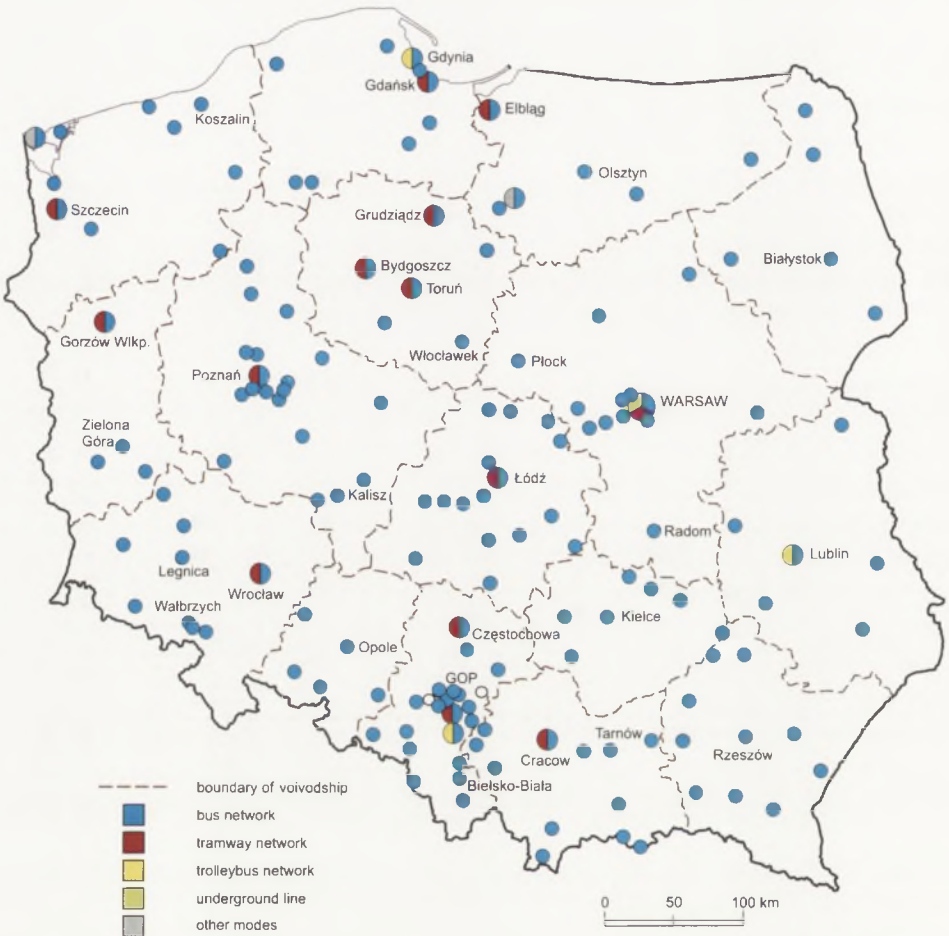


Figure 3. Local passenger transport by means of transport, 2005

The newest, most convenient, but only slowly-growing means of collective transport is the Warsaw Underground – which has been operating since 1995 (Table 4). The first and only line is now (as of 2005) some 17 km long. The rate of growth of this mode of transport is entirely dependent on available funding, which is of course rather scarce.

Railways

The peak period of the 1980s saw Poland with a well-developed rail network of more than 27,000 km. However, the 1990s brought a tremendous decrease in numbers of passengers carried, as well as freight shipped (Table 5).

Table 3. Surfaced public urban transport, 1988–2003

Characteristic	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
Number of inhabitants in localities served by public urban transport (thousand)	18 453	18 613	18 778	18 719	18 643	18 876	18 899	18 812	18 539	18 545	18 689	18 658	18 319	18 451	18 105	18 032	
Transport network length of lines (km)	42 981	43 701	44 036	42 861	46 714	47 189	50 747	52 602	51 725	50 282	48 538	50 944	49 763	51 594	51 824	53 486	
routes exploited (km)																	
bus routes (km)	19 145	19 675	19 937	19 332	21 974	23 437	25 259	25 293	24 625	24 163	22 782	24 943	24 120	25 278	25 677	25 423	
including public sector									22 808	20 921	21 197	20 708	22 035	20 744	21 084	20 620	20 819
self-government ownership									21 887	20 687	20 708	20 374	21 416	20 451	20 659	20 276	20 421
tramway routes (km)	915	917	921	899	903	961	929	935	923	931	932	932	934	938	940	935	
including local self-government ownership									671	716	724	725	727	721	723	718	
trolleybus routes (km)	94	98	103	147	109	109	108	85	101	100	132	119	119	120	86	86	
Public transport passengers carried (million persons)																	
annually ^a	8 965	8 513	7 264	6 274	6 030	5 962	5 980	5 910	5 364	5 225	4 934	4 935	4 954	4 569	4 333	4 199	
daily ^a	24.6	23.3	19.9	17.2	16.9	16.3	16.4	16.2	16.2	14.3	13.5	13.5	13.6	12.5	11.9	11.5	

^a – estimation

Source: based on Central Statistical Office's publications: (1) *Rocznik Statystyczny*; (2) *Transport – wyniki działalności* (various years).

Table 4. Warsaw Underground, 1995–2004

Characteristic	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Length of line (km)	11	11	11	13	13	13	14	14	16	16
Rolling stock (units)	42	42	60	60	60	84	108	138	138	156
Passengers carried (million persons)										
annually ^a	19.9 ^b	27.0	29.5	36.4	48.9	57.6	70.0	73.8	75.9	80.9
daily ^a	0.07 ^b	0.07	0.08	0.10	0.13	0.16	0.19	0.20	0.21	0.22

^a – estimation; ^b – since April 1995.

Source: as in Table 3.

Table 5. Rail network and traffic, 1988–2004

Year	Rail network exploited (km)		Passenger traffic (thousand)		Freight traffic (thousand tonnes)				
	Total	including narrow-gauge lines	Total	including narrow-gauge lines	Total	including PKP		including independent carriers	
						total	including narrow-gauge lines	total	including narrow-gauge lines
1988	26 545	2 357	983 763	3 168	427 956	427 956	6 656	-	-
1989	26 644	2 357	951 544	2 975	388 920	388 920	6 049	-	-
1990	26 228	2 235	789 922	2 404	281 658	281 658	3 519	-	-
1991	25 848	1 996	651 991	1 818	227 797	227 797	2 485	-	-
1992	25 254	1 855	549 302	1 206	201 663	201 663	1 864	-	-
1993	24 926	1 614	541 089	1 003	214 212	214 212	1 547	-	-
1994	24 313	1 418	494 617	943	214 745	214 745	1 186	-	-
1995	23 986	1 388	465 901	842	225 348	225 348	1 002	-	-
1996	23 420	1 135	434 221	745	223 542	223 542	914	-	-
1997	23 328	1 039	417 347	709	226 963	226 963	734	-	-
1998	23 210	1 097	401 509	725	206 391	206 391	554	-	-
1999	22 891	985	395 850	691	186 846	186 846	480	-	-
2000	22 560	985	360 687	533	187 247	187 247	342	-	-
2001	21 119	985	332 218	452	166 856	166 856	240	-	-
2002	21 073	344	304 144	51	222 908	159 725	-	63 183	25
2003	20 665	344	283 359	80	241 929	162 116	-	79 813	73
2004	20 250	344	272 162	85	282 919	163 626	-	119 293	121

Source: as in Table 3.

Thus, one of the most serious transport problems in Poland is a slump in the rail network (Fig. 4), in connection with a steady and ongoing decrease in traffic and a depreciation of the exploited railway lines (Taylor, 2003; 2004). The latter is combined with unsatisfactory financing of rail infrastructure from the state budget. On many routes, speed must be much reduced or traffic limited to one track only (Photo 2). The picture presented in Table 5 does not reflect a real decrease in the length of network since in 2002 the official statistics encompassed for the first time some 500 km of former industrial railways in Upper Silesia.

The rapid growth in private car ownership observed from the beginning of 1990s has combined with a liberalization of the bus market, a passive marketing



Photo 2. A typical interregional train on non-electrified line in northern Poland



Figure 4. The railway network, 2005

policy on the part of the then Polish State Railways (PKP) and timetables unadjusted to the needs of customers all lead to the aforementioned collapse in numbers of rail passengers. As a result, traffic has been brought to a halt on a large part of the local lines. On the other lines, the numbers of trains have been limited to two or three pairs per day. In practice, there was a process of local rail closures only until 2003. As late as in 2004, and especially

in 2005, the traffic on several stretches returned again. Closures are caused mainly by insufficient subsidies for local traffic. The deficit is all the greater, because of the lack of suitable rolling stock for lines with low levels of traffic (Taylor, 2006). For several years now, the subsidies to local passenger traffic have been unsatisfactory, despite a statutorily-defined level of subsidy (*Polish State Rail Commercialization, Restructuring and Privatization Act*

of 2000). Regional authorities do not have enough funds available to cover the shortfall. Moreover, some voivodship authorities (e.g. those of Dolnośląskie and Świętokrzyskie voivodship) are not interested in rail passenger traffic at all. Others (like Zachodniopomorskie and Opolskie) play great attention to local rail transport, purchasing new rolling stock and reintroducing traffic to suspended passenger links. In the Mazowieckie voivodship, the first rail and local-authority joint-venture called *Koleje Mazowieckie* (Mazowsze Rail) was launched, while *Warszawska Kolej Dojazdowa* (Warsaw Commuting Rail) was purchased by a local-government consortium. Some other regions plan similar undertakings. However, the non-cohesive policy of the various local authorities leads to growing disproportions in the quality of regional transport services: on the one hand some regions are relatively well served by rail while on the other rail is much neglected elsewhere. It seems that a change in the way regional passenger traffic is financed is now much needed. The model applied hitherto leads to deeper deficits for the *Przewozy Regionalne* (Regional Carriage Company), and to the above-mentioned regional disparities. The year 2005 would seem to have been crucial here, on account of the enormous increase in prices of liquid fuels. As a result, some rail-carriage companies are experiencing relative growth in the numbers of passengers transported, especially in intra-conurbation (Photo 3) and inter-city traffic. The latter is provided by unsubsidized express, Intercity and Eurocity trains. Companies originating from former the PKP in practice possess a monopoly in passenger traffic (Taylor and Ciechański, 2006).

In the last dozen or so years freight traffic has also decreased. This has been caused by the development of private road-transport carriers, as well as very disadvantageous freight rates at the time the then PKP was functioning as one state enterprise. Incomes deriving from freight traffic have been used for cross-subsidizing the deficit in passenger traffic. As late as the beginning of the 21st century, some increase in cargo traffic was apparent, and from 2002 on new independent operators were created. Their market position is gradually strengthening, particularly where bulk cargo goods are concerned. However, a disadvantageous phenomenon is the very large share of coal amongst the commodities shipped (Taylor and Ciechański, 2006).



Photo 3. Fast Urban Rail train on Warsaw suburban station

Another problem concerns the restructuring of narrow-gauge railways. In 2002, rudimentary passenger and freight traffic was stopped. All the then exploited PKP narrow-gauge railway lines were transferred to local government, which then commissioned exploitation via outsourcing, mainly to associations and private firms. At present, besides several lines exploited in line with their primary desig-



Photo 4. Warsaw Wileńska Station. Modern shopping centres often dominate or even replace former railway stations

nations by the Local Rail Transport Association of Kalisz, the majority of narrow-gauge railways are used in tourist and recreational traffic only.

