Statistical Office in Warsaw
ul. 1 Sierpnia 21, 02-134 Warsaw
tel.: 22 464 20 85 fax: 22 846 78 32
e-mail: InformatoriumUSWAW@stat.gov.pl http://warszawa.stat.gov.pl

DEMOGRAPHIC AND SOCIO-ECONOMIC SITUATION IN THE AREAS PROTECTED BY LAW IN SELECTED GMINAS IN MAZOWIECKIE VOIVODSHIP

Mazovian Centre for Regional Surveys
2012

Elaborated by:
Anna Antoszczak
Emilia Wyszołmierska

TABLE OF CONTENTS:

„Mazowieckie voivodship covers the majority of the historical region of Mazovia. Vast majority of the voivodship lies on the Polish Plain, in the Land of Great Valleys. Despite its location on the naturally plain land, the voivodship features diverse landscapes and numerous large areas of high preserved natural value. The area of Mazovia is enriched with numerous river valleys and creeks. An important element of the landscape, of large significance for nature, are valley walls in the form of wide cliffs. In contrast, the north-east of the region is dominated by elevations formed during the Quaternary glaciations, with numerous undrained hollows and kettle lakes, created through the process of the vanishing of post-glacial ice buried in the moraine or fluvioglacial deposits.

Another natural wealth of the voivodship are the remnants of the primeval woods, constituting nowadays large forest complexes with countless examples of natural plant communities and native fauna sanctuaries. A characteristic feature of the landscape, often found on deforested areas, are historical parks – remnants of the surroundings of mansions and palaces. They play a vital role on the typically agricultural areas, constituting many a time a wildlife sanctuary, especially for the birds. In the parks one can encounter valuable species of native and exotic trees and veteran trees."

„Mazowieckie Voivodship Environment Protection Program
for the years 2007-2010 with an outlook for 2014"

INTRODUCTION

The primary aim of creation of a system of areas protected by law is to preserve natural processes and stability of the ecosystems and above all to conserve biodiversity. Thus nature protection includes any activity, which aims at preventing destruction and harm to both living and non-living creations of nature.

In 2010 in Mazowieckie voivodship areas protected by law covered 29.7% of the total area. The areas of the highest natural value in the voivodship are covered by varied forms of legal protection[1]. They are:

- one national park (Kampinos National Park),
- 181 nature reserves,
- 9 landscape parks, including 5 located entirely within the voivodship,
- 29 areas of protected landscape,
- 67 *Natura 2000* areas,
- 4275 monuments of nature,
- 8 documentation sites[2],
- 731 ecological arable lands,
- 26 natural and scenic complexes.

They constitute a system of protected areas, linked by ecological corridors formed by valleys of minor rivers and by forest complexes.

The presence of areas protected by law in a given area is often perceived as an obstacle for the development of the connected territory[3]. Hence the **aim** of the analysis is to present the demographic and socio-economic situation of gminas, which have areas protected by law and to verify the hypothesis that the presence of such areas has a negative impact on the development of the gmina as a local unit.

Among 314 gminas of Mazowieckie voivodship, 243 have in their territory areas protected by law. For the analysis, **87 gminas** have been selected, in which the area protected by law covers **between 50% and 100%** of the total area.

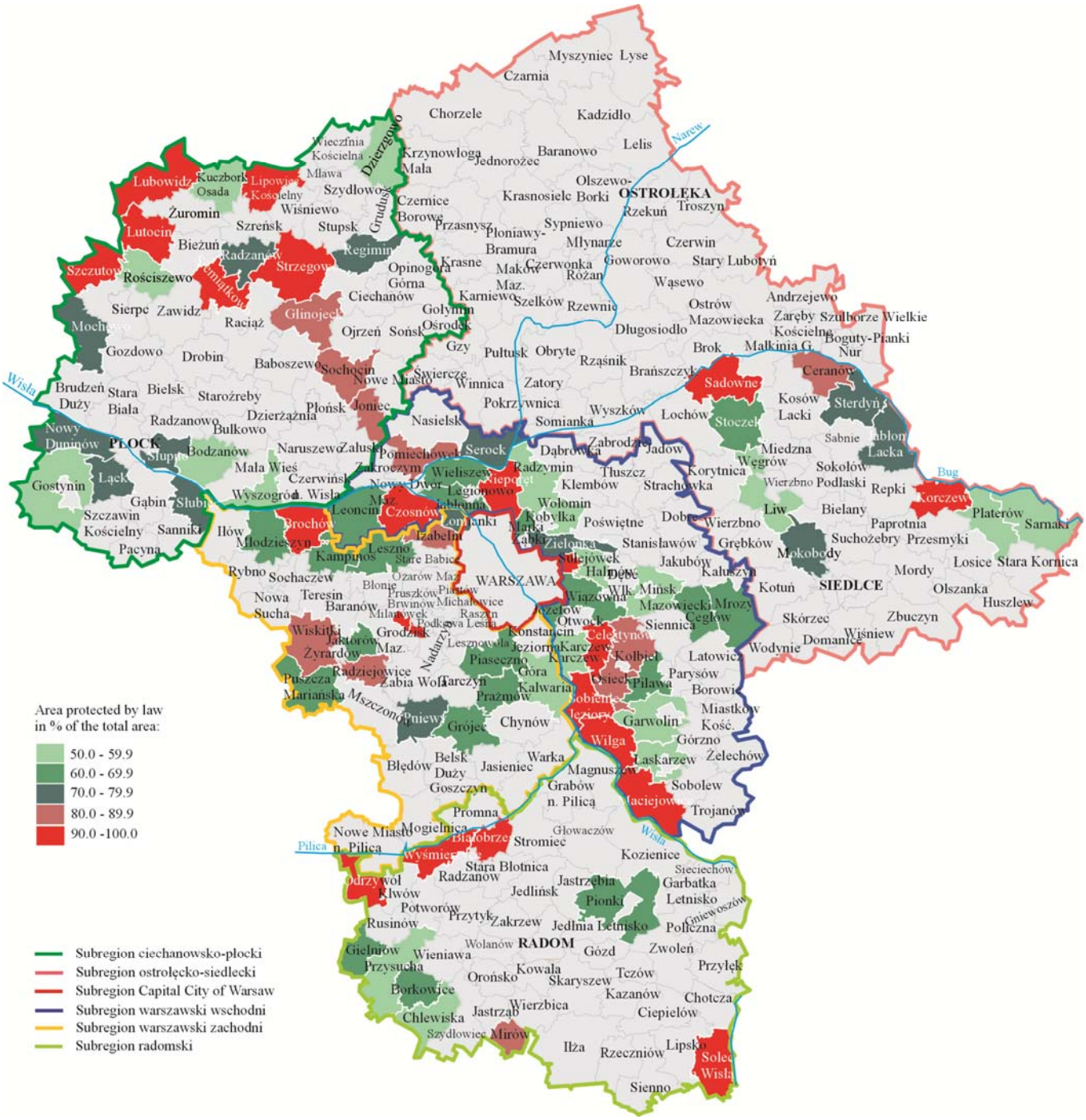
---

[1] Act of 16 April 2004 on nature protection (Journal of Laws of 2009, No. 151, item 1220 with amendments).

[2] Documentation sites are invisible on the surface or displayable sites of special scientific and educational interest, where geological formations, fossil accumulations or mineral objects occur; caves and rock shelters with alluviums, as well as exploited and discarded opencast and underground workings. Also sites of occurrence of fossilised plant and animal remnants can become documentation sites.

[3] PAP, „Będzie algorytm subwencji ekologicznej", *PortalSamorządowy.pl*, 17.05.2012; M. Cyrankiewicz, „Gminy chcą subwencji ekologicznej", *Rzeczpospolita. Prawo*, 21.05.2012.

Map 1. **Areas protected by law in selected gminas of Mazowieckie voivodship**



The elaboration has been based on data for **2010** available on the website of the Central Statistical Office. TERYT register classification served for determining the type of each gmina, either urban, rural or urban-rural.

Through the use of selected analytical methods spatial differentiation of the demographic situation, elements of the labour market, living conditions of the population and tourist functions of selected gminas have been presented in a wider perspective than the one offered by the traditionally used indicators. The following fields have been studied:

I. Demographic processes:

- Webb's classification of population change;
- age structure – Ossan triangle;
- demographic ageing rate.

II. Socio-economic situation:

- the level of socio-economic development according to Hellwig development measure.

III. Tourist function:

- Charvat index;
- Baretje and Defert index;
- Schneider index.

The potential of human resources is decisive for the development and wealth of any region. A good measure of the value of the demographic processes is net migration. Its rate per 1000 inhabitants allows to assess the attractiveness of the region. It can be assumed that positive net migration points to the attractiveness of the place, with respect to economy, society and ecology, whereas negative net migration can support a statement that the given gmina is depopulating due to the barriers to development and lack of perspectives.

Another factor of high significance for the demographic potential is the natural increase per 1000, that is the difference between the number of live births and the number of deaths over the studied period. The interconnection of these two factors has been defined in **Webb's classification**, which is one of the most widely known methods of measuring the links between natural increase or decrease and positive or negative net migration, which conditions occurrence of a particular type of the actual population increase of decrease.

Webb's classification contains:

I . Four types of active units with population increase due to:

A — natural increase higher than the co-occurring net emigration (+NI > –NM),

B — net immigration combined with an even larger natural increase (+NI > +NM),

C — natural increase combined with an even larger net immigration (+NI < +NM),

D — net immigration higher than the co-occurring natural decrease (–NI < +NM),

II. Four types of regressive units depopulating due to:

E — natural decrease larger than the co-occurring net immigration (–NI > +NM),

F — negative net migration and an even larger natural decrease (–NI > –NM),

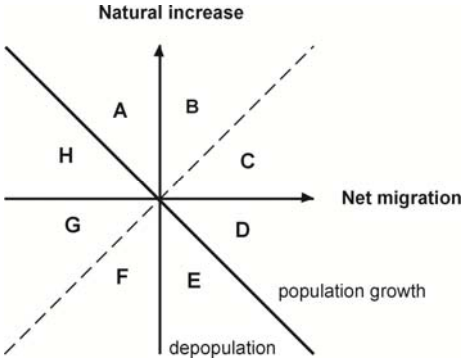
G — natural decrease and an even larger negative net migration (–NI < –NM),

H — negative net migration larger than the co-occurring natural increase (+NI < –NM).