Inland and costal shipping

The major inland waterways in Poland are the Vistula and Odra rivers plus the mouth segments of their main tributaries, and selected lakes (Fig. 5). However, waterways other than the Vistula and Odra are of marginal – in many cases purely formal – significance. Thus, these two rivers together with their linking rivers and canals are practically speaking the only waterways. The total length of the inland waterways so defined is 1950 km, including 970 km of the Vistula, 690 km of the Odra together with Gliwice Canal, and 290 km of the Bydgoszcz Canal together with the Noteć and Warta rivers. It is estimated that the length of important

waterways is 1213 km only, while 16 river ports are of key importance (Kulczyk and Winter, 2003).

In 2004, the total length of navigable inland waterways was 3638 km, including 3306 km (90.9 %) being exploited. This is a marked increase over 2003, when only 83 per cent of the then waterways were in use. When compared to 1995, however, the length of navigable waterways is seen to be down (Table 6).

Since 1989, inland and costal shipping has resembled other modes of transport in encountering a large decrease in traffic. According to Miłkowski (1997), in 1980 the vessels of Polish inland shipping carried 22.2 million tonnes. At present the figure is of only 8 to 10.5 million tonnes of cargo annually. An absolute majority of the commodities are shipped via the Odra waterway. The Vistula is practically unused. There is a large share of international shipping, comprising between 40 and 50% of tonnage. There is

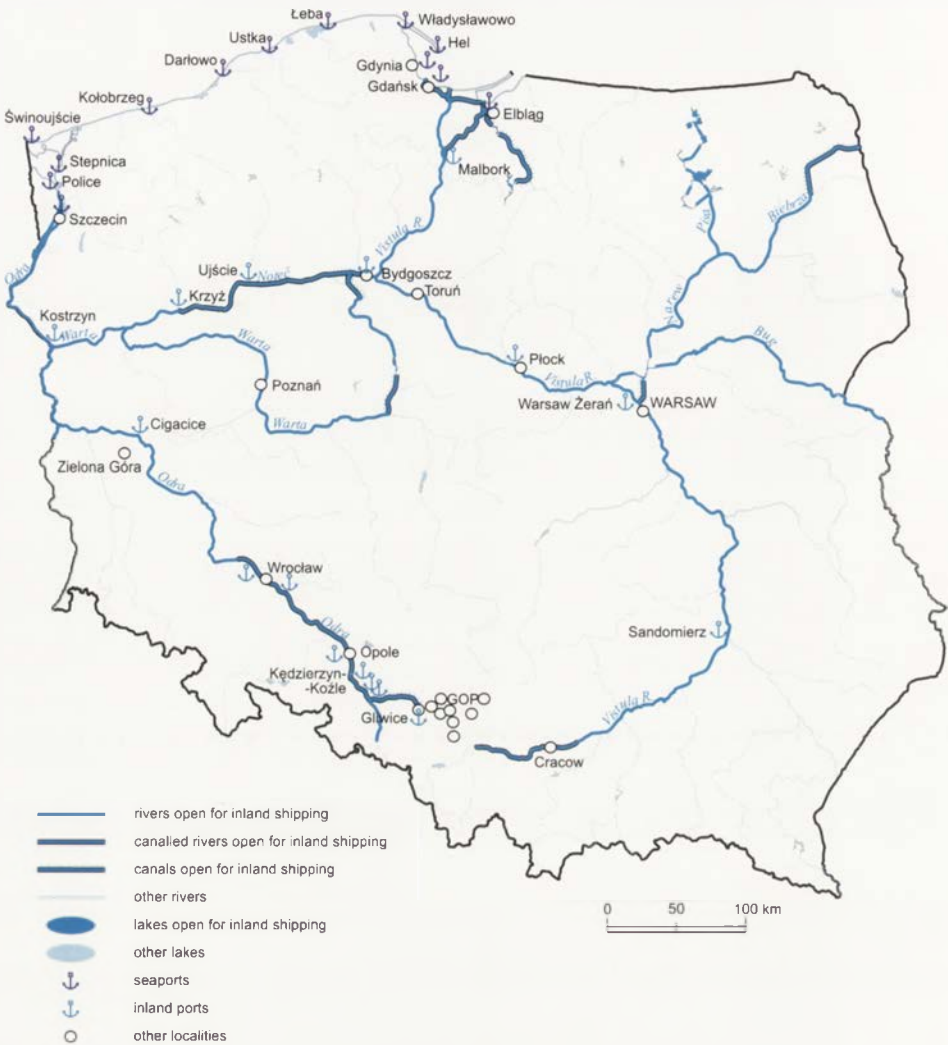


Figure 5. Seaports, inland ports and waterways, 2005

a domination of commodities exported, amounting to between two-thirds and three-quarters of tonnage. Imports are in decline, but the transit and Polish fleet transit between foreign inland ports are increasing. Passenger traffic is of a tourist and recreational nature only.

Some years ago, it was a very popular activity to make a boat excursion, for example in the Szczecin area, with a view to purchase of cheaper alcohol being made within the so-called duty-free zone. After accession to the EU in 2004, this kind of international traffic has

Table 6. Inland and costal shipping, 1988–2004

Characteristic	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Navigable inland waterways (km)	3 997	3 997	3 997	3 997	3 997	3 997	3 980	3 980	3 812	3 812	3 812	3 813	3 813	3 812	3 640	3 643	3 638
Freight traffic by weight (thousand tonnes)	15 556	14 040	9 765	7 828	7 875	8 720	10 115	9 306	9 000	9 340	9 376	8 382	10 433	10 255	7 729	7 968	8 747
including international freight	1 531	1 470	1 747	2 345	2 938	2 852	3 681	3 932	3 827	3 293	3 330	3 100	5 408	4 439	3 193	3 009	3 737
Passenger traffic (thousand persons)	6 492	7 770	3 816	975	667	606	660	1 208	647	1 030	955	1 121	1 265	1 637	1 648	1 795	1 396
Tugboats	27	25	25	23	22	16	14	12	11	13	16	8	9	27	20	17	14
Pushers	387	387	386	372	348	337	348	327	327	318	293	251	236	251	239	242	243
Barges	1 427	1 380	1 337	1 300	1 011	937	866	737	767	734	667	556	492	598	582	590	587
Passenger vessels	75	69	57	54	42	32	34	56	34	47	52	76	81	104	111	113	119

Source: as in Table 3.

Table 7. Polish merchant fleet, 1988–2004

Characteristics	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
TOTAL	256	249	247	234	217	195	178	168	162	162	148	149	128	110	114	116	118
Cargo ships	247	240	238	224	206	185	169	160	154	154	140	140	120	102	107	110	111
including																	
bulk carriers	89	89	91	93	93	89	88	87	87	86	73	89	79	71	73	72	72
tankers	8	8	8	6	5	5	5	5	4	4	4	7	7	9	12	13	12
container and semi- -container ships	46	45	46	42	36	23	22	18	25	21			1	1	1	1	1
Ferries	9	9	9	10	11	10	9	8	8	8	8	9	8	8	7	6	7
Vessels under the Polish flag													41	22	22	20	12
Vessels under foreign flags													87	86	92	96	106

Source: as in Table 3.

slumped, duty-free cruises above all else. Inland shipping transported only 14.7 per cent of the passengers it did in 2003, cf. coastal shipping 52 per cent of the previous number of passengers.

A serious problem is the age of inland and coastal vessels. In 2004, nearly 80 per cent of pushers and 75 per cent of vessels in inland shipping were more than 25 years old. In the case of the coastal fleet, 61 per cent of vessels are 26 years old or older.

In recent years a transformation of inland and coastal shipping firms has been taking place. In 1992, the formerly state-owned enterprise called *Żegluga na Odrze* (Odra Shipping) was transformed into the company *Odratrans plc*, this belonging entirely to the Treasury. Two years later, *Odratrans* bought a majority of the shares in *Żegluga Bydgoska* (Bydgoszcz Shipping), another Treasury company (www.odratrans.com.pl). The companies *Żegluga Gdańska* (Gdańsk Shipping), *Żegluga Warszawska* (Warsaw Shipping) and *Żegluga Krakowska* (Cracow Shipping) have been sold to private entrepreneurs, while two others – *Żegluga Szczecińska* (Szczecin Shipping) and *Żegluga Mazurska* (Mazurian Shipping) have been split into smaller firms. For example, *Żegluga Ostródzko-Elbląska*, a part of the former *Żegluga Mazurska*, has been included within the urban transport enterprise of the town of Ostróda (Miłkowski, 1997).

According to Miłkowski (1997), as of 1992 there were six private carriers, cf. as many as 56 just a year later. In the second half of 2005, the REGON database included as many as 69 coastal and 810 inland shipping carriers!

Maritime shipping

Following a decrease of about one third, the Polish fleet has started to recover its potential (Table 7). There is a dominance of bulk cargo ships (about two-thirds of the whole fleet). A serious disadvantage is the age of vessels. In 2004, only 3% of vessels were below five years old, while half of the fleet was aged 20 and over (including 28 % over 26). A second problem is the decreasing number of vessels belonging to Polish ship-owners and sailing under the Polish flag. It is much more economical and rational to register ships under a cheap flag of convenience. In 2004, some 90 per cent of the Polish fleet was registered as Cypriot, Liberian, Bahamian, Panamanian, or Vanuatuan.

The volume of freight and number of passengers carried do not change greatly over time (Table 8). In practice, the numbers of passengers transported by cargo vessels have decreased to several hundred annually, while almost all persons travel by ferries.

After several years of stagnation, there is some increase in throughputs at the Polish seaports (Table 9, Fig. 5). The greatest are those of Gdańsk, Szczecin, Gdynia and Świnoujście. Smaller throughputs are noted at Police near Szczecin. Of even lesser significance is the seaport at Kołobrzeg, while Darłowo, Stepnica, Ustka (Photo 5), Władystawowo and Elbląg are of marginal importance only. There is an increase in transit throughputs overall, however, and this implies a favourable forecast for the future of the maritime economy.

Table 8. Freight and passenger traffic of Polish maritime fleet, 1988–2004

Characteristics	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Freight traffic (thousand tonnes)	30 827	28 299	28 477	27 563	26 953	23 869	23 168	26 019	25 703	25 479	25 362	22 747	22 774	22 426	25 222	25 435	22 499
Passenger traffic (thousand persons)	453	667	569	573	680	630	624	540	550	583	629	627	625	582	559	526	626
including ferries	443	658	562	567	675	626	620	537	547	580	622	620	624	581	558	526	626

Sources: as in Table 3.

Table 9. Throughputs in Polish seaports, 1988–2004 (thousand tonnes)

Throughputs	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
TOTAL	51 811	48 035	47 039	41 785	46 387	50 495	52 384	49 175	48 945	50 985	50 996	49 679	47 871	47 754	48 966	51 885	56 917
including transit	8 960	6 146	5 022	2 540	3 692	5 890	5 104	3 708	4 184	3 656	6 430	6 221	6 010	7 057	6 019	11 611	13 154
Gdańsk	20 553	18 859	18 613	17 001	20 447	23 261	22 413	18 608	16 875	18 200	20 624	18 793	16 712	17 913	17 487	21 631	24 077
Gdynia	10 278	9 503	9 987	7 274	6 286	7 759	8 055	7 739	8 661	9 088	8 016	7 775	9 397	8 360	9 349	9 797	10 711
Kołobrzeg	285	269	264	222	99	132	149	129	154	122	135	105	116	141	136	152	154
Police								2 505					2 481	2 006	2 201	2 428	2 610
Szczecin	10 362	9 392	9 718	9 318	10 941	11 525	13 660	11 228	13 923	14 283	13 736	14 299	11 110	10 324	9 570	8 578	9 480
Świnoujście	10 283	9 956	8 405	7 911	6 517	7 782	8 067	8 807	8 736	8 610	8 291	8 612	8 942	8 877	10 116	9 113	9 753

Sources: as in Table 3.