In the case when the values of the natural increase rate and net migration rate are equal, transitory types are introduced. A transitory type can occur both between the depopulating and demographically active units, and within each of the categories. When the negative net migration equals natural decrease, the area is depopulating but it is impossible to tell which of the factors prevails. The type of the unit under study is read from the set of coordinates (and diagonals) presenting the relationship between the variables. The y-axis corresponds to

the values of natural increase, and the x-axis – to the net migration for permanent residence over the studied period.

Fig. 1. **Method for the classification of areas according to the components of population change**



The application of Webb's method allowed to determine the status of the population development in the gminas. From the conducted analysis it stems that out of the total number of 87 gminas participating in the study – 45 were demographically active (i.e. their population was growing), in 41 gminas the population change was regressive and 1 gmina (Osieck) belonged to the transitory type – the natural decrease was balanced by positive net migration. A vast majority of demographically active gminas belonged to the type C. These are gminas, in which net immigration outnumbers natural increase. Majority of the regressive gminas represented type G - gminas, where the number of population diminishes due to the natural decrease and, in addition, an even greater negative net migration. The classification of the analysed gminas according to Webb's classification is presented in the table below.

Table 1. **Demographic types of selected gminas of Mazowieckie voivodship according to Webb**

Demographic type	Proportion of areas protected by law in the total area of the gmina (in %)				
	50.0-59.9	60.0-69.9	70.0-79.9	80.0-89.9	90.0-100.0
A (active)	Karczew			Mirów	Celestynów
B (active)	Wołomin, gm. w. Garwolin	Pilawa, gm. w. Pionki			
C (active)	Halinów, Radzymin, Góra Kalwaria, gm. w. Mińsk Mazowiecki	Jaktorów, Grójec, Kampinos, Wieliszew, Piaseczno, Prażmów, Wiązowna, Józefów, Leoncin, Marki, Jabłonna	Nowy Duninów, Łomianki, Serock, Łąck, Zielonka, Słupno	Kołbiel, Wiskitki, Izabelin, Pomiechówek	Nieporęt, Wyśmierzyce, Czosnów, Sulejówek

Table 1. **Demographic types of selected gminas of Mazowieckie voivodship according to Webb (cont.)**

Demographic type	Proportion of areas protected by law in the total area of the gmina (in %)				
	50.0-59.9	60.0-69.9	70.0-79.9	80.0-89.9	90.0-100.0
D (active)	Bodzanów	Stoczek, Puszcza Mariańska, Leszno	Pniewy	Joniec, Radziejowice	Milanówek, Podkowa Leśna
D/E (transitory type)				Osieck	
E (depopulating)	Chlewiska, Sarnaki, gm. w. Gostynin	Mrozy, Młodzieszyn, Cegłów			Sobienie-Jeziory, Brochów, Wilga
F (depopulating)		Gielniów, Borkowice	Sterdyń, Jabłonna Lacka, Regimin		Korczew, Lipowiec Kościelny, Odrzywół, Solec nad Wisłą
F/G (depopulating)	Wyszogród			Ceranów	
G (depopulating)	Liw, Przysucha, Kuczbork- Osada, Dzierzgowo, Platerów		Mokobody, Słubice, Mochowo		Lubowidz, Siemiątkowo, Maciejowice, Szczutowo
H (depopulating)	Rościszewo, gm. w. Łaskarzew		Radzanów (pow. mławski)	Glinojeck, Sochocin	Strzegowo, Lutocin, Białobrzegi, Sadowne

Actual increase of population caused by the natural increase larger than negative net migration (type A), occurred in three gminas: Karczew and Celestynów (in otwocki powiat), and Mirów (in szydłowiecki powiat).

Type B, gminas where the population increase resulted from natural increase (larger) and net immigration, is represented by four gminas: Wołomin (wołomiński powiat), Pionki (rural gmina, radomski powiat), Garwolin (rural gmina, garwoliński powiat) and Pilawa (garwoliński powiat).

In the group of demographically active units, the attention is drawn to the most frequent type C, with net immigration as the dominant factor. This type occurs mainly in gminas concentrated around the capital city (25 out of 29 gminas representing type C belong to the Warsaw Metropolitan Area). Such a situation is a result of the influence of the capital city on the demographic development of the neighbouring administrative units. Thanks to Warsaw, its size and development potential, the neighbouring areas become more active. Analogous impact, although on a smaller scale, is seen also around the other subregional centres. Gminas neighbouring with Płock: Łąck, Nowy Duninów, Słupno, Bodzanów are within the

city's influence, which increases the work opportunities of their inhabitants and contributes to the local development.

The last category of demographically active units – type D is represented by nine gminas. The situation of these gminas is less favourable than in the two former categories (types B and C), which featured both natural increase and net immigration. Gminas belonging to the type D have positive net migration which outnumbers their natural decrease of population.

Osieck, gmina in otwocki powiat, has been classified as transitory type (D/E) – as the positive net migration compensates the natural decrease.

Among the depopulating units the least favourable situation is observed in the types F and G; these are gminas where natural decrease co-occurs with negative net migration. Majority of these gminas are located on the periphery of the voivodship. In the east of the voivodship these are i.a.: Jabłonna Lacka and Sterdyń (sokołowski powiat), and Korczew and Mokobody (siedlecki powiat). In the southern part of the voivodship such situation is found mainly in the gminas of przysuski powiat: Gielniów, Borkowice, Odrzywół, Przysucha.

A slightly better situation occurs in the gminas representing type H, where population is shrinking due to the negative net migration, outnumbering natural increase. Such situation occurred in nine gminas: Radzanów and Strzegowo (mławski powiat), Glinojeck (ciechanowski powiat), Rościszewo (sierpecki powiat), Lutocin (żuromiński powiat) Białobrzegi (białobrzeski powiat), Sadowne (węgrowski powiat), Łaskarzew (garwoliński powiat) and Sochocin (płoński powiat).

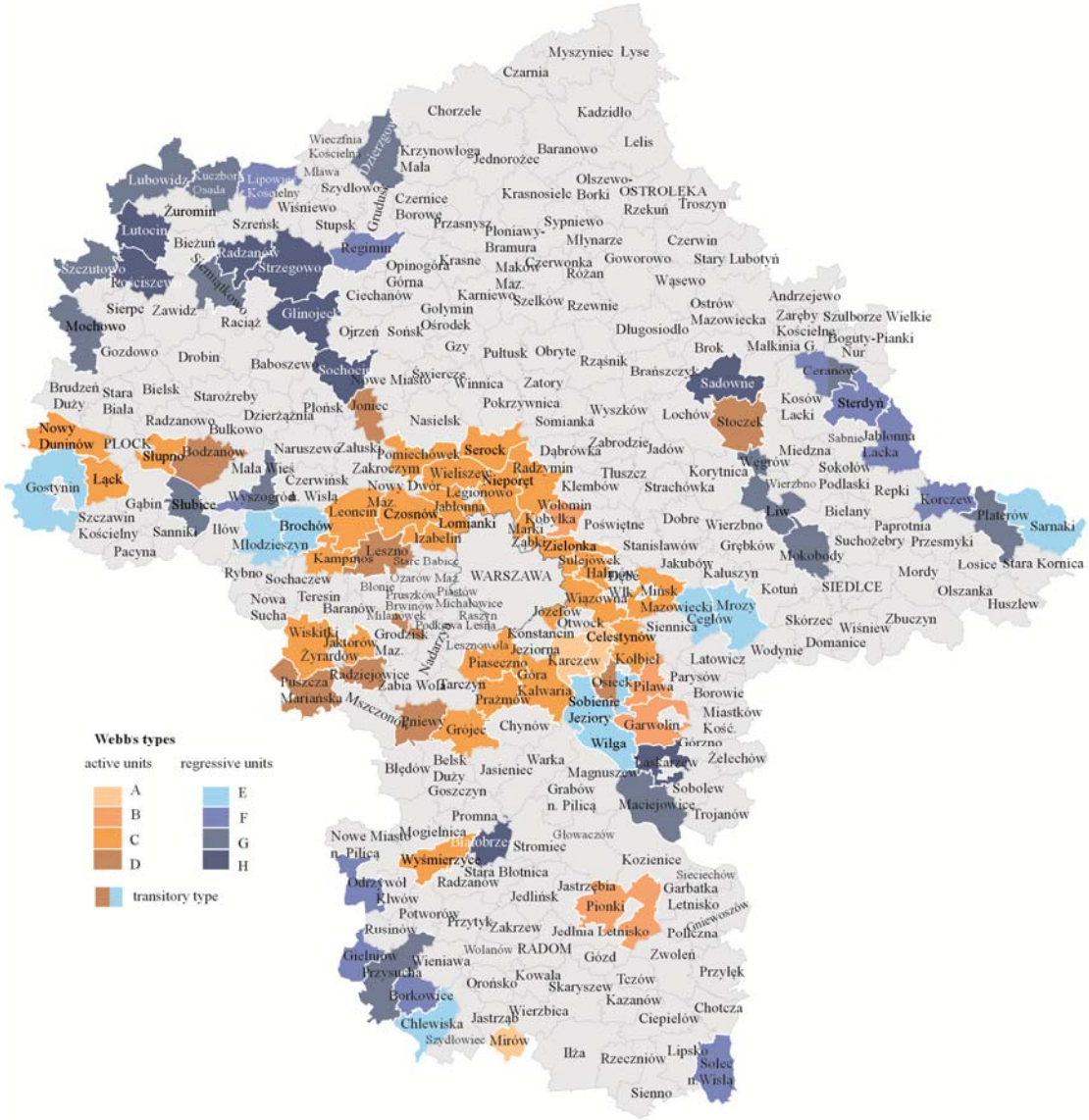
A similar situation is observed in the units belonging to type E. Such gminas are depopulating, with the natural decrease dominating over net immigration. Among the analysed gminas this type is represented by nine gminas: Mrozy and Cegłów (miński powiat), Młodzieszyn and Brochów (sochaczewski powiat), Chlewiska (szydłowiecki powiat), Sarnaki (łosicki powiat), Sobienie-Jeziory (otwocki powiat), Wilga (garwoliński powiat) and Gostynin (gostyniński powiat).