Table 10. Air traffic, 1988–2004

Characteristics	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Passenger traffic (thousand persons)	2 018	2 305	1 715	1 208	1 254	1 405	1 596	1 847	2 043	2 287	2 620	2 620	2 880	3 436	3 607	3 978	4 044
including domestic	427	417	227	99	129	188	244	271	314	338	388	399	455	650	719	829	870
international	1 581	1 888	1 488	1 110	1 125	1 217	1 355	1 576	1 729	1 949	2 232	2 221	2 426	2 786	2 948	3 150	3 175
Freight traffic (thousand tonnes)	11	12	14	11	13	17	20	22	28	36	33	29	28	27	28	31	29

Sources: as in Table 3.

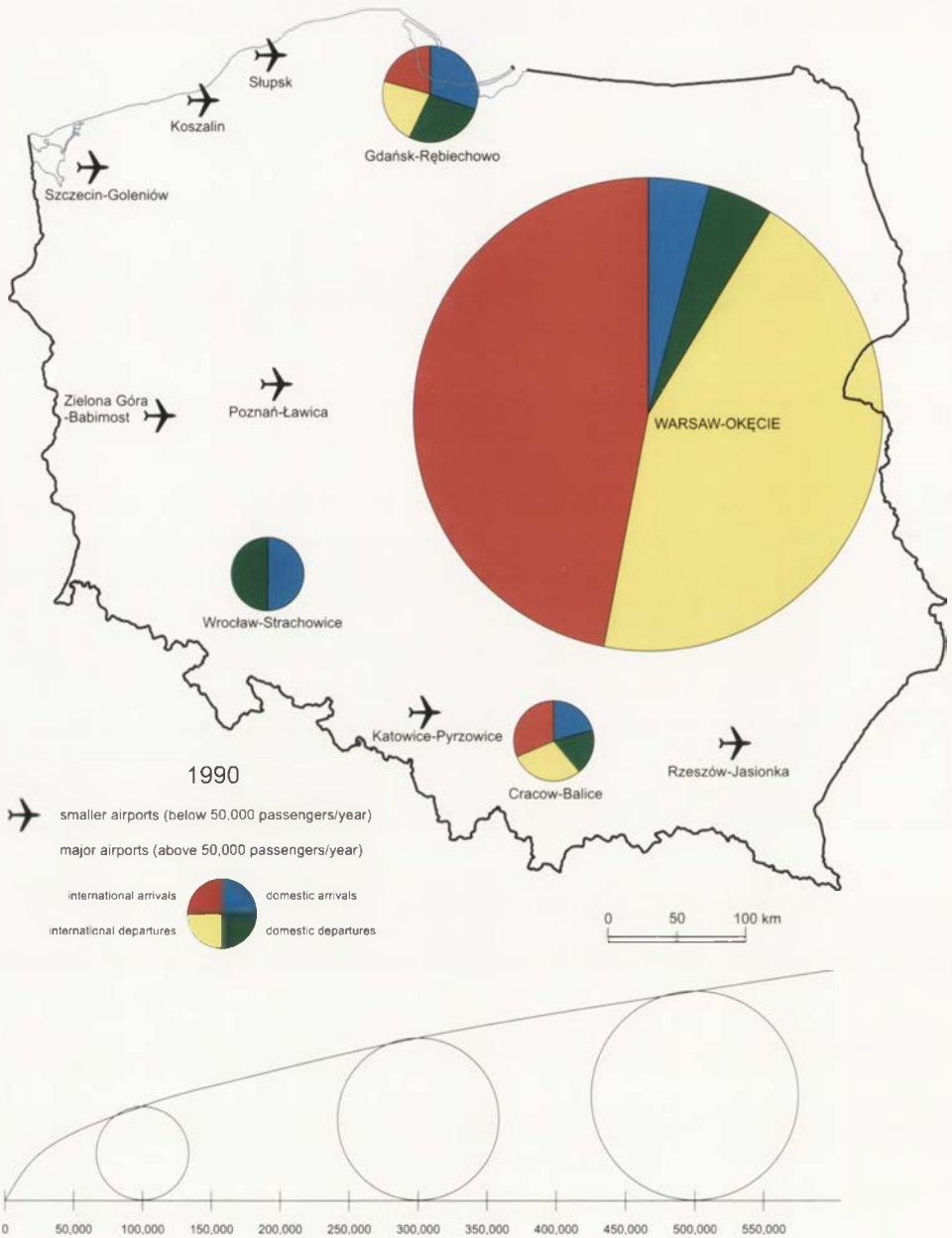


Figure 6a. Passenger traffic at airports, 1990
(based on the Central Statistical Office publications: *Transport – wyniki działalności* and *Rocznik statystyczny – various years*).

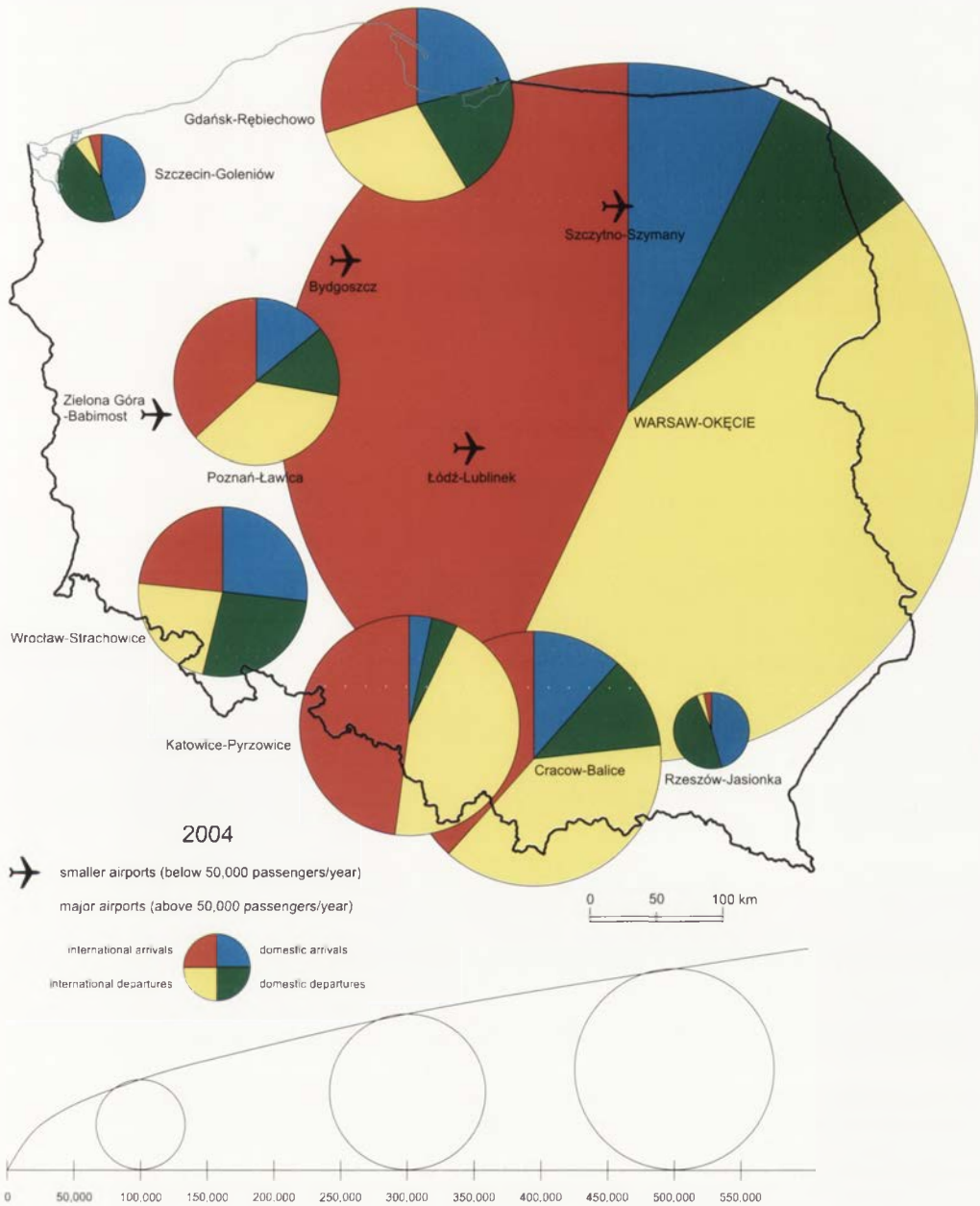


Figure 6b. Passenger traffic at airports, 2004
(based on data as in Fig. 6a)



Photo 5. Small Baltic seaport at Ustka

Air transport

Air transport is the fastest-growing mode. During the last decade or so, the numbers of passengers served more than doubled (Figs. 6a and 6b), especially in international traffic. The tonnage of cargo still plays a marginal role, nevertheless (Table 10).

Domestic and international air traffic is served at 12 airports. The majority of these are reporting substantial increases in the numbers of passengers served. Indeed, some airports were established or reinstated in the 1990s in response to the growing demand for air transport, or because of local aspirations. Examples here would be the airports of Szczytno-Szymany, Łódź-Lublinek and Zielona Góra-Babimost, serving just a small number of passengers annually, in both domestic and international traffic. Some airports (Czecharowski, 1999a; 1999b; 1999c) were opened only in the 1990s, e.g. Szczytno-Szymany and Bydgoszcz-Szwederowo, being formerly military air-bases. In turn, certain airports have so far been subject to jointly civil/air-force use, e.g. that at Goleniów near Szczecin and Rzeszów-Jasionka.

Czecharowski (1999a, 1999b, 1999c) draws attention to the distances between airports and localities served. The greatest distance applies in the case of Olsztyn and Szczytno-Szymany airport (58 km). A little nearer is Szczecin airport located at Goleniów (45 km). Zielona Góra-Babimost or Katowice-Pyrzowice are still nearer to their respective cities (34 km). A location a dozen or so kilometres from the cities apply to Gdańsk or Wrocław airports (Rębiechowo and Strachowice, respectively). While only several kilometres separate the city centres of Łódź, Warsaw or Bydgoszcz from their airports.

A rapid growth in air traffic ensures that the present airports are not large enough (Figs. 6a and 6b). This is especially true of Warsaw-Okęcie airport (serving about 6 million passengers in 2004), which is now under an extension process. Simultaneously, some work is being done to upgrade and modernize the former military air base at Modlin, some 35 km to the north of Warsaw. After adjustment processes, part of the freight and low-cost passenger traffic could be served from there.

A relatively new phenomenon for Poland are the low-cost airlines. One of the forerunners was Polish air lines *Air Polonia*, which went bankrupt, unfortunately. Nowadays the Polish airports serve such low-cost carriers as *Centralwings* belonging to *Polish Airlines Lot* (and serving Warsaw, Katowice, and Wrocław airports), Germany's *Germanwings* (Warsaw, Cracow), the Hungarian *Wizz Air* (Gdańsk, Warsaw, Katowice, Poznań and Wrocław), the Slovak *SkyEurope* (Warsaw, Cracow), Irish *Ryanair* (Gdańsk, Szczecin, Bydgoszcz, Poznań, Wrocław, Łódź, Cracow and Rzeszów) and the British line *easyJet*

(Cracow, Warsaw). The appearance of low-cost carriers is working to activate regional airports. Regional ports are more attractive for low-cost airlines because of their lower rates than at the central airport. According to Czyczuła, Filarska and Gertz (2005), as of December 2004 the largest shares of low-cost traffic were to be noted at the airports for Katowice (70%) and Cracow-Balice (46%). In Gdańsk, the figure was 30 per cent, cf. less than 20% at all the other airports.