In two gminas, Ceranów (sokołowski powiat) and Wyszogród (płocki powiat) registered negative net migration was equal to the natural decrease, hence both gminas have been classified among depopulating units, transitory type F/G.

Using Webb's method allowed to divide the territory of the voivodship into two parts: centre of the region, where actual population growth dominated, and depopulating peripheries.

Growth of the population occurred in the gminas within the influence of the capital city. No impact of the area protected by law was observed. Among the depopulating gminas there were gminas with both the lowest (among the studied units) and the highest (100%) proportion of area protected by law in the total area. Similarly, among the demographically active ones, there are such gminas as: Bodzanów (płocki powiat) with 50.3% of area protected by law, Kalinów (miński powiat) – 53.1%, Wołomin (wołominski powiat) – 53.2% as well as gminas with 100% of their area protected by law. Such gminas include: Czosnów (nowodworski powiat), Sulejówek (miński powiat) and Celestynów (otwocki powiat). The factor determining the type of development was rather the situation of the gmina with respect to the centre of the region.

Map 2. **Demographic types of selected gminas of Mazowieckie voivodship according to Webb**



To assess the current socio-economic and demographic condition of the region, as well as to develop new perspectives for it, it is necessary to rely on the division of population according to age, based on socio-economic premises, in which three age groups are distinguished:

– pre-working age (0-17 years),

– working age (18-59 years for women, 18-64 years for men),

– post-working age (60 years and more for women, 65 years and more for men).

Such distinction allows to establish, at a given time, the number of people entering working age and the number of people, who leave working-age group, and as a result – to estimate the pool of potential workforce.

The structure according to economic groups of age has been shown using the so-called **Ossan triangle**. The proportion (in %) of the above defined age groups in the total population of each gmina has been marked on the sides of the triangle. As a result, the character of the age structure of a given gmina is shown by the location of the corresponding point, which is the cross-point of the three lines parallel to the sides of the triangle. On the basis of the arithmetic means of the proportion of each age group, the triangle has been divided into six classes reflecting different stages of development of the age structure of the population (Table 2.)

Table 2. **Classes describing the stages of the development of the age structure of the population (in %)**

Class		Pre-working age	Working age	Post-working age	Stage of the population
1		>20.4	>62.3	<17.3	Demographic Youth
2		>20.4	<62.3	<17.3	
3		>20.4	<62.3	>17.3	Demographic stabilisation
4		<20.4	>62.3	<17.3	
5		<20.4	>62.3	>17.3	Demographic ageing
6		<20.4	<62.3	>17.3	

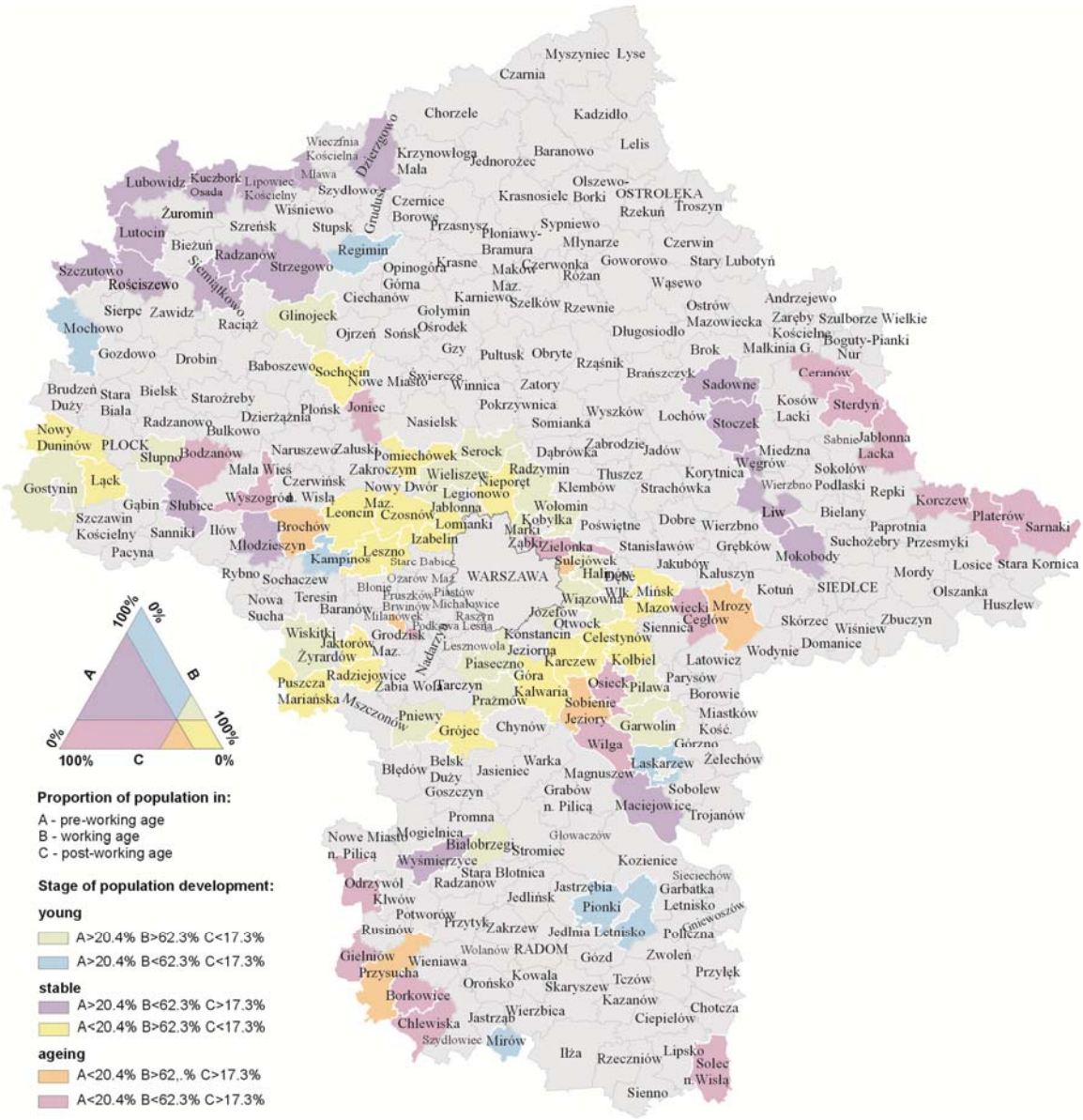
Among 87 gminas included in the study the largest part (37) has been classified to the stage of demographic stabilisation, while the numbers of gminas in demographic youth stage and in demographic ageing stages were both equal to 25.

Gminas classified as “demographically young” featured a large proportion of persons in pre-working age (over 20.4%) and a low proportion of people in post-working age (below 17.3%).

The largest proportion of people aged 0-17 has been registered in Mirów (szydłowiecki powiat) – 23.6%, whereas the smallest – in Karczew (otwocki powiat) – 17.4%.

The pool of workforce is reflected by the number of people in working age. The largest proportion of this age category has been registered in gminas located in Warsaw's neighbourhood, in legionowski powiat: Wieliszew – 66.9%, Jabłonna – 66.8%, Nieporęt – 66.7%. The lowest proportion of working-age people has been observed in the gminas located in the eastern part of Mazovia: Sterdyń – 56.7%, Ceranów – 56.8% (sokołowski powiat) and Korczew (siedlecki powiat) – 57.3%. These gminas feature also the largest proportion of persons in post-working age: 25.3%, 24.8% and 24.9%, respectively.

Map 3. **Classification of the selected gminas of Mazowieckie voivodship according to economic age groups**



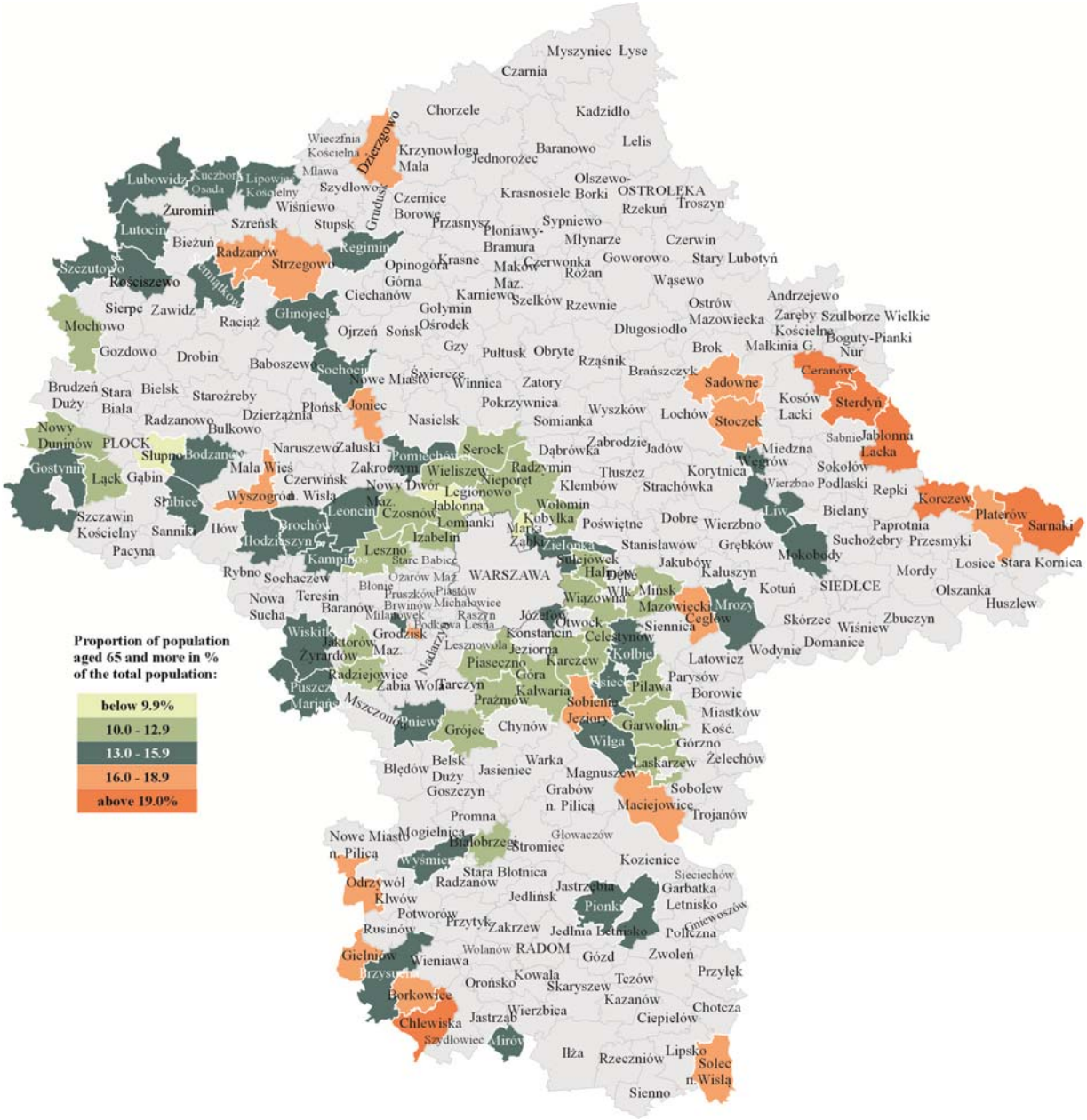
A synthetic picture of the age structure of the population according to economic groups can be obtained by calculating the age dependency ratio. It is the proportion of the number of people in non-working age (the sum of people in pre-working and post-working age groups) per 100 people in working age. It determines the potential burden of the non-working groups of the society on the working people. The lowest value of this ratio has been registered in Wieliszew (gmina located in legionowski powiat), where, where per 100 working-age people there were 49 people in non-working age. The highest value has been calculated for Ceranów and Sterdyń (both gminas located in sokołowski powiat), where the value of the ratio equalled to 76 people in non-working age per 100 working-age people.

Among the gminas of Mazowieckie voivodship, as in the whole Poland and Europe, we can observe a slow ageing of the society, expressed with the growing demographic ageing rate[4]. Mazowieckie voivodship belongs to the central-eastern part of Poland, where the process of ageing progresses faster than in the rest o the country. The percentage of people aged 65 and more in the total population equalled 14.5%.

Assessing the advancement of the ageing process can be performed using the UN scale of demographic ageing, in which the percentage of people above 65 years old exceeding 7.0% indicates a "demographically old population". On this basis it can be stated that the populations of the analysed gminas of Mazowieckie voivodship all belong to the "demographically old" category, as in all of them the percentage of population in old age is over 7.0%.

[4] The ratio of the elderly persons (65 years and more) to the general population.

Map 4. **Demographic ageing rate in selected gminas of Mazowieckie voivodship**



The lowest demographic ageing rate among the analysed gminas has been registered in the following gminas: Jabłonna (legionowski powiat) – 8.4%, Marki (wołomiński powiat) – 9.0% and Słupno (płocki powiat) – 9.9%. At the same time these gminas feature a large proportion of people below 20 years of age: 24.7%, 25.8% and 24.0%. Such age structure of the population is evidence of the youth of the local community, which can become He driving force for the development of the area. These gminas registered also a high natural increase and net migration per 1000 per people, which can be an effect of the process of

suburbanisation, that is moving from the cities to the surrounding areas: in the cases of Marki and Jabłonna – from Warsaw, and from Płock to Słupno.

The highest proportion of people aged 65 and more has been registered in gminas located near the eastern border of the voivodship: Sterdyń (sokołowski powiat) – 22.3%, Ceranów (sokołowski powiat) – 21.7%, Jabłonna Lacka (sokołowski powiat) – 20.7%, Korczew (siedlecki powiat) – 22.0% and Sarnaki (łosicki powiat) – 19.1%. In these gminas there was a low percentage of people below 20 years of age. A high proportion of the elderly persons can affect negatively the development of the society, as a burden for the younger generations, or even contribute to the economic regress of these areas. These gminas also observe natural decrease of the population and negative net migration (with the exception of Sarnaki). Located in the eastern part of the voivodship, they are agricultural, less developed regions. These factors cause that they are not attractive for inhabitants, hence the outflow of the population and the unfavourable demographic structure.

Analysing the demographic potential of the gminas included in the study one can observe that they are subject to the same trends as the rest of the gminas in Mazowieckie voivodship. The gminas located in the centre of the voivodship in Warsaw Metropolitan Area and within the threshold of the capital city's influence have a large demographic potential. They are demographically active units with population size growing mostly due to immigration, favourable age structure and a relatively low demographic ageing rate. The presence of areas protected by law draws attention to the natural value of the area, which increases the attractiveness of these gminas. Environmental value and transport accessibility contribute to the fact that they are often chosen for residence by many people from both Mazovia and other regions of Poland.

The unfavourable demographic processes concentrate first of all on the fringes of the voivodship where depopulating areas with an unfavourable age structure and advanced process of population ageing can be found.

The issues of environmental protection gain increasing importance for the socio-economic development. The necessity of compliance to the European norms and standards in this domain forces, especially the investors in industry, to increase outlays on necessary investment in building the infrastructure for environment protection or to pay more for using the existing infrastructure.

According to the legal act[5] in national parks and nature reserves any investment beyond the needs of the protection of areas of natural values is prohibited. In landscape parks, on areas of protected landscape and *Natura 2000 Network* areas, economic activity, especially in industry, is strongly limited.

Therefore the presence of protected areas on the territory of a given gmina tightens the conditions for investment, especially for industrial activities. However, the concept for the protection of areas of natural value allows for their sustainable and controlled use (apart from the nature reserves and areas under strict protection). It is hard to imagine a total exclusion of over 30% of the country territory from economic activity. On the other hand the areas with the most valuable nature and landscape are usually the ones where for various reasons economic activity on a large scale has not been much developed and for that reason they have not been degraded. They are most often forest complexes or agricultural areas (without any large production sites or heavy industry).

It is worth to have a closer look at the socio-economic situation of the gminas where areas protected by law cover more than half of the area. In the subsequent section the analysis focuses on the description of three areas belonging to the domain of sustainable socio-economic development, i.e. economy, society and natural environment. In the description of the economic development the commonly used variables allow for assessing the GDP, size of investment outlays as well as the indicators for urbanisation, industrialisation, technical and communication infrastructure and employment of the workforce. The decisive factors for social development are the level of education, culture and arts, healthcare and social assistance, as well as the labour market situation. Social development is reflected in the

[5] Act of 16 April 2004 on nature protection (Journal of Laws of 2009, No. 151, item 1220 with amendments).

living conditions of the population, influenced by i.a. housing conditions, equipment of the households, communication infrastructure.

To assess the socio-economic situation only variables which are measurable, available and complete were used. Hence some variables, despite their importance for the subject matter, were not included into the group of analysed variables due to the lack of availability, as they are aggregated only down to the level of powiats. Furthermore the level of differentiation of the data and correlation of variables was considered; in the case of excessive correlation the relevant indicators were eliminated.

The assessment of the level of socio-economic development was performed using **Hellwig development measure**. It is one of the most frequently used taxonomic methods, whose aggregated measure is calculated as a synthetic measure of the distance of an object from the theoretical model of development, which is a hypothetical gmina with the best observed values of the variables.

CHOICE OF VARIABLES AND DESCRIPTION OF RESEARCH METHOD

In the preliminary analysis quasi-constant variables were eliminated. For this purpose, for each variable up to *j, coefficient of variation* was calculated, the value of which is the relation of the standard deviation to the arithmetic mean, according to the formula:

$$V_j = \frac{S_j}{\overline{x_j}}$$

where:

V_j – *coefficient of variation* for each variable *j*;

$S(x_j)$ – standard deviation for variable *j* along the formula:

$$S_j = \sqrt{n^{-1}\sum_{i=1}^{n}\left(x_{ij} - \overline{x_j}\right)^2}$$

$\overline{x_j}$ – arithmetic mean of variable *j,* according to the formula:

$$\overline{x_j} = n^{-1}\sum_{i=1}^{n} x_{ij}, (i = 1, ..., n)$$

It was assumed that the variables which satisfy the condition $|V_j| \leq V^*$, where V^* means the critical value of the coefficient of variation, will be eliminated. The adopted critical value was $V^* = 0.10$. As all the variables displayed relatively large variation, on this stage none of them was eliminated.

In the next stage the strength of correlation between the variables was examined using Pearson's coefficient of linear correlation. The following formula was used:

$$r_{xy} = \frac{\sum_{i=1}^{n}\left(x_i - \overline{x}\right)\left(y_i - \overline{y}\right)}{\sqrt{\sum_{i=1}^{n}\left(x_i - \overline{x}\right)^2 \sum_{i=1}^{n}\left(y_i - \overline{y}\right)^2}}$$

where:

r_{xy} – Pearson's coefficient of linear correlation,

x, y – measurable statistical traits, x = (1,2, … , n), y = (1,2, … , n),

$\overline{x}, \overline{y}$ – arithmetic mean of the variables x and y.

Pearson's coefficient of linear correlation has values in the range <–1; 1>, where r_{xy} = 0 means there is no linear correlation between the variables, and r_{xy} = 1 means exact, positive linear correlation between the variables, and r_{xy} = -1 means exact, negative linear correlation between the variables. The variables which show a strong correlation will not be used in the further analysis.

For all variables a matrix of correlation was constructed. The value r^*=|0,75| was adopted as the critical value of the correlation coefficient. Due to the high level of correlation with the rest of the variables one variable was eliminated: number of economic entities in REGON register per 1 thousand population.

Eventually, in the set of variables used for the assessment of the level of socio-economic development of the gminas included in the survey there were **11 variables**:

x_1 — income of the budget of gminas and towns with powiat status per capita (in PLN),
x_2 — investment outlays per capita (in PLN),
x_3 — percentage of registered unemployed in the number of working-age population (in %),
x_4 — number of the employed per 1000 inhabitants,
x_5 — number of people granted social assistance per 1000 population,
x_6 — number of pupils per 1 computer with access to the Internet for the use of pupils in primary schools,
x_7 — number of population per 1 library,
x_8 — average useful floor area of a dwelling in dwelling stock per capita (in m^2),
x_9 — percentage of persons using sewerage (in %),
x_{10} — municipal waste collected over a year per capita (in kg),
x_{11} — percentage of areas protected by law in the total area of the gmina (in %).