Summary

Despite an excellent geographical location, Poland is not making the best use of its transport capabilities. With the exception of air transport, practically all modes of transport are facing serious problems, if ones that differ in their nature. The worst situation is that of the continuously depreciating surface transport infrastructure, ensuring that at least some flows of commodities and passengers deliberately bypass Polish territory, though heading in the same direction via neighbouring countries. A further serious problem is the marginalization of inland shipping.

Therefore seemingly a must is the financial healing of the construction and maintenance of the rail and road networks. The present situation in which funds for the construction and upgrading of rail systems are cross-subsides for roads, or vice versa, is unacceptable. The state should put more effort into achieving the best possible parameters for the transport routes. Otherwise, Poland will lose out in competition with neighbouring countries such as the Czech Republic or Slovakia,

which are able to offer much better infrastructural standards. It will also be necessary to resolve the competition issue between rail and road transport. Though much more environmentally friendly, rail transport is currently being treated much less favourably than road transport. EU Directives stating that 60 per cent of funding should be allocated to roads while the remaining 40 per cent goes to railways, are being ignored. A serious problem is the neglecting of external costs, which are much lower for rail rather than road transport. In the case of a further neglecting of its national transport network, Poland will be marginalized in international terms.

Practically all the modes of transport are experiencing marked declines in traffic when compared with the period before 1989. It is only air transport which has achieved a much increased volume of passenger traffic when compared to 1988, although recovery has come gradually after a preliminary slump. In practice, all the transport modes have been deregulated, some like rail passenger traffic to a lesser extent, and others – such as air, road or rail freight traffic – much more (Taylor and Ciechański, 2006).

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Poland's international linkages

Tomasz Komornicki

Institute of Geography and Spatial Organization

POLISH ACADEMY OF SCIENCES

e-mail: t.komorn@twarda.pan.pl

Introduction

The most important feature of the globalizing economy is the rising interdependence of places (Stryjakiewicz, 1999). At the same time, a need arose to analyse international linkages at the regional or even local levels. In Polish conditions, this process assumes an additional dimension, inasmuch as it has been associated with an ongoing systemic transformation manifested in such features as the decentralization of economic activity and consequent decentralization of international economic linkages. The opening up of Polish economic – and indeed cultural – space to international linkages has become a further dynamic phenomenon in the transformation period (Komorowski, 2002) – perhaps the most dynamic of all, in fact.

International linkages may be of an economic, social or political nature, corresponding to flows of goods, capital, persons and information. It has been the aim of the work described here to address such linkages in terms of an indication of the dynamics involved in changes in the inter-

national (including transboundary) cooperation engaged in by Polish regions. The work first takes in linkages as regards foreign trade, tourism and personal contacts, as well as those of a political nature. Separate consideration is then given to border traffic as a measurable manifestation of interaction in the near-border regions. When it came to linkages at national level, use has been made of the most recently-available statistical data. The description of relationships at the level of the region, i.e. the voivodship (province-region) or in some cases powiat (county) has been based on work done previously on the basis of material gathered between 2000 and 2003 (Komornicki, 2003).

Foreign trade

It was in 1991 that Poland signed the Association Agreement with the European Community which would determine the directions to trade in subsequent years. Classic effects of the creation and shifting of trade ensued. Where the status of main trading

Natural and human environment of Poland

partner for Poland was concerned, the place of the Soviet Union (which accounted for 31% of exports and 33% of imports in 1980) was taken by the reunified Germany (32% of exports and 24% of imports as of 2003). Further positions down the ranking were also taken by EU Member States. As of 2003, the 24 other would-be or existing Member States of the EU accounted for 81% of Poland's exports and 77% of its imports. Leaving aside Germany, in its dominant position, the other large trading partners for Poland (current EU Member States plus the USA) represent a rather diverse structure. The most important roles in trade are played by Italy, France, the United Kingdom and Netherlands. Russia maintains a position in the ranking on account of imports above all, crude oil and natural gas being brought in. In contrast, Polish exporters have not yet proved able to win back the Russian market they lost in the wake of the 1998 economic crisis.

Major changes in the branch structure to Polish foreign trade have taken place. The work by Cieřlik (2000) shows that Poland retains its comparative advantage, above all in the sectors characterized by a limited input of human capital, as well as the generation of processed agricultural products. At the same time, however, the share of goods with a small input of human capital fell steadily as regards overall Polish exports during the 1990s. The raw materials declined in their relative importance. There was a marked rise in exports where the car-making and car-parts sectors were concerned, as well as from the furniture and clothing industries. In the first case, this was the result of foreign investment, while in the two latter ones it was more a result of endogenous factors (including the low-cost labour force). There has

been an increase in the proportion of trade turnover with EU countries accounted for by the trade between sub-groups, as well as the sale of products through multinational corporations. Trade within a branch or within a corporation links the situation as regards foreign trade with the influx of foreign capital, something which leads to concentration of trade (both imports and exports) in the spatial sense – in places where large developments are located.



Photo 1. Used cars imported to Poland and transported to Eastern Europe

Poland is characterized by a very uneven regional breakdown when it comes to exports (Fig. 1). These mainly derive from Warsaw and the western part of the country, in which almost all poviats participate in trade. In contrast, in eastern Poland, trade is engaged in almost solely within the largest centres. The main areas of the absolute concentration of exports nationwide are: (a) the Warsaw

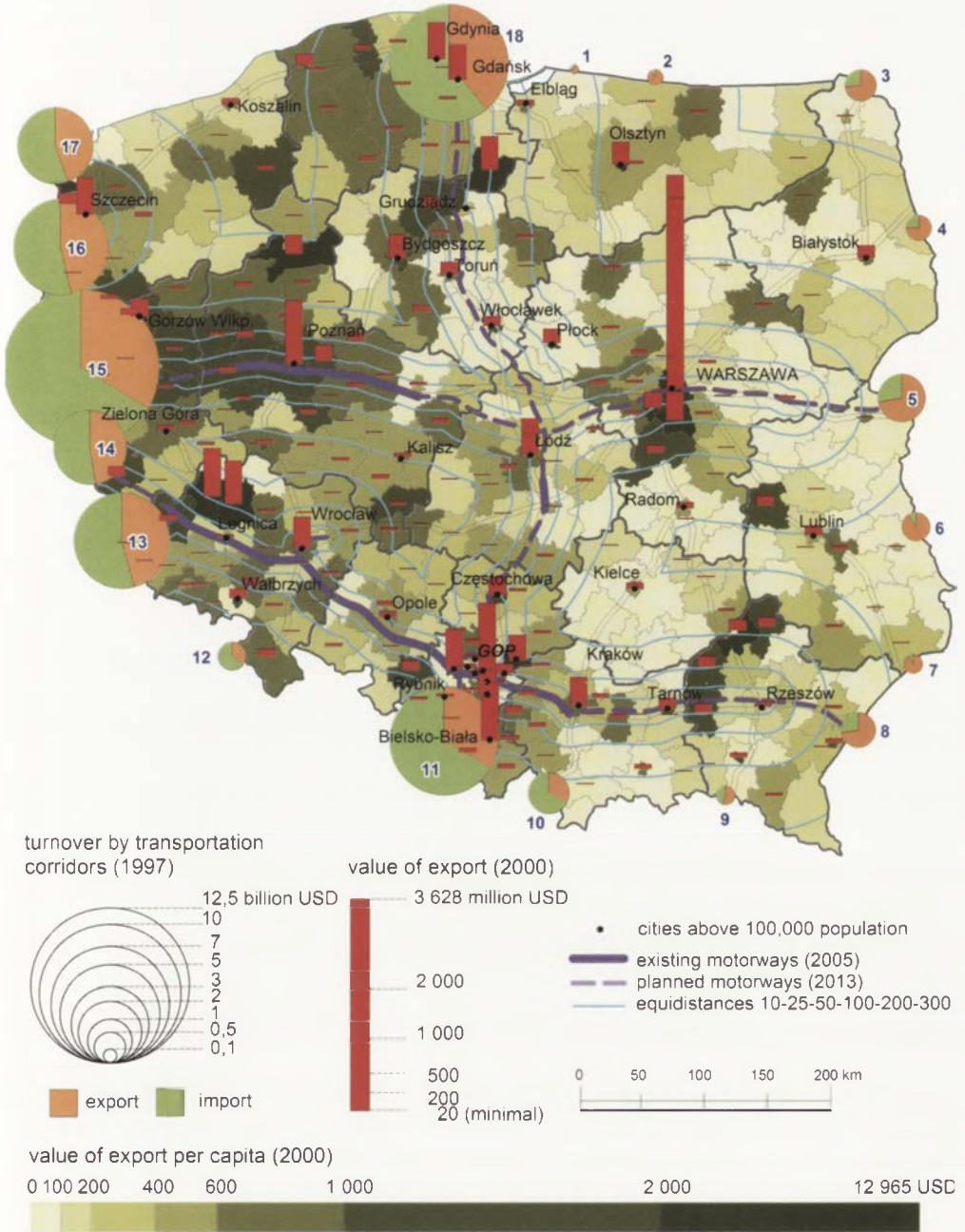


Figure 1. Regional breakdown to Polish foreign trade (acc. to Komornicki, 2003)

agglomeration, (b) certain urban areas in Upper Silesia, (c) the Legnica-Głogów Copper-Mining District, (d) other large urban and industrial agglomerations, above all that of Poznań, and (e) selected smaller centres in which modern industrial plants are located (mainly with foreign capital playing its role). A still-greater concentration is to be noted for imports. The position of Warsaw (as the seat of importing firms) is absolutely dominant in this case (accounting for 30.5% of the value of all movements of goods reported in 2000). The roles of the remaining agglomerations (especially Poznań and Gdańsk) are greater than in the case of exports. In contrast, it is the Upper Silesian Industrial District which is of lesser significance relatively. The direct transfer of foreign goods to local centres is of vanishingly limited importance almost everywhere (except in Wielkopolska and Lower Silesia). Rather, the large centres of import are the cities in which the large petrochemical concerns are located, i.e. Płock and Gdańsk. Also clearly visible are the aforementioned centres of modern industry, in which production for export is usually associated with major importation of components, as well as sometimes the machinery needed to modernize output. There are some whole regions of the country in which belts of enhanced significance as regards international trade exchanges have taken shape. These most often relate to elements of transport infrastructure. Thus belts of this kind have come into existence along the Berlin–Wrocław–Cracow–Ukrainian border route, the Warsaw–Lublin–Ukrainian border route, and along the coast between Szczecin and Gdańsk. The beginnings of

a beltlike concentration of trade relations can also be observed along the *Via Baltica* route or corridor leading from Warsaw to the border with Lithuania.

The importance of the EU as a destination for exports declines steadily as one moves east through Poland, its place gradually being taken by countries of the former USSR. While the diversity of partners is generally higher in the large agglomerations (especially Warsaw, Upper Silesia and Gdańsk), it also tends to increase towards the east, as EU markets come to be augmented by more significant roles for partners in Eastern Europe. There are even certain industrial centres in Podkarpackie voivodship which enjoy links with the USA as well.

International tourism

The 1990s brought a previously undreamed-of development of international tourism in Poland. The main stimuli to this were the opening-up of borders, changes in exchange rates and the importance of near-border trade. In the year 2000, foreigners were assigned 6 million registered person-overnight accommodation places, albeit ones distributed very unevenly across the country. The administrative units accounting for the greatest number of overnight stays by foreigners were Warsaw, Cracow and the powiats along the western part of the Baltic coast. While the guests in Warsaw were largely on business, it was Cracow that accounted for by far the largest numbers of foreigners within tourist groups. As a particularly attractive destination for tourists (unlike Warsaw), it found itself on the itinerary of almost eve-

ry group touring Central Europe. It also represents the overnight accommodation base for the school parties from Israel visiting the Nazis' former Auschwitz Concentration Camp at Oświęcim. Today, tourism is one of the main indicators of Cracow's status as a "European city". The coastal area in the west of Poland in turn represents a significant destination for cheap stays by Germans. Beyond that, there are a great many visitors to Gdańsk, Poznań, Wrocław and Szczecin, as well as to the tourist regions of the Sudety Mts., Mazurian Lakes and Podhale (i.e. the southern mountain region). Where the largest centres are concerned, the weakest performers where overnight stays are concerned have been the cities of Upper Silesia, Łódź and Bydgoszcz. When the incidence of overnight stays is set against the sizes of local populations, the ranking is then dominated by the tourism-oriented poviats on the coast. Kołobrzeg

was able to assign 4316 person-places to over-nighting foreigners for every 1000 inhabitants. Other high values for this index were characteristic of the Mazury region, Sudety Mts. and Podhale (Tatra Mts.), as well as the large centres of Cracow and Warsaw.