In order to standardise the variables they were subject to *normalisation* along the following formula:

$$z_{ij} = \frac{\left(x_{ij} - \overline{x_j}\right)}{s_j}, \left(j = 1, 2, \ldots, n\right)$$

where:

z_{ij} – standardised value of x_{ij}.

As a result a matrix of values of variables z was produced, which was the basis for determining the so-called model of development, i.e. an abstract object P_0 (a gmina) with standardised coordinates $z_{01}, z_{02}, \ldots, z_{0j}$, where: $z_{0j} = \max\{z_{ij}\}$, when z_j is a stimulant, and $z_j = \min\{z_{ij}\}$, when z_j is a de-stimulant. It follows that the model of development is a hypothetical gmina with the Best observed values of the variables.

In the next stage the similarity of objects P_0 (gminas) to the abstract ideal object (model of development) was examined through calculating the distance from the model according to the formula:

$$D_{io} = \sqrt{\sum_{j=1}^{m} \left(z_{ij} - z_{oj}\right)^2}$$

where:

D_{io} is the distance from the object i to the object P_0.

In the last stage of calculations for each object P_i (gmina) the synthetic index was calculated according to the formula:

$$d_i = 1 - \frac{D_{io}}{D_o} \left(i = 1, 2, ..., n\right)$$

where:

$$D_o = \overline{D_o} + 2S_o$$

$$\overline{D_o} = n^{-1} \sum_{i=1}^{n} D_{io}$$

$$S_o = \sqrt{n^{-1} \sum_{i=1}^{n} \left(D_{io} - \overline{D_o}\right)^2}$$

The taxonomic measure d_i has values in the range [0, 1]. The more the values of the variables are close to the model, the higher the level of development

For the classification of gminas according to the level of development two parameters of the taxonomic measure were used, i.e. its arithmetic mean and standard deviation. On their basis the following groups were distinguished:

- **group I** – with **the highest** level of development, to this group belong the gminas for which the distance from the model exceeds the sum of the arithmetic mean and of the standard deviation: $d_i > \overline{d_i} + s_{d_i}$;
- **group II** – with **medium** level of development, this group consists of gminas whose distance from the model is within the range: $\overline{d_i} - s_{d_i} < d_i \leq \overline{d_i} + s_{d_i}$;
- **group III** – with a **low** level of development, to this group belong the gminas, whose distance from the model does not exceed the value of the difference between the mean and standard deviation: $d_i \leq \overline{d_i} - s_{d_i}$.

where:

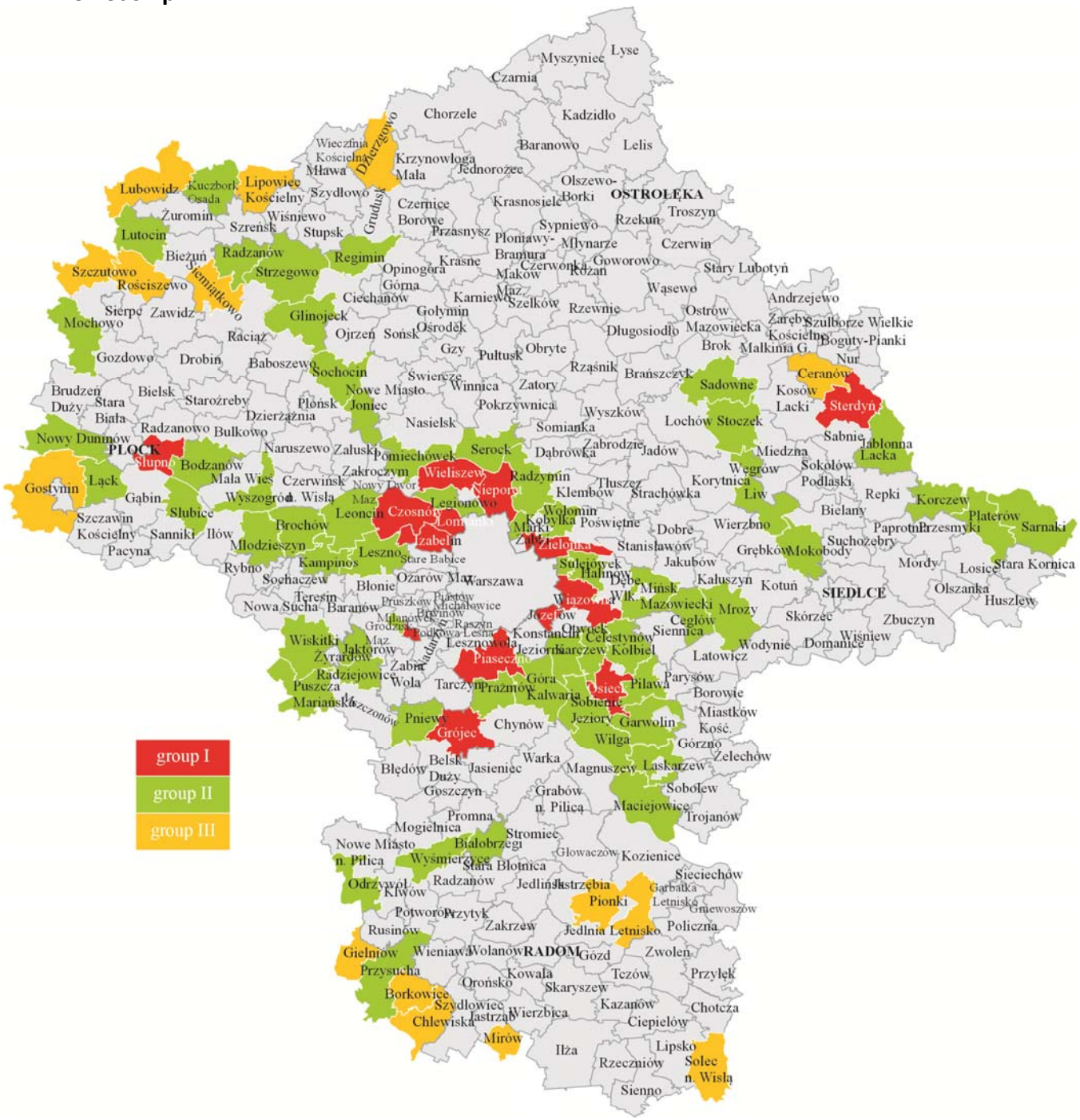
d_i – value of the synthetic measure calculated according to the Hellwig development measure method,

$\overline{d_i}$ - arithmetic mean of the variable d_i (taxonomic measure),

s_{di} – standard deviation of the variable d_i.

By using the Hellwig taxonomic development measure the analysed gminas were ranked according to their level of socio-economic development. The spatial distribution of the values of the measure of development is presented in map 5. whereas the table 1. (in annex) presents the ranking of gminas according to the value of the measure of development.

Map 5. **Distribution of Hellwig development measure in selected gminas of Mazowieckie voivodship**



Group I consists of 14 gminas, of which three urban ones (half of the urban gminas participating in the survey), three urban-rural and eight rural gminas. The gminas from this group are concentrated mainly around the capital city, of which 11 belong to Warsaw Metropolitan Area. It is worth to pay attention to three gminas: Osieck (otwocki powiat), Sterdyń (sokołowski powiat) and Słupno (płocki powiat), which do not belong to Warsaw

Metropolitan Area and have a rural character, yet their value of the development measure is on a par with the areas around Warsaw. In addition, Słupno is the gmina which registered the highest value of the development measure in the group.

The most numerous group is group II, to which 60 gminas were classified, including three urban ones, 12 urban-rural and 45 rural ones. The gminas belonging to this group are dispersed on the whole territory of the voivodship – they are both areas in the Warsaw Metropolitan Area, and peripheral gminas in large distance from urban agglomerations. The highest value of the development measure in this group was registered in Leszno (gmina in warszawski zachodni powiat), the lowest – in Szczutowo (sierpecki powiat) – both with rural character.

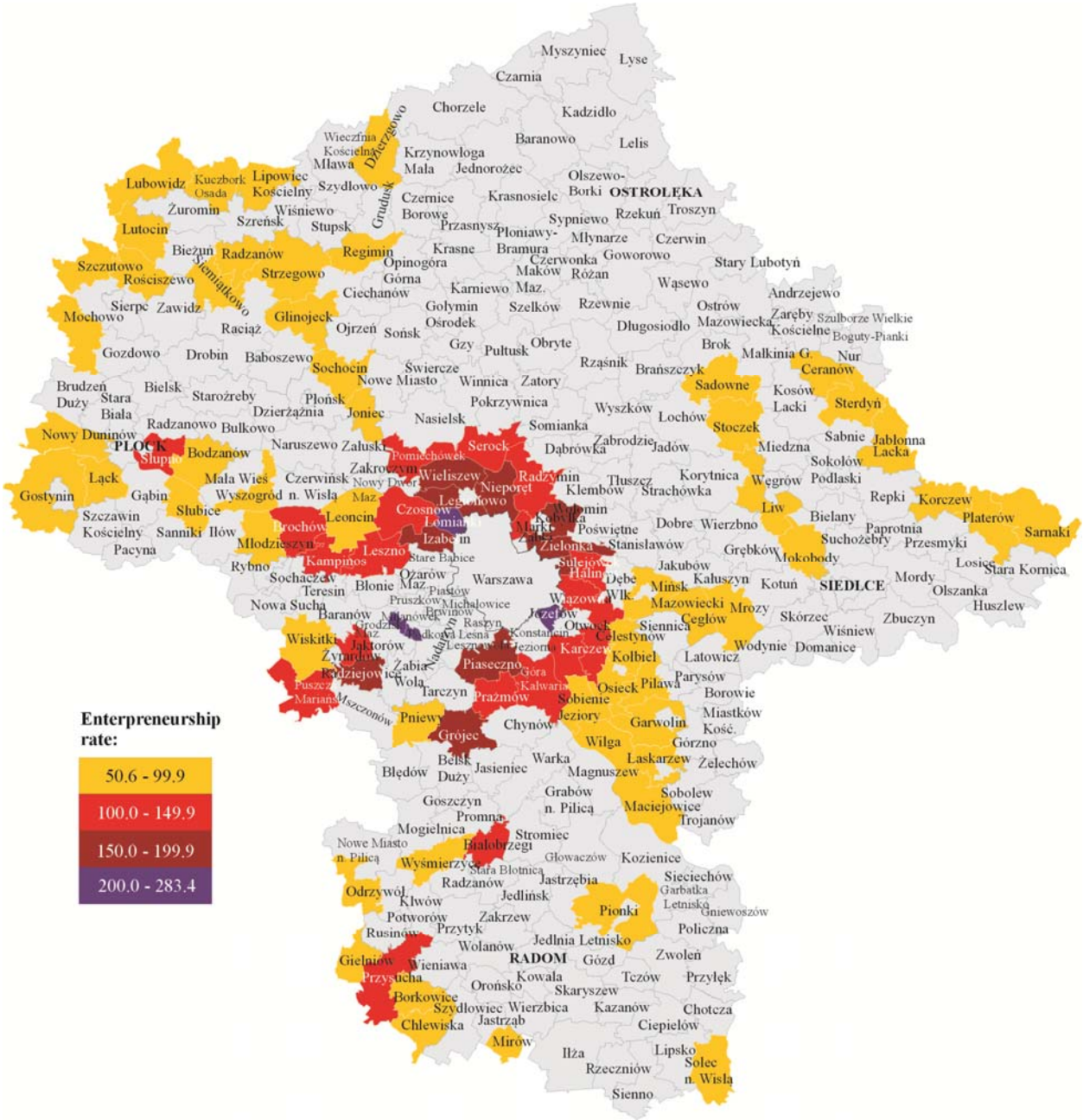
Group III consists of 13 gminas, all of rural character. The highest value of the development measure was registered in Ceranów (gmina in sokołowski powiat), the lowest - Mirów (gmina in szydłowiecki powiat). Most probably the peripheral location of these areas with respect to the areas with high economic potential and lack of convenient communication connections has caused that these gminas registered the east favourable values of the synthetic index.