EU citizens (primarily Germans) prevail among those paying a visit to Western Poland, but their significance declines as one moves east. The greatest diversity to the breakdown of data for visitors' origins characterises the Mazowieckie and Małopolskie voivodships, and their respective centres of Warsaw and Cracow in particular. In general, however, the structure diversifies towards the east, as incomers from Eastern European countries increase in significance, along with Americans and Israelis, for example.

Notwithstanding the above, it is notable that less than 5% of those coming in from abroad are actually making use of



Photo 2. Polish western border – commercial centre for Germans

the aforementioned registered accommodation base. This state of affairs doubtless reflects the facts that a great proportion of incomers are on day-trips only, while a large (hard-to-determine) number of the stays taking place are not finding their way into the statistics, as incomers stay in unregistered private rooms, with family members or in their vehicles away from the acknowledged camp sites. Estimates from the Institute of Tourism suggest that around 20% of those entering Poland are in fact over-nighting somewhere.

Further data from the Institute (see www.intur.pl) show that stays in Poland lasting a minimum of one night were taken by 7.2 million people coming into the country. In turn, survey research carried out by the Institute of Geography and Spatial Organization of the Polish Academy of Sciences shows that there is much more limited spatial variation to the intensity of departures from Poland than to arrivals into the country (if ones that are still distinctive). Departures are conditioned to a much more limited extent by factors differentiated regionally. The research shows that the classic factor of level of wealth in society is not effective in describing the likelihood of people making departures from Poland. Those leaving the country for periods of time are in fact of very varied financial wellbeing, though standard of living not unnaturally conditions the structure of outward movements from Poland in respect of the purposes of travel, the directions taken and the means of transport used. The border areas play host to those with unfavourable economic situations who are making foreign trips. The costs of going out of the country are very low there, while potential benefits

from illegal work or small-scale trade are very large. On the other hand, the large agglomerations are the sources of foreign departures by people on business or participating in organized tourism.

Individual contacts in the light of survey research

In the aforementioned survey research, almost 3/4 of respondents reported that they had family or other people close to them living beyond Poland's borders. It was usual for these kinds of contacts to be being maintained by a greater proportion of the people in cities further to the east. Only much lower proportions for this kind of relationship (below 60%) were to be noted in the case of people travelling abroad from Katowice, Łódź and other smaller cities located far from the state border. By far the greatest proportions of those surveyed (33.1%) declared that they had family or acquaintances in Germany. Next on the list was the United States (declared by 24.7%), while third place was taken by Canada (6.5%), followed by France, the United Kingdom, Sweden, Italy and Australia. A surprisingly small number of people spoke of family in countries other than Germany that border with Poland. Large proportions of those having familial or acquaintanceship-based contacts with Germany are present in all of the centres studied in what may broadly be defined as "Western Poland". The proportions are markedly lower in the east. Regional differences in the above kinds of linkage with the USA tend to correlate inversely with those involving Germany (i.e. the greater the pro-

portion of surveyed individuals in a centre declaring they have people close to them in the States, the lower the proportion involving Germany, and vice versa). The group with American contacts is based, not only in the south-east, but also in Warsaw (44% of those surveyed have family or acquaintances in the USA, cf. just 22% in Germany). By far the strongest family ties with the USA are characteristic of Nowy Targ (where no fewer than 73.3% of respondents have people close to them in the States). Further places in this ranking are occupied by Rzeszów, Białystok and Warsaw.

Public-transport linkages

The linkages based around public transport are a response to local demand for international carriage, thereby attesting to the existence of socially- (and to some extent also economically-) motivated interactions, the latter relating in particular to small-scale trade and work abroad. As of

2002, as many as 276 of the 373 Polish powiats (county-level administrative units) had public-transport linkages with destinations abroad (Fig. 2). Most of the international lines of communication have stops in the largest cities (though in the case of coach connections it is nothing unusual for local centres to be involved). Nevertheless, the main nodes of public-transport-related international linkages are Warsaw (with 1572 return trips abroad made each week), Wrocław (615), Katowice (590), Poznań (477), Cracow (472) and Opole (426).

The greatest flexibility is demonstrated by coach and air communications. Among the 494 international coachlines existing in Poland as of 2002, as many as 34.0% offered connections with Germany, followed by a further 12.8% with destinations in Ukraine. Where Western European countries were concerned, the United Kingdom was the subject of most connections (almost 10% of all lines), followed by France and Italy. Overall, Poland



Photo 3. Krzewina – Polish-German border crossing for pedestrians

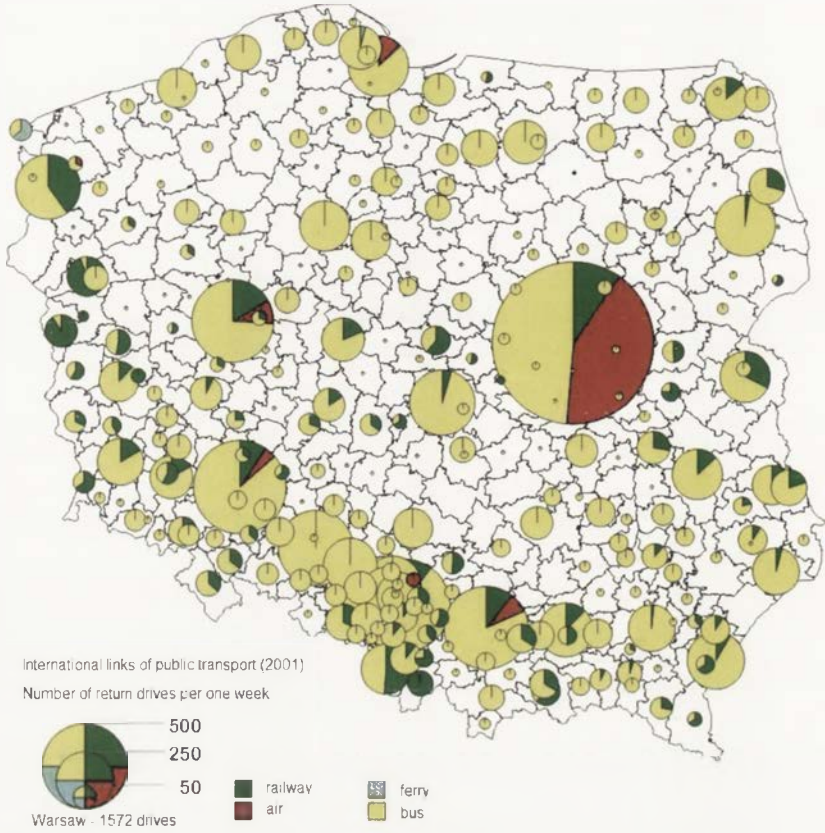


Figure 2. International public-transport linkages, 2001 (acc. to Komornicki, 2003)

had coach links with 25 European countries (Turkey included). Direct coach connections were serving as many as 271 of the 373 powiaty. There was nevertheless a marked concentration of linkages across a belt of southern Poland (from Przemyśl to Bolesławiec, together with the Podkarpackie voivodship and Sudety Mountain Foreland). Beyond that there were centres in Warsaw, Poznań, Łódź, Białystok, Szczecin, Tri-City (Gdańsk-Gdynia-Sopot) and Bydgoszcz. Local nodes in the system of coach transport have also developed in the eastern (and to some extent the south-

ern) near-border areas, the distances covered in travel to the neighbouring countries being small in these cases. The most important centres of this kind are Białystok, Suwałki, Tomaszów Lubelski, Przemyśl and Nowy Targ. No analogous concentration in the areas bordering with Germany is to be noted, however: a clear majority of the connections heading in a westerly direction are entirely long-distance.

2004 ushered in a dynamic development of communications by air, primarily thanks to the activity of the low-cost carriers. A liberalization of the market and

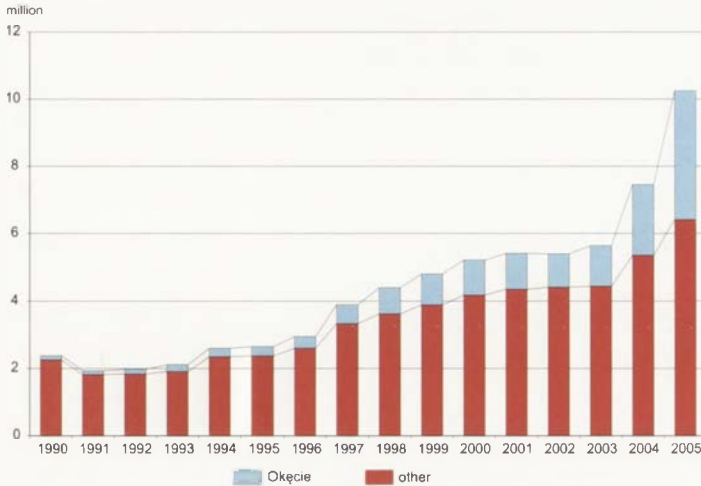


Figure 3. Decentralization of air traffic, 1990–2005
(acc. to data from Border Guard)

decentralization of carriage had taken place (Fig. 3), and the intensity of international traffic at regional airports was to grow several-fold (especially where Katowice-Pyrzowice and Cracow-Balice airports were concerned). The increase in traffic was founded upon:

- encroachment on to the market for low-cost international carriage previously occupied by the coachlines,
- the development of incoming tourism (especially where Cracow is concerned), *inter alia* as a response to advertising campaigns from the airlines.

Transboundary and regional cooperation

A manifestation of the decentralization of Poland's international linkages post-1989 was the onset of international cooperation between local (and later regional) authorities. Research carried out in 2000

and 2004 has made clear how the numbers of gminas involved in international contacts declines markedly as one moves from west to east. The greatest number of cooperation agreements have been concluded with Germany (the country involved in the cases of more than 30% of the gminas committed to partnership links of any kind). Not unnaturally, the links with Germany are prevalent in the western voivodships, though also in the Warmia-Mazury region. However, as many as c. 20% of units have signed agreements with Ukraine (first and foremost in the Podkarpackie and Lubelskie voivodships) and France (mainly in the Mazowieckie, Łódzkie and Lubelskie voivodship), 16% with the Czech Republic (mainly in the near-border voivodships of Lower Silesia and Upper Silesia), and 12% or under with Lithuania, Hungary, The Netherlands, Italy and Slovakia. Where the neighbouring countries are concerned, Belarus and Russia have been the subject of by far the fewest signed agreements (Skorupska, 2005).

Particularly noteworthy as of 2004 were the new contacts established with local governments in neighbouring countries other than just Germany. This coincided with an increase in the number of relationships entered into at the initiative of a partner. Enjoying contacts with partners in both Western Europe and neighbouring countries, the local authorities in the eastern (and southern) borderland areas are also characterized by a greater diversity to their international relations of a geographical nature.

The international cooperation in place between local authorities at gmina level may be analyzed using a model for the diffusion of innovation. To be identified in Poland in this context are two overlapping processes of diffusion: the hierarchical (large centres – small towns – rural gminas – as confirmed within Kujawsko-Pomorskie voivodship in work by Szymańska and Michniewicz, 2002) and the continuous (west-east, with the source of innovation in Western Europe). Both are still in the expansion phase, though reference to a near-saturation in the case of western Poland may be justified).

The most important elements conditioning the development of local cross-border cooperation were (according to Szul, 2001) the geographical, economic, socio-cultural and linguistic, as well as the institutional and international-political factors. In turn, according to Ciok (1998), the main barriers to such cooperation involve a lack of economic equilibrium, cultural and linguistic distance and institutional shortfalls. A key element in practice was the facilitated access to external sources of funding for joint projects. A particular role here was played by the PHARE CBC

pre-accession programme established in 1994 with a view to the sustainable development of near-border areas being supported through infrastructural investment (mainly in transport via roads, bridges and border-crossings, as well as in the environmental protection sphere). PHARE CBC was the largest, unified, annual programme helping to sustain Poland's integration into European structures. In line with its specific features (cross-border cooperation with the then EU Member States), almost all investments were made along the western border (half of the total in the single Lubuskie voivodship).

As of 2005, the various Polish borders boasted no fewer than 16 Euroregions: Baltic, Neman, Białowieża/Belovezhskaya Forest, Bug, Eastern Carpathians, Tatra Mountains, Beskidy Mts., Cieszyn-Silesia, Upper Silesia, Pradziad, Glacensis, Dobra, Nysa, Szprewa-Nysa-Bóbr, Pro Europa Viadrina and Pomerania. The functions these serve differ greatly in practice, as do their scope of action. The best-developed Euroregional cooperation exists in the borderlands with Germany and the Czech Republic. Administrative units along the eastern border are in turn committed by virtue of top-level agreements entered into between central administrations, tending to be more in the nature of expressions of willingness to cooperate than cooperation itself. The competences of the local-authority partners in Ukraine and Belarus are in any case very much more limited than those of their Polish counterparts. Also unfavourable is the excessive spatial development of the newly-arising structures (the Eastern Carpathians, Bug, Neman and Baltic Euroregions). This has limited the emergence of smaller (poten-



Photo 4. Eastern border of European Union – the Polish-Russian part

tially more effective) cooperative ventures. Having said that, a first truly local-scale Euroregion has appeared on the eastern border – in the shape of the Białowieża/Belovezhskaya Forest Euroregion established in 2002.

Conclusions

The work carried out offers support for the contention that the 1990s were a period in which the international linkages from Polish territory underwent deconcentration. This was first true of economic linkages, and in this case the reasons need to be looked for in overall deconcentration of economic activity, primarily in commerce and services (including tourism), but also in some branches of manufacturing (like furniture-making). A very important element was the withdrawal of the state – or of state-owned enterprises – from former monopoly positions as regards certain

types of international linkage. It was therefore possible for a natural adjustment of the spatial distribution of linkages to that of demographic and economic potential to take place. However, this premise relates first and foremost in comparative terms, to the situation pertaining in the heyday of the centrally-planned economy. Further transformations (particularly those ongoing at the end of the 1990s) have been less unequivocal. In relation to certain types of linkage (e.g. in foreign trade), we may observe a renewed drive for concentration, albeit one that frequently affects regions other than those involved previously in the given sphere.

The spatial configuration to the different types of linkage is variable, but it is still possible to conclude that western Poland has stronger international contacts than the eastern part of the country. The area of strongest contacts extends further to the east in northern and southern Poland, creating some kind of fan-shaped pattern

(with a centre of gravity in Poznań) that in some ways harks back to how things were in the days of the Austrian and Prussian parts of partitioned Poland. However, within the fan there is an "island" of relatively the strongest international contacts centred of course on Warsaw. The capital is in fact surrounded by a ring of areas whose linkages are either weak or very weak. Further places of concentration of linkages are other large centres, above all Poznań, the Tri-City (Gdańsk-Gdynia-Sopot) and Cracow, as well as Wrocław and Szczecin to a lesser extent. The relatively strong position of the Upper Silesian Industrial District mainly reflects the export of coal from there. In turn, the agglomeration with clearly the weakest of linkages is that of Łódź.

At the same time, international economic contacts are highly concentrated, not only in the large agglomerations, but also (if in "appropriate" proportion) in the medium-sized regional centres (in particular where foreign investment is at a greater level). Other areas with strong foreign linkages are near-border areas (including also in the east, especially near the border crossings), as well as certain regions that are attractive to tourists.

It can be reported that, when taken as a whole, the real geographical differentiation to international linkages is not as great as the available statistical data suggest. The intensity of personal contacts as identified by survey research would seem to resemble the situation for economic linkages in declining as one moves from west to east, but the disproportion in this case is far less marked. Bearing in mind the two types of linkage, it is reasonable to regard the country as being divided into

a zone of linkages with Germany (around 2/3 of the country), as well as a zone of linkages with North America and the countries of Eastern Europe (the remaining 1/3 of Poland; Fig. 4). Existing outside these areas are the agglomerations of Warsaw, Upper Silesia, Cracow and Gdańsk, and to a lesser extent also those of Białystok and Lublin. There are also clearly-marked if more minor zones of linkage with neighbouring countries (as well as with Denmark and Sweden, or Hungary and Austria). The most extensive of these – other than the one involving the German border – involves the Czech Republic and Ukraine, while the smallest in area are those with Lithuania and the Russian Federation's (Kaliningrad District). When sizes are set against the demographic potential of partner countries, the linkages that are stronger than would be expected are those with countries of the Baltic Sea region or else CEFTA. These are very much concentrated in Warsaw and the regions closest to the given partner. In turn, in terms of the sizes of the countries linked, linkages with Russia, Ukraine, France and the United Kingdom should be seen as weaker than they might be. The role of distance from the border in the intensity of trade and transport linkages with neighbour countries is generally limited, to the point where it only takes on noticeable statistical significance in the cases of Germany, the Czech Republic and Ukraine.

The eastern part of Poland has different directions of linkage. Where certain types of contacts are concerned, a "splitting" of the configuration is observable. The split-line separates the Podlaskie i Lubelskie voivodships, and to a lesser extent also the Podkarpackie voivodship,



Figure 4. Zones of international linkage on Polish territory
 1 – dominant linkage with the EU, first and foremost Germany; 2 – dominance of linkage with Eastern European countries, as well as the USA;
 3 – areas with a diverse range of directions to linkage; 4 – zones of the greater significance of linkage with neighbouring countries (other than Germany)

from the rest of the country. These areas are linked most weakly with the EU, and at the same time most strongly with the countries of the former USSR. The aforementioned split is nevertheless eased as a result of person-to-person international contacts. While eastern Poland gravitates towards Eastern Europe in the economic sense, in the social sense it also demonstrates strong connections with the western part of the continent (as well as with the USA, Canada and Australia). This is attested to by the results of surveys and the configuration of international coachline

links. The linkages with the east are mainly manifested in visits by the inhabitants of neighbouring countries (primarily for the purposes of trade, taking up work or transit). In contrast, the westerly links are mainly maintained by Poles. The expression of both types of linkage in this area can thus be accepted to be western.

The different partner countries with which linkage is relatively strong also differ to the point that certain characteristic types can be identified. Thus, countries with which instances of contacts are spread evenly across Polish space include

the United Kingdom, France and Spain. In turn, the countries with which contacts are maintained across Poland, albeit at varying intensities are: Germany, the United States, Russia, the Czech Republic and Italy. Finally, the countries with which the contacts are markedly confined spatially include: The Netherlands, Belgium, Slovakia, Ukraine, Austria, Sweden and Canada. Countries on the list which need to be addressed separately are The Netherlands and Denmark, with which the contacts are very much dispersed on the regional and even local scales (respectively in Wielkopolska and Western Pomerania).

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Geography in Poland

Stanisław Liszewski
Faculty of Geographical Sciences
UNIVERSITY OF ŁÓDŹ
e-mail: miastur@geo.uni.lodz.pl

Florian Plit
Faculty of Geography and Regional Studies
WARSAW UNIVERSITY
e-mail: flplit@uw.edu.pl

Development of Polish Geography

Notwithstanding the many centuries that have now passed since the concept *ge grápho* ("description of the world") first came into the Greek language, it remains in use – if in a limited way – in describing the field of knowledge we know as geography, the aim of whose study and teaching is, *inter alia*, the contemporary description of our planet. However, the description of the Earth as practised by geographers of the early 21st century differs fundamentally from that we find in the work of Eratosthenes (276–194 BC). These differences lie, not only in the precise, scientific description of the natural agents building the Earth and the person that lives in this environment, changing and shaping it, but also in the attempts at explaining and

understanding the entire humankind-environment system.

The development of geography as a modern science has been linked with the need to create a conceptual apparatus appropriate to the field, to develop original research methods or adapt existing ones and to prepare suitable means by which to convey the results of scientific work carried out.

Equally, the dynamic development of narrowly-specialized research noticeable as all fields of science progressed in the 20th century was also to be noted in geography. The result has been the shaping of many sub-disciplines that have now become almost independent of one another. Things have now come so far that the main problem is not in any way a lack of results of detailed research, but rather the lack of development of any scientific

methods by which these might be brought together in a comprehensive synthesis, ultimately with a view to our being able to account in full for the processes ongoing in the humankind-environment system.

And indeed it is this holistic and systematic conceptualization of results concerning the mutual impacts of natural and social factors on a regional basis, in terms of geographical space or the landscape, or in relation to the environment as a whole, that is one of the most important features separating geography from the other sciences. A further feature concerns the way in which phenomena and processes are addressed in terms of their spatial relations, thereby ensuring that geography is a chorological science.

Monographs have been the traditional way in which defined areas have been presented spatially. The work presented here represents an attempt at such a study emphasizing humankind and the environment within the contemporary political borders of Poland.

The geographical description of Poland

The very first fully original Polish geographic work is *Chorographia Regni Poloniae*, written by Jan Długosz in the middle of the 15th century. It constitutes an ample description of the hydrographic network, surface relief and towns of Poland, Lithuania and Ruthenia. Soon after, at the turn of the 16th century, a course in cosmography was taught at the Academy of Cracow. In the 16th century original maps of Poland were elaborated (by B. Wapowski, and following him – by W. Grodecki, whose maps

were included in the Flemish atlases), while descriptions of Poland, written in Latin by Maciej of Miechów and Marcin Kromer, as well as descriptions of the duchy of Moscow by A. Guagnin, gained wide popularity across entire Europe. At the end of the 18th century an educational reform was carried out in Poland (the first ministry of education ever was then established in Poland). In the elaboration of school handbooks (K. Wyrwicz, F. Siarczyński) novel didactic principles were applied (like, for instance, the demonstrative method, field excursions, or the activating methods of teaching), which are referred to, in particular, by the International Charter of Geographical Education, adopted at the Congress of IGU in Washington in 1992.

The loss of independence (1795–1918) made normal development of geography, considered by the partitioning powers to be a “subversive” discipline, impossible. Despite this, in the first half of the 19th century Poles elaborated a topographic map (*Topograficzna Karta...*, until 1843) that was one of the best in the world at that time. Further, in 1849 the second in the world chair of geography was established in Cracow, with W. Pol as the head. Participants of the national uprisings and independence activists were being sent to Siberia, and contributed, as educated people, to the cognition of this area (thus, e.g., B. Dybowski investigated lake Baikal, and J. Czernski – the Russian Far East, the latter commemorated through the name of Czernski Mt.). Polish exiles conducted investigations also on other continents, in particular in South America (I. Domeyko in Chile – Cordillera Domeyko), P. E. Strzelecki in Australia (located the highest elevation and called it Kościuszko

Mt. after the Polish-American independence hero of the late 18th century), as well as in Antarctic. Poland incited lively interest abroad, as witnessed by the fact that the first universal geography in the world was preceded by the volume devoted exactly to Poland (Malte-Brun, 1807).