For the further analysis it is significant, that in the studied areas the level of development is differentiated even within one powiat. A good example may be sokołowski powiat (in ostrołęcko-siedlecki subregion), in which lay Sterdyń from group I, Jabłonna Lacka from group II and Ceranów classified in group III with the least favourable values of the index. Hence in the further part of the analysis the description is based on the situation of the particular gminas.

The statistics of Mazovia are largely affected by Warsaw agglomeration, which causes both positive consequences for the development and problems with the functioning of subregional units. The element favourable for development are the functions of Warsaw as the capital city, which attract foreign investors and multinational companies investing their capital in Poland; as not all investments can be located in the centre, they spread to the suburban areas, further and further away from the very centre of Warsaw. However, the large concentration of economic entities in the capital city's area does not favour the development of the smaller regional centres.

A very important factor determining and stimulating socio-economic development is the level of local entrepreneurship. Spatial distribution of the entrepreneurship rate[6] is presented in the map below.

Map 6. **Entrepreneurship rate in selected gminas of Mazowieckie voivodship**



The highest values of the entrepreneurship rate were registered in the neighbourhood of Warsaw or other urban centres. 90% of gminas which registered over 100 entities per 1000

[6] The number of economic entities run by natural persons per 1000 population.

inhabitants belong to Warsaw Metropolitan Area. Apart from the metropolitan area, a large scale of entrepreneurship was registered in Białobrzegi (gmina in białobrzeski powiat), Słupno (płocki powiat) and Przysucha (gmina in przysuski powiat), with 140, 133 and 102, respectively, economic entities per 1000 population.

The lowest entrepreneurship is displayed by inhabitants of peripheral gminas, located away from the larger urban centres. The lowest level of the entrepreneurship rate was observed in Rościszewo in sierpecki powiat. It is a gmina which, in comparison to the powiat, registers unfavourable indicators in the field of demography: the smallest population (4 146 people), the highest demographic dependency ratio (68 persons in non-working age per 100 working-age population), social situation: a large number of people receiving social assistance benefits (114 people per 1000 inhabitants), the lowest percentage of population using water supply network (62.8%) and sewerage (4.9%), relatively low enrolment rate[7] (93.8% in primary schools and 91.1% in lower secondary schools), as well as labour market: the lowest number of employed per 1 000 population (29 people) and a relatively large number of the registered unemployed per 1000 inhabitants (74 persons). Regarding the value of the development index among 87 studied gminas Rościszewo ranked low, 79th. Unfavourable data registered by the gmina are a result of the problems on the local labour market, as two other gminas in the same powiat (Mochowo and Szczutowo) display an equally low scale of entrepreneurship.

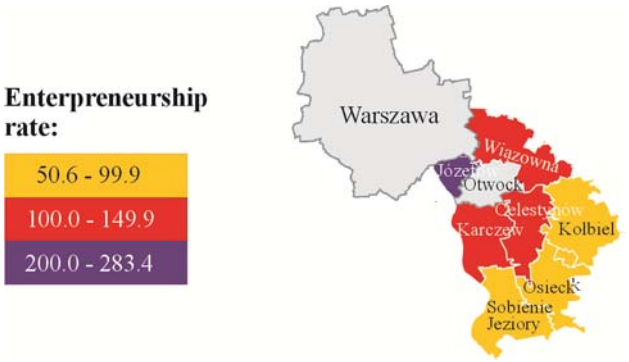
In the group of gminas with low scale of entrepreneurship there are also five rural gminas located on the peripheries of Warsaw Metropolitan Area: Leoncin (gmina in nowodworski powiat), Wiskitki (żyrardowski powiat), Pniewy (grójecki powiat), Kołbiel (otwocki powiat) and Mińsk Mazowiecki (miński powiat). However these gminas, despite the low entrepreneurial activity of their inhabitants, do not face the problem of high unemployment, Thanks to the proximity of areas with high economic potential and convenient communication connection they profit from the external labour market.

It is worth to draw attention to the mentioned earlier influence of the capital city and transfer of investment capital from the city core to the suburban areas. A very good example of this phenomenon is otwocki powiat, where particular gminas registered very different

[7] The proportion of the number of persons studying (as of the beginning of the school year) on a particular schooling level (regardless of age) to the size of population (as of 31. December) in the age group corresponding to the level of education.

levels of the entrepreneurship rate, increasing with the proximity to the centre of the capital city.

Map 7. **Entrepreneurship rate in otwocki powiat**



Business activity in the areas protected by law is subject to limitations depending on the form of nature protection[8]. According to the act[9] in such areas mining, heavy industry and any business activity with high environmental impact are banned, whereas agriculture and forestry are limited by legal regulations. However, among the gminas included in the study dominating types of economic entities[10] are the ones running trade activities (retail, excluding retail car sales) or specialist construction works. These types of activities do not have negative impact on the environment or ecological balance, but fulfil the basic consumer and welfare needs of the inhabitants.

Presence of areas protected by law in gminas does not limit the economic activity of their inhabitants. Gminas with almost 100% of protected area register as good results as the ones with lower proportion of such areas. Examples include: Izabelin, Nieporęt or Sulejówek, where the area protected by law exceeds 75% of the total area, and despite that the registered value of the entrepreneurship rate is high.

Economic entities functioning in gminas generate demand for work, hence the areas with the largest number of registered economic entities register the highest number of the employed[11] per 1000 inhabitants.

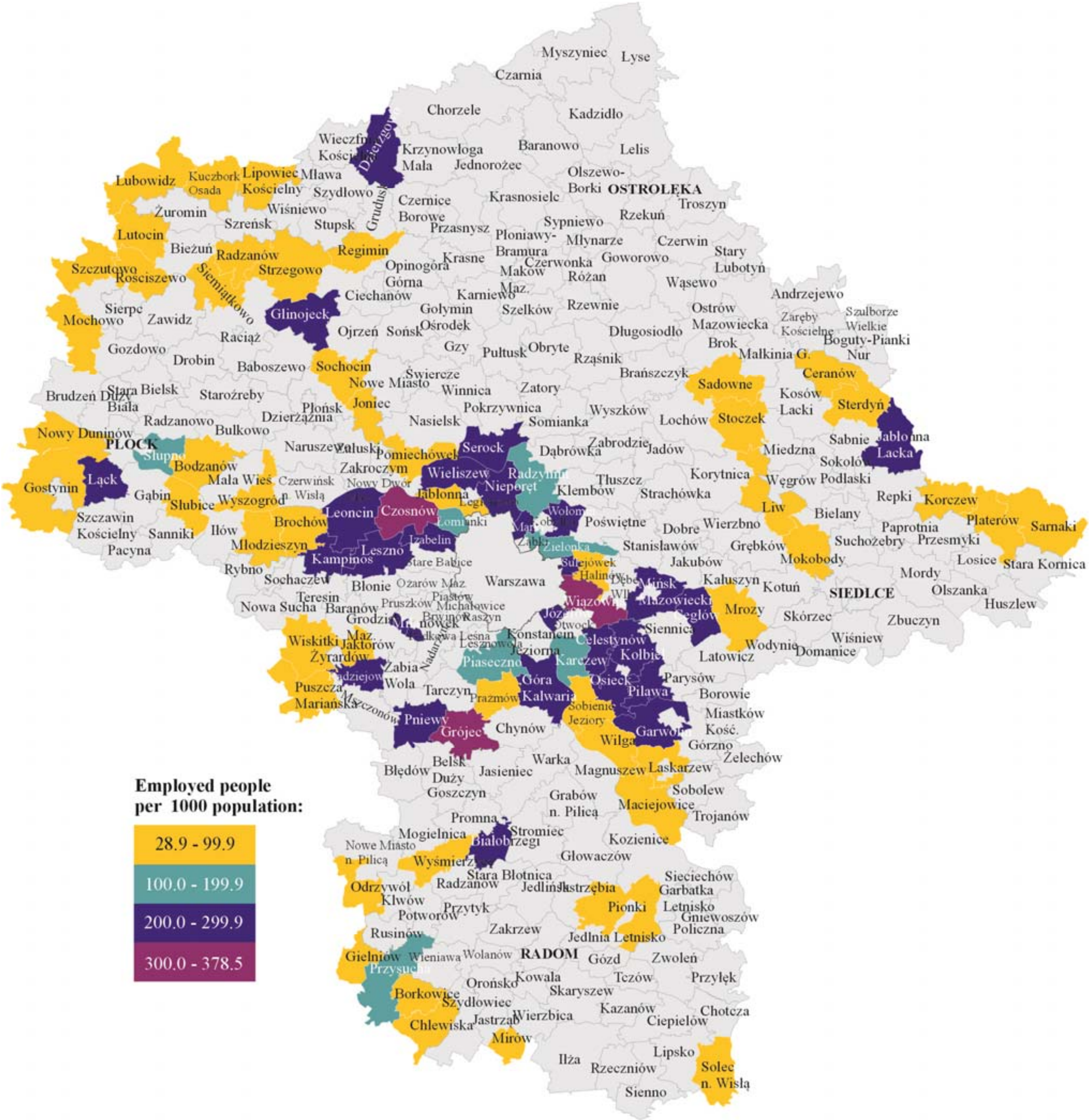
[8] In landscape parks and areas of protected landscape business activity is allowed and should be run according to the general (act on nature protection) and detailed (plan of protection in the park, voivode's order) regulations.