In 1882 the chair of geography was established at the University in Lwów (now Ukrainian Lviv). Soon, Eugeniusz Romer (1871–1954) became the most pronounced personality there. He modified the method of coloured hypsographic contour maps, developed a new scale of colours, which is used commonly in the world until today. He was the author of atlases, climatologist, geomorphologist, teacher, and in the years 1928–38 and then 1945–49 he was the Vice-President of IGU.

The lack of statehood limited the possibilities for comprehensive geographical studies to be carried out, above all where these might refer to Poland as a single region. The first attempts at regional geographical studies were in fact made in the late 19th and early 20th centuries, one of the most successful being that of Wacław Natkowski (1913), who published a set of materials regarding the geography of what had once been Polish lands. The work, which was designed as a school textbook, gives a clear impression of the then state of geographical knowledge on the lands the author refers to as “of the former Poland”. An advantage of Natkowski’s work is that it seeks a comprehensive (all-embracing) presentation of geographical phenomena in the area under discussion, thus corresponding with the classical idea of regional geography.

Poland’s regaining of independence in 1918 increased interest in geographical

knowledge of the country. It bore fruit in several studies that were mainly authored by Professors of Geography at Warsaw University or the Jagiellonian University in Cracow. In 1922, Stanisław Lencewicz published a textbook on *A course in Polish geography*, which took in the area of the country within the new post-War borders. Of a similar nature was the work of Ludomir Sawicki (1932) entitled *Zarys ogólny geografii ziem polskich (A general outline of the geography of the Polish lands)*. The broadest and most comprehensive treatment of Polish geography to emerge in the inter-War period was in turn the volume of *Wielka Geografia Powszechna* entitled “Polska” (*Great Universal Geography*), which was also written by Stanisław Lencewicz (1937).

The characteristic feature of the studies referred to was the geographical description of Poland in its entirety, for which the basis was the country’s differentiation in physico-geographical terms. In these works, humankind and its activities were presented against the background of subject matter relating to the natural environment.

One consequence of Second World War was the change in the political boundaries of Poland – something that represented a new challenge for geographers inasmuch as that it had to satisfy the interest society was showing in the area of the country as newly existing at that time. In the development of Polish geography, this area coincided with a clear division of what was formally at least a uniform field into numerous specializations (the geographical sciences). In relation to the geography of Poland, this bore fruit in the emergence of separate textbooks on the

physical and socioeconomic geography of Poland. The authors of the more important studies from Polish physical geography were: Lencewicz and Kondracki (1959), Kostrowicki (1961), Dylkowa (1973), and most recently Kondracki (1998). In turn, economic or socioeconomic geography textbooks were penned by Loth and Cichońska-Petrażycka (1960–1962), Leszczycki (ed.; 1968), Domański (ed.; 1985), Leszczycki and Domański (1992), and Fierla (ed.; 1994).

One characteristic feature of these handbooks was their far-reaching level of detail as regards the division of Poland into physical-geographic regions, while another was the analysis of economic and social phenomena on the basis of country's administrative divisions. This situation led to the total lack of cohesion so characteristic of former ways of viewing geography. The only minor attempts to look for correlations between natural phenomena and human activity were to be found in the works by Dylkowa (1973) and Kondracki (1998).

Geographers participated in the programs of environmental protection, in the administrative reform of the country, elaboration of the spatial development plans of the country on various levels of detail. Since 1993 the *Atlas Rzeczypospolitej Polskiej* is being published (continuous updating of content), a number of geographical dictionaries were published, as well as the universal geographies (the most valuable ones are *Geografia Świata* (World Geography, 1995–2002), and then *Encyklopedia Geograficzna Świata* (Geographical Encyclopedia of the World, 1995–97).

Geography is a popular direction of university studies in Poland, and teaching

in schools is characterized by high quality. An important role should be assigned in this respect the national youth Geographical Olympics (32nd edition in the school year 2005/2006). Its laureates participate since 1996 in the International Geographical Olympics, always taking the first or second ranks.

Ongoing for several years now, the discussions among Polish geographers regarding the search for common features to the narrow specializations into which geography has been divided give cause for a moderate amount of optimism, allowing it to be judged that Polish geographers really might be able to generate a synthesis that would be the new geography of Poland.

The contemporary organization of Polish geography

At the beginning of the 21st century, geography was perceived in two ways by Polish society. In the first place, it was seen as the subject of tuition in schools at all levels (a school-leaving exam in geography can be taken), as well as as the subject of a course of academic studies allowing a student in higher education to obtain the title of a professional Licentiate, or then a Master, of geography.

Society's second insight into geography (though less widespread) is achieved through the prism of the results of scientific work carried out by geographers and the practical application that these have.

In Poland, geographical study courses are run at 11 universities and 3 teacher-training colleges. Organizationally, geography is located in the Faculties of Biology

and Earth Sciences, usually within an Institute of Geography, or else in joint faculties – alongside geology. Only in the two Polish universities (of Warsaw and Łódź) are there separate Faculties of Geography (or Geographical Sciences).

The scientific activity of Polish geographers takes place within the framework of the higher education establishments and institutes, in which work of varying scale and scope is carried out. An important element in the development of the scientific research being done by geographers are the prepared doctoral and habilitation theses, which can be done at eight of Poland's universities, as well as at the Institute of Geography and Spatial Organization of the Polish Academy of Sciences.

The latter institute emerged as a research institution of the PAS in 1953, and was for many years an informal but effective organiser of scientific research for all Polish geographers.

An organization in society that is both scientific and professional in profile is the Polish Geographical Society, which brings together both qualified geographers working in different institutions (be these scientific workers, teachers or employees of state institutions, etc.), as well as students and those "sympathetic to" geography. The Society was founded in late 1917 and early 1918 in Warsaw (official founding date January 18th 1918), and has continued actively ever since, except during Second World War (Kortus 2001). Presently the Society has 1494 members in 23 Divisions (see fig. 1), which have regional and thematic character.

The oldest geographical journals published in Polish are *Przegląd Geograficzny* and *Czasopismo Geograficzne*. The former was the official mouthpiece of the

Polish Geographical Society from 1918, but when the Institute of Geography PAS came into being it was taken over by that scientific institution. In turn, the publication of the Association of Polish Teachers of Geography (*Zrzeszenie Polskich Nauczycieli Geografii*), which came into being in Łódź in 1921, was *Czasopismo Geograficzne*, after 1946 the journal of the united Polish Geographical Society.

Today, all the higher education establishments and scientific institutions taken together have around 1200 geographers employed in scientific posts or research posts. The figure excludes technicians, administrators and those providing services. The group includes around 200 professionally active Professors or Associate Professors in geography (Czyż 2002).

Geography has taken its permanent place among Poland's state-run institutions involved in the organization of academic life and the training of higher-level personnel. A representative of geographers is a permanent member of the State Accreditation Committee, while geography is also represented on the Central Committee for Scholarly Degrees and Scientific Titles, as well as on the Ministry of Education and Science's Council on Sciences. Geographers are elected members of the Polish Academy of Sciences and Polish Academy of Arts and Sciences, as well as other scientific societies of national reach in which they play important and leading functions.

The Committee on Geographical Sciences

The Polish Academy of Sciences' Committee on Geographical Sciences was

established in 1952 by the PAS as one of its numerous committees. The aim was to ensure coordination of the scientific activity (in the early days also the didactic activity) of all academic and research institutions concerned with geography at the higher level in Poland. On March 16th 1960, it changed its name to the Committee on Geographical Sciences PAS and has remained so up to the present time (Kozłowska-Szczęśna, 2003).

In relation to the particular term of office (which last 3 or 4 years), the Committee has between 30 and 40 members selected by secret ballot from among all active Professors and Associate Professors in Poland. The Committee is headed by a chairperson selected from among the members. In its more than 50-year history, the successive chairs were Professors: Stanisław Leszczycki (14 years), Kazimierz Dziewoński (6 years), Mieczysław Klimaszewski (3 years), Rajmund Galon (9 years), Stefan Kozarski (6 years) and Zbyszko Chojnicki (12 years), and Stanisław Liszewski (actually).

The Committee engages in its activity in periods between plenary sessions that take place at different academic centres, by way of established topic groups. In the present (2003–2006) term of office, the Committee has involved itself in a series of activities aiming at closer scientific, didactic and organizational integration of Polish geography. Two such activities can be mentioned here as examples.

Each year brings the organization of discussion meetings for all of the Professors and Associate Professors in Polish geography, as well as other invited geographers. These meetings take place under the joint name of "Forum of Polish Geographers",

the first event of this kind having convened in 2004 at the Jagiellonian University in Cracow. The subject of that meeting was "Geography in the first years of the 21st century" (Jackowski, 2004). The second Forum was held in 2005 at the University of Silesia in Sosnowiec, the topic of discussion there being "The influence of the development of the geographical sciences on the process by which the public are educated and geographical knowledge promoted in Poland" (Jania and Jackowski, 2005). The third meeting is set for 2006 and is to be held at the Adam Mickiewicz University in Poznań. This meeting is devoted to a discussion of the very important issue for geography that is "Regional geography as a subject of research and teaching". Materials from each Forum (detailing papers given and discussions) are published in a separate publication.

In parallel with these meetings with wider participation within the "Forum of Polish Geographers" framework, one of the Committee's Commissions has taken the initiative to organise a once-yearly colloquium with a theoretical and methodological focus under the heading "Fundamental geographical concepts and ideas in the light of the changes ongoing in geography and today's world". These colloquia are of a working nature and are places for the direct exchange of geographers' ideas and views on important methodological issues. The first Colloquium (held in Toruń in 2004) was devoted to the characterization of the basic conceptual categories in geography, while the second (Łódź 2005) concerned the human being in contemporary geography. The third (scheduled for Bydgoszcz in 2006) is to be devoted to "geography and the changes in today's world".

The Committee on Geographical Sciences has also been very active in drawing up new teaching standards for Polish geography at Licentiate and Master's degree levels. Committee Members have also been active co-participants in the preparation of a ranking of Polish geographical journals. The Committee launched accreditation for scientific conferences organized by Polish geographers and is preparing a list of those who in the last year have obtained doctoral or habilitation status across Poland. These lists are published in *Przegląd Geograficzny*.

Finally, the Committee on Geographical Sciences serves as the National Committee for Polish geographers and thus remains in permanent contact with the International Geographical Union.

Polish geography as part of the international family of the world's geographers

Contacts between Polish geographers and the international geographical organizations date back to the end of the 19th century: the list of participants at the 7th International Geographical Congress organized in Berlin in 1899 included the name of a single Pole (Kondracki, 1973).

The 1922 emergence in Brussels of the International Geographical Union more or less coincided with Poland's regaining of independence and hence with a firming up of international contacts. It was at the initiative of Prof. Eugeniusz Romer, head of the first National Geographical Committee of Polish Geographers, that Poland acceded to the International Geographical Union in 1925. It has been an active

participant in that organization's work ever since (Winid, 1953).

This high level of inter-War activity of Polish representatives within this international organization gains further confirmation from a number of facts. In the first place, the Congress convened at Cambridge in 1928 saw the election of Prof. Eugeniusz Romer to the post of IGU Vice-President, a post he held through two terms of office. It was mainly thanks to his activity that the International Geographical Union came to Warsaw for its 15th (1934) Congress. To date, this has been the one and only time since the Union was first established that the Congress has been held in any of the Central or Eastern European countries. Back then, however, a further sign of progress was the election of another IGU Vice-President in the shape of Prof. Stanisław Pawłowski. Having been elected to the post at the 15th Congress held in Amsterdam in 1938, the Professor was alas to be murdered by the Nazi Occupants of Poland just a short while later.

When that awful War had finally come to an end, the first years of peace brought only sporadic Polish participation at Congresses, mainly through the presence of those who had remained in other European countries or America post 1945.

The first active participation by an official Polish delegation came about as late as in 1956, at the 18th (Rio de Janeiro) Congress. Nevertheless, renewed international activity was signalled by that event, with Polish geographers going on to become members and even chairs of the Union's Commissions and Study Groups.

Thus, Polish geographers participated at every Congress starting from 1956, including at the 30th, which was held in

Glasgow in 2004. There is no way to give here a detailed discussion of Polish activity in this, the world's largest international organization of geographers. All we can do is to mention a few names of those who took up various IGU posts over the 60-year period following the end of Second World War. The very President of the IGU was the Pole, Prof. Stanisław Leszczycki, in the 1968–1972 term of office. He also served as Vice-President in the years 1964–1968 and 1972–1976. A fellow Vice-President was Prof. Jerzy Kostrowicki, who held this function for two terms.

Polish geographers were also active in chairing the different IGU Commissions. Names here include Prof. Jan Dylík (1956–1972), Prof. Kazimierz Dziewoński (1964–1968, 1975–1994), Prof. Mieczysław Klimaszewski (1956–1968), Prof. Jerzy Kostrowicki (1956–1976), Prof. Stanisław Leszczycki (1956–1972), Assoc. Prof. Bogodar Winid (1956–1960) and Dr. Alina Potrykowska (1998–2004).

Beginning with the 26th Congress taking place in 1988, it has been possible to note a marked decline in the level of activity of Polish geographers, connected on the one hand with a changeover in their generations, and on the other with the period of systemic transformation Poland entered after 1989. In observing the role played by Polish geographers at the 30th Congress taking place in Glasgow, and most especially the initiative younger Polish geographers took to have one of the next few Regional Conferences of the IGU held in their country, it can be judged that years of renewed activity in the international arena on the part of Polish geographers can now hopefully be anticipated.

The 80-year tradition of affiliation between Polish geographers and the IGU combine with considerable organizational development of geographical institutions in Poland, and above all with serious substantive discussions on the theoretical and methodological bases of contemporary geography ongoing in Poland for 10–20 years, to guarantee the development of this sphere of knowledge, whose beginnings stretch back into antiquity. And the need "to describe the world" continues to fire the creative imagination of successive generations of geographers.

Main scientific centres of geography

Research is carried out at the Stanisław Leszczycki Institute of Geography and Spatial Organization of the Polish Academy of Sciences, at the classical universities and pedagogical academies, within the framework of the Polish Geographical Society, as well as, on a smaller scale, at some other university-level schools (like the schools of economics, including the Warsaw School of Economics, the agricultural schools – including the Warsaw Agricultural University the naval academies – e.g. climatology at the Gdynia Maritime University, chairs of landscape architecture at the technical universities, etc.), as well as in the planning bureaux of various types. In the Polish Academy of Sciences most researchers describe themselves as working in human geography, while at the universities – as physical geographers (Łoboda, 2004), yet the significance of social geography has been recently increasing in the latter, as well. In terms

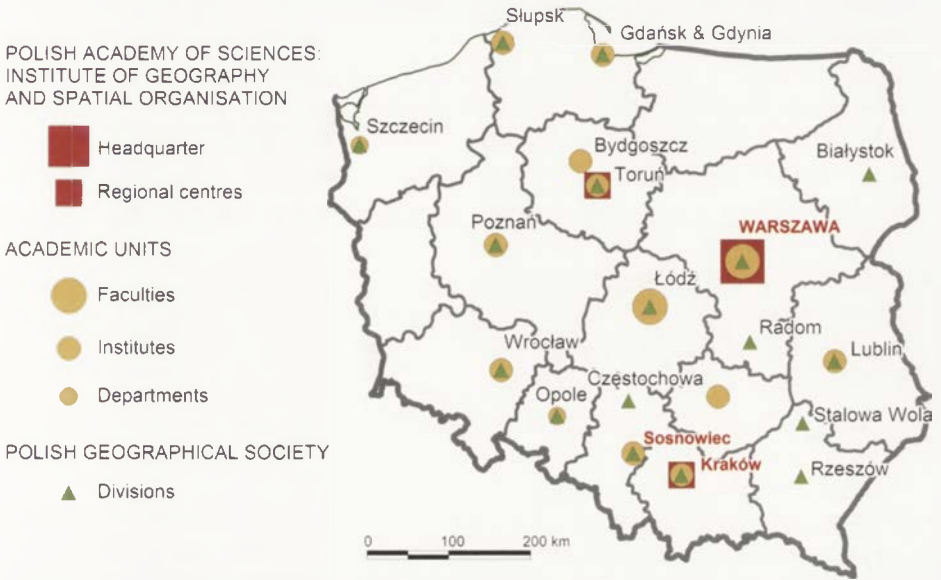


Figure 1. Geographical centres in Poland

of the numbers of students educated the leading positions are taken by: University of Silesia, University of Lodz, Warsaw University and Adam Mickiewicz University in Poznań. The teaching and research staff is the amplest at the Adam Mickiewicz University (Czyż, 2000).

The Stanisław Leszczycki Institute of Geography and Spatial Organization of the Polish Academy of Sciences

The Institute was established in 1953 for purposes of carrying out of research having particularly high importance for the national economy and of coordinating research conducted in other centres (through, in particular, financing of joint research programs and publication of research reports). Owing to the highly skilled research staff, the best library resources in Poland, and the journals of high renown, the Institute tries after

1989 to play the role of the most important geographical centre according to the principle of *primus inter pares*. The Institute employs some 60 persons of the research staff, and carries out research in geography of towns and population, regional development and geopolitics, geocology and climatology. The Institute has a Department of Geomorphology and Hydrology of Lowlands in Toruń, and the Department of Geomorphology and Hydrology of Mountain and Upland in Cracow. The English-language journals published by the Institute are *Geographia Polonica*, *Geopolitical Studies* and *Europa XXI*. Here also the most prestigious Polish-language geographical periodical is published, namely *Przegląd Geograficzny* [Geographical Review], along with some other ones, like *Prace Geograficzne* [Geographical Studies] and the series of *Atlas of Warsaw*.



Photo 1. The Stanisław Leszczyński Institute of Geography and Spatial Organization of the Polish Academy of Sciences



Warsaw University

Geography is represented here by the Faculty of Geography and Regional Studies. The Faculty employs altogether more than 100 of the research staff and educates some 1,300 students of geography and spatial economy, including also a number of post-graduate studies. This centre specialises in geocology, sedimentology, hydrology, as well as regional geography and the interdisciplinary studies of the developing countries.

This specialization is reflected in the titles of yearbooks published at the Faculty: *Actas Latinoamericanas de Varsovia*, *Africana Bulletin*, *Asian and Pacific Studies*. English is also the language of *Miscellanea Geographica*, published in the years of congresses and regional conferences of the IGU.

Jagiellonian University in Cracow

The Institute of Geography and Spatial Management makes a part of the Faculty



Photo 2. Faculty of Geography and Regional Studies at the Warsaw University



of Biology and Earth Sciences. It is the oldest centre of geographical studies in Poland, one of the oldest in the world. The most important research directions of the Institute include geomorphology, hydrology and mountain climate, especially of the Carpathians, as well as geography of settlement processes and tourism. In the framework of geography of tourism, cultivated here, the geography of pilgrimages developed, which became the impulse to the appearance of the centre of geography of religion. The journal *Peregrinus Cracoviensis* is devoted to this domain.

University of Łódź

This is a young, dynamic academic centre. Geography forms here the Faculty of Geographical Sciences, educating roughly 1,500 students (the biggest number of students of geography in Poland). Since the 1950s the centre gained renown due to the studies of periglacial processes (led by Jan Dylík, the journal *Biuletyn Peryglacjalny* [*Periglacial Bulletin*] was issued). Nowadays, side by side with the classical studies from the are-

as of physical geography and climatology, high importance was gained by the investigations in geography of tourism (journal *Turyzm* [*Tourism*], presenting studies from the domain of tourism), urban geography and political geography European Spatial Research and Policy.

Adam Mickiewicz University in Poznań

The specific feature of this centre consists in the significant emphasis placed on theoretical work in methodology of geography. The centre employs the biggest number of professors and associate professors in geography. The most significant achievements of the centre belong to the domains of geomorphology and geocology, environmental protection, landscape studies, as well as economic and settlement geography. English language journal *Questiones Geographicae* is published.

University of Silesia (in Sosnowiec)

Geography is a part of the Faculty of Earth Sciences at this university. It is a young academic centre of geography, situated in a mining and industrial region,



Photo 3. Jagiellonian University in Cracow



Photo 4. University of Silesia (in Sosnowiec)

strongly degraded in the past, currently undergoing transformation. Studies carried out here concern mainly the anthropologically conditioned transformation of natural environment: human impact and reclamation. These studies are conducted together with geologists and biologists, while in the area of transformation of social structures and the study of cultural landscape – together with sociologists, architects and ethnologists. Of other areas of research attention should be paid to the study of karst and to glaciology. In collaboration with the Association of Polish Geomorphologists the journal *Landform Analysis* is published. Some 1,300 students are being educated.

University of Wrocław

The Institute of Geography and Regional Development belongs to the Faculty of Natural Sciences. The studies are

conducted in various domains of geography and concern particularly the south-western part of Poland (e.g. the regional atlases), for instance – morphology of mountain slope in various climatic zones (e.g. investigations in Sudety Mts.), geography of towns, tourism and culture. The periodical of the Polish Geographical Society, *Czasopismo Geograficzne* [*Geographical Journal*] is published in Wrocław.

Marie Skłodowska-Curie University in Lublin

Geographers concentrate here in the Institute of the Earth Sciences within the Faculty of Biology and Earth Sciences. Lublin is situated on the loess plateau in Eastern Poland. Lublin was one of the first places in the world, where landscape maps were elaborated. Nowadays, studies in various areas of geography are con-

ducted, especially dealing with physical geography (studies in loess relief, paleogeography, etc.). The University maintains broad collaboration with the eastern neighbours of Poland, especially with Ukraine, and carries out investigations of the socio-economic changes in the borderland zone.

University of Szczecin

Geography makes a part of the Institute of Marine Studies at the Faculty of Natural Sciences. Research conducted concerns mainly physical geography of the coastal zone: remote sensing of the seas, photo-interpretation of the coastal zone, geomorphology and geology of the sea bottom, climatic changes at the border of land and sea. It is a very young centre, but a very dynamic one, as well, participating in numerous international programs and maintaining broad collaboration with other Baltic countries, especially with Germany.

University of Gdańsk

Geography is situated at the Faculty of Biology, Geography and Oceanology. The research carried out concerns especially the eastern part of the Polish seacoast, regional development and eco-development.

Nicolas Copernicus University in Toruń

Institute of Geography belongs here to the Faculty of Biology and Earth Sciences. The research conducted concerns a variety of subjects, especially in the domains of geomorphology, hydrology and geography of Polish Lowlands, as well as changes in natural environment, geography of set-

tlement processes and agriculture. The centre has a long lasting tradition, continued until today, of polar studies.

Kazimierz Wielki University in Bydgoszcz

The youngest University in Poland. Geography is situated at the Faculty of Natural Sciences. The study are conducted in physical geography, mainly in quaternary geomorphology and hydrology as well as in environmental protection.

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Geographical studies are also conducted at the pedagogical academies in Słupsk, Kielce, Cracow. In terms of the numbers of students and research staff these centres are comparable with the smaller universities. The research interests concentrate mainly on the region, in which the school is located, and on teaching of geography.

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