[9] Act of 16 April 2004 on nature protection (Journal of Laws of 2009, No. 151, item 1220 with amendments).

[10] Excluding persons running private farms in agriculture.

[11] According to the actual workplace and kind of activity; excluding economic entities with not more than 9 employed persons; excluding persons running private farms in agriculture.

Map 8. **The number of employed people per 1000 population in selected gminas of Mazowieckie voivodship**



However, not all gminas, which have a high entrepreneurship rate demonstrate equally large number of employed persons. Among the gminas included in this study seven registered the entrepreneurship rate between 100 and 150 entities per 1000 population and the number of employed persons not higher than 100 people per 1000 inhabitants. These gminas are: Brochów (sochaczewski powiat), Słupno (płocki powiat), Pomiechówek (nowodworski powiat), Halinów (miński powiat), Prażmów (piaseczyński powiat), Jaktorów (grodziski powiat) and Puszcza Mariańska (żyrardowski powiat).

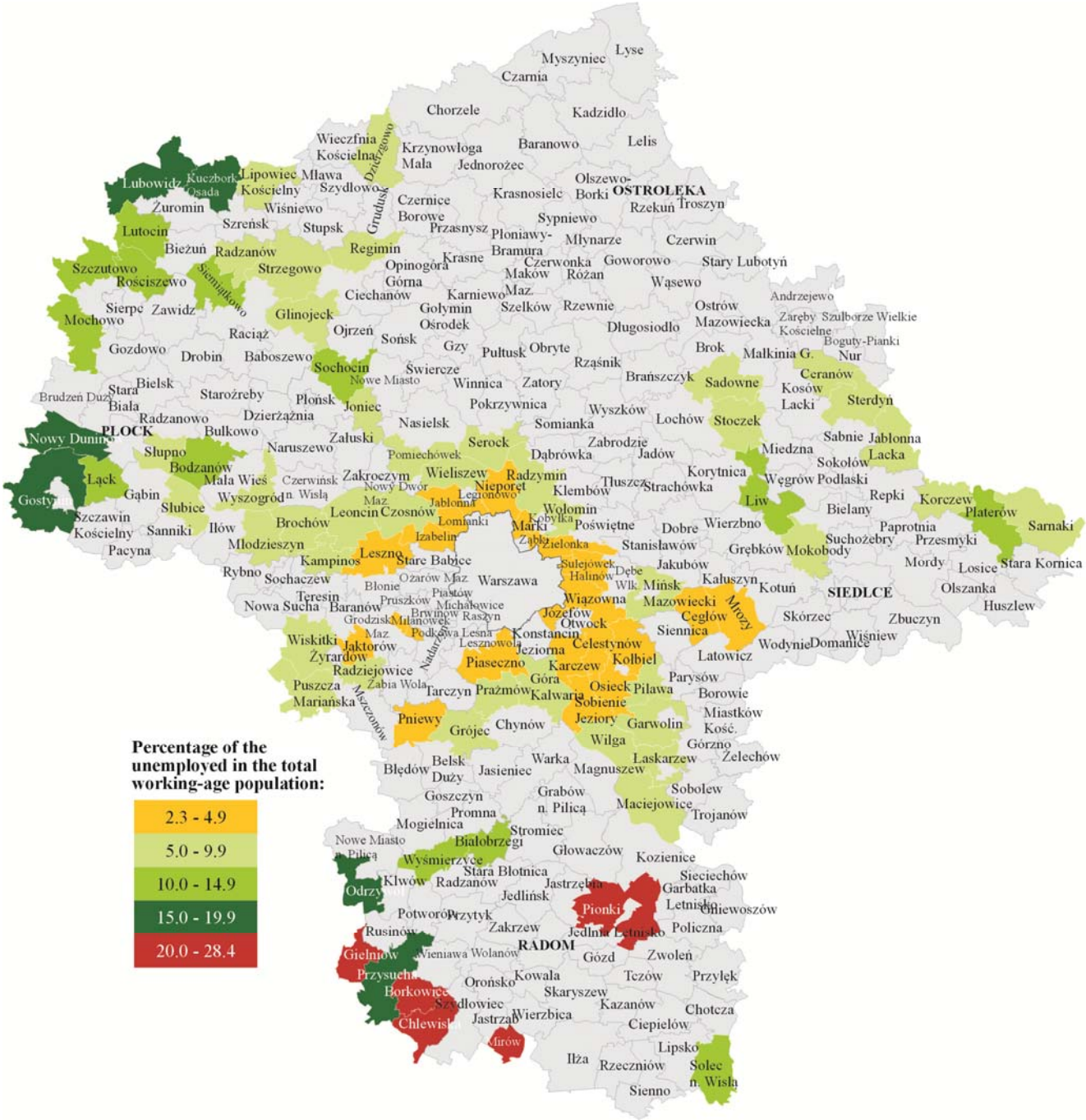
In contrast, in nine gminas the situation was reverse: the value of entrepreneurship rate was not higher than 100 entities per 1000 population while the number of employed persons exceeded 200 per 1000 inhabitants. These gminas are: Leoncin (nowodworski powiat), Jabłonna Lacka (sokołowski powiat), Mińsk Mazowiecki and Cegłów (miński powiat), Kołbiel and Osieck (otwocki powiat), Pilawa and Garwolin (garwoliński powiat) and Pniewy (grójecki powiat).

In the area of analysed gminas in the case of the number of both entities and employed persons, one can observe the so-called sprawl of the development of the Warsaw metropolis and the influence of the larger urban centres on the local labour market, which then affects negatively the development of smaller centres and peripheral areas. The low scale of entrepreneurship in these areas and inconvenient communication connections with larger centres generate unemployment.

As the unemployment rate is not available on the level of gminas, for the aims of the analysis the percentage of registered unemployed in the number of working-age population has been calculated.

The highest values of unemployment rate were registered in gminas, where protected areas cover less than 66% of the area, these are: Gielniów and Borkowice (przysuski powiat), in which the unemployment rate equalled 28.4% and 26.4%, respectively. The lowest unemployment occurred in gminas where the protected area covers above 95%: Podkowa Leśna (grodziski powiat) – 2.3%, Sulejówek (miński powiat) – 3.0% and Milanówek (grodziski powiat) – 3.4%.

Map 9. **Percentage of registered unemployed in the working-age population in selected gminas of Mazowieckie voivodship**



Due to the fact that the labour market situation affects the social situation of inhabitants, the gminas facing the problem of unemployment show the largest need for financial assistance in the form of welfare benefits. The largest number of people relying on such assistance was registered in Gostynin (gmina in gostyniński powiat), where the proportion of such persons equalled 186 people per 1 000 inhabitants. The least – in Łomianki near Warsaw (warszawski zachodni powiat) and in Piaseczno (piaseczyński powiat) – 16 persons

per 1000 inhabitants in both gminas. The most common reason for granting benefits was poverty and unemployment; among the studied gminas the percentage of families using benefits for these reasons among all families receiving benefits was 26.7% due to poverty and 21.3% - to unemployment.

A factor strongly determining the living conditions of inhabitants is the number of dwellings in the gmina. Despite the fact that Mazowieckie voivodship boasts the largest dwelling stock in the country (387 per 1000 population), the accessibility of dwellings is still insufficient.

In the case of gminas having areas protected by law, difficulties in residential construction can occur in relation to the so-called surface forms of nature protection i.e. national parks, nature reserves, landscape parks, protected landscape areas, *Natura 200 Network* areas, they concern less ecological arable lands, documentation sites and natural and scenic complexes. However on the latter restrictive bans – changes in land use plans resulting in preventing residential construction – can be introduced by the communal council. Hence, in the *Plans of Spatial Organisation of the Gminas* the local authorities take into account the systems of protected areas, both existing and projected.

The largest number of dwellings, taking into account only the newly built ones, was registered in Radzymin (wołomiński powiat) and Piaseczno (pasieczyński powiat) – 16 and 13, respectively, completed dwellings per 1000 inhabitants. The least newly built dwellings were constructed in Lutocin (żuromiński powiat) and Szczutowo (sierpecki powiat) – in both gminas the number was 0.2 dwelling per 1000 inhabitants.

It is worth to pay attention to the phenomenon of suburbanisation, which occurs especially in the gminas in Warsaw Metropolitan Area and around subregional centres. The phenomenon is the most dynamic in the areas situated near main communication routes (roads and railway lines) as well as in areas attractive with respect to natural environment and tourism. From the point of view of the spatial planning suburbanisation is linked to the disadvantageous process of spontaneous urbanisation. This leads in many cases to the uncontrolled sprawl of residential construction, causing the increase of the cost of infrastructure, deteriorating communication and, what's important – negative impact on the environment due to the pressure of residential construction on the areas protected by law.

The development of construction registered in the areas around Warsaw is a result of many processes, i.a. migratory inflow of population for the capital city due to the lower costs of

maintaining the property or from the other regions due to the opportunity of receiving better salary than in the other parts of the voivodship. Locations around Warsaw play the role of "dormitories" for the capital city, with the characteristic phenomenon of second homes from which the inhabitants commute to the metropolis. Similar processes were observed in suburban zones of the subregional centres: Płock, Ostrołęka, Siedlce and Radom, but the scale of these phenomena is much smaller and limited to a few gminas around each urban centre.

Considering the average useful floor area of a dwelling[12] per capita the best situation occurs in the gminas around Warsaw: Podkowa Leśna (grodziski powiat) and Łomianki (warszawski zachodni powiat), which registered 49.2 m^2 and 44.2 m^2 of living space per 1 person. The smallest average useful floor area was registered in gminas located peripherally with respect to the centre: Szczutowo (sierpecki powiat) – 21.1 m^2 and Mirów (szydłowiecki powiat) – 18.4 m^2.

In addition, weaker construction turnover in peripheral areas results in unsatisfactory standard of the equipment of dwellings in technical installations, especially in rural areas. Widespread detached housing dominating in these areas poses significant technical and economical barriers to their equipment with technical infrastructure: water supply network, sewerage, gas, telecommunication or roads. Hence, the largest percentage of inhabitants using sewerage was observed near Warsaw: in the urban-rural gmina Piaseczno (piaseczyński powiat) – 74.2% and in the urban gmina Zielonka (wołomiński powiat) – 65.4% of the total number of inhabitants. In 19 among the analysed gminas there was no sewerage. These gminas include i.a.: Siemiątkowo (żuromiński powiat) and Lipowiec Kościelny (mławski powiat) in ciechanowsko-płocki subregion, Ceranów (sokołowski powiat) and Korczew (siedlecki powiat) in ostrołęcko-siedlecki subregion, and Mirów and Chlewiska (szydłowiecki powiat) in radomski subregion. All the gminas with no sewerage are rural ones.

The area of Mazowieckie voivodship features also large differentiation with respect to the social infrastructure. Although the gminas near Warsaw have much better developed infrastructure, its availability for the inhabitants (number of people per one facility) the situation has been changing. In the domain of health care – the least people per 1 health care establishment are registered in Sarnaki (łosicki powiat) – 1 258, and Korczew (siedlecki

[12] In dwelling stock.

powiat) – 1 439 persons, the most in gminas near Warsaw: Halinów (miński powiat) – 14 105 and Celestynów (otwocki powiat) – 11 318 people per 1 health care establishment.

In a similar vein, considering the IT equipment in primary schools (excluding special ones), the largest number of pupils per 1 computer with access to the Internet is found in gminas in Warsaw Metropolitan Area: Milanówek (grodziski powiat) – 28, and Izabelin (warszawski zachodni powiat) – 26 pupils per 1 computer. The lowest number is registered in Stoczek (węgrowski powiat) – 4 pupils, and Sadowne (węgrowski powiat), Platerów (łosicki powiat), Gostynin (gostyniński powiat) and Pniewy (grójecki powiat) – 5 pupils per 1 computer in each of the gminas.

It is worth noting that among the analysed gminas there is less than 10 pupils per 1 computer in 41 gminas, of which only one is an urban-rural one (Wyśmierzyce, białobrzeski powiat), the rest are rural ones.

Therefore, among the gminas covered by the study two zones can be distinguished: the zone of dynamic economic development, high quality of life and the zone of poor structural development, constituted partly by economically and socially marginalising peripheral areas, usually of rural character.

TOURISM

Due to the presence of particular natural environment assets in the analysed gminas, tourism may become an important development mechanism as it integrates several sections of the economy. It is especially important for the problematic areas, which lack any significant socio-economic potential but can profit from the inherent assets of their natural and cultural environment.

Mazowieckie voivodship is famous for family, weekend and business tourism. In Mazovia, apart from the picturesque nature, numerous beautiful mansions, castles and open-air museums are spread all over the region.

A large part of the gminas in the voivodship undertake actions in favour of tourism development. The most important of them are renovation of historical sites and blazing tourist trails (pedestrian, bicycle and kayaking) in order to make the attractive areas accessible for the increasingly popular adventure tourism. A significant for of promotion are cyclical events. Most often these are harvest festivals, May-Day and folk festivities, sports tournaments, sports-recreation fairs, accompanied by performances of popular music groups, competitions and exhibitions of local produce. according to the available statistics for 2009[13], counting only activities of cultural establishments and centres and community centres, in Mazovia there were 23 671 events, including 1 628 tourist and sports-recreation ones, in which 245 053 people participated. Among the studied gminas the most events organized by the above listed institutions, took place in Grójec – 302 events, of which 7 of tourist, sports and recreational character, with 280 participants.

Of special importance for tourism development are the events which attract not only the inhabitants of a particular gmina, but also tourists from the rest of the country and are advertised in the mass media. Among the events taking place in the analysed gminas, the ones with nationwide recognition are i.a. annual folk festivity in Węgrów “European wedding feast”, national “Knights Tournament for Princess Anna’s Ring” in Liw, International Folk Festival “Kupalnocka” in Serock or Folk Bands and Singers of the Vistula Regions Contest “Powiślaki” in Maciejowice.

Some of the local authorities undertake actions aimed at stimulating entrepreneurship among the inhabitants – they organise trainings in order to promote the awareness of

[13] Data gathered biannualy.

profits from tourist services. Local authorities also direct some of their financial capital for tourism. Among the gminas participating in the survey the highest percentage of expenditure for tourism in the budget of the gminas was registered in Łąck (płocki powiat) and Sarnaki (łosicki powiat), where this proportion amounted to 0.4% of the total budget. It is worth underlining that in the budget of Mazowieckie voivodship expenditure on tourism constituted 0.1%.

Thanks to numerous actions in favour of tourism development in the last five years the number of collective tourist accommodations increased by 22.0% (in 2010 in comparison with 2005). However, the development of the tourist function in the analysed areas remains varied.

In order to assess the level of development the tourist attractiveness analysis was performed. For this aim a set of the following three measures was used:

- tourist accommodation density - the number of bed places per 1 km^2 of total area, called the **Charvat index**;
- tourist function index – the number of tourist bed places per 100 permanent inhabitants – the **Baretje and Defert index;**
- tourist traffic intensity index by - the ratio of accommodated tourists per 1000 permanent residents, called the **Schneider index.**

Among 87 studied gminas half does not possess any tourist accommodation. The table below presents the results; the gminas are ordered according to the percentage of areas protected by law in a given gmina's area.

Table 3. **Indicators of tourist function in selected gminas of Mazowieckie voivodship**

Gmina	Powiat	Percentage of areas protected by law	Wskaźnik Charvata	Wskaźnik Baretje'a i Deferta	Wskaźnik Schneidera
Wilga	garwoliński	100.0	2.9	6.5	1363.3
Czosnów	nowodworski	100.0	0.9	1.2	475.4
Białobrzegi	białobrzeski	100.0	0.6	0.5	155.3
Solec nad Wisłą	lipski	100.0	0.3	0.7	33.7
Sulejówek	miński	100.0	3.6	0.4	30.7
Szczutowo	sierpecki	99.9	0.4	1.0	481.8
Strzegowo	mławski	94.9	0.1	0.4	184.9
Nieporęt	legionowski	93.1	8.6	6.3	4450.4

Table 3. **Indicators of tourist function in selected gminas of Mazowieckie voivodship (cont.)**

Gmina	Powiat	Percentage of areas protected by law	Charvat's index	Baretje and Defert's index	Schneider's index
Radziejowice	żyrardowski	88.2	1.9	2.8	2360.9
Osieck	otwocki	87.9	3.2	6.3	1629.2
Glinojeck	ciechanowski	87.8	1.3	2.5	339.2
Pomiechówek	nowodworski	87.1	1.3	1.6	487.9
Wiskitki	żyrardowski	82.4	0.4	0.6	131.9
Słupno	płocki	79.6	0.4	0.4	482.2
Zielonka	wołomiński	76.7	2.3	1.1	672.6
Łąck	płocki	74.0	8.5	15.5	3134.8
Serock	legionowski	72.7	17.3	15.1	7970.3
Łomianki	warszawski zachodni	71.9	3.6	0.6	363.7
Nowy Duninów	płocki	71.8	1.2	4.4	470.7
Słubice	płocki	71.4	0.3	0.7	396.5
Jabłonna	legionowski	69.9	0.7	0.3	166.6
Marki	wołomiński	69.8	4.9	0.5	175.3
Józefów	otwocki	68.6	16.0	1.9	1261.5
Wiązowna	otwocki	67.8	0.9	0.9	389.2
Piaseczno	piaseczyński	65.5	2.0	0.4	314.6
Grójec	grójecki	61.6	1.0	0.5	176.8
Pilawa	garwoliński	60.5	0.5	0.3	380.8
Gostynin	gostyniński	58.5	0.2	0.4	112.3
Sarnaki	łosicki	55.7	5.5	21.2	1566.3
Mińsk Mazowiecki	miński	55.2	1.6	1.3	650.5
Garwolin	garwoliński	54.4	2.3	2.5	612.2
Góra Kalwaria	piaseczyński	53.4	0.2	0.1	73.4
Radzymin	wołomiński	53.3	0.8	0.5	197.8
Halinów	miński	53.1	1.4	0.6	170.7
Przysucha	przysuski	52.2	1.4	2.1	322.8
Chlewiska	szydłowiecki	51.9	1.3	2.7	1112.0
Bodzanów	płocki	50.3	0.1	0.2	3.9
Wyszogród	płocki	50.0	0.3	0.4	11.9

Interpreting the tourist accommodation density index (*Charvat index*), it was noted that among the studied gminas the value of the index was the highest in Serock – 17.3, which means that per 1 km^2 of area there are over 17 tourist bed places. A high value of the index was registered also in gminas around Warsaw: Józefów (otwocki powiat) – 16.0 and Nieporęt (legionowski powiat) – 8.6. The lowest value was observed in Bodzanów (płocki powiat) and Strzegowo (mławski powiat) – 0.1 each. It is worth noting that for the whole area of the voivodship the index is 1.2.

The analysis of the tourist traffic intensity index (*Schneider index*) yields similar results. The highest value of this index was noted also in Serock (legionowski powiat), where per 1000 inhabitants in 2010 there were 7 970 accommodated tourists. The least tourists relative to the number of inhabitants were registered in Bodzanów (płocki powiat) – 4 tourists. For the whole voivodship there were 609 accommodated tourists per 1000 inhabitants.

When analysing the tourist function index, calculated as the number of tourist bed places per 100 inhabitants (*Baretje and Defert index*) it was observed that 19 gminas were above the value for the whole voivodship which amounted to 0.8 bed places per 100 inhabitants. The gmina equipped with the most numerous bed places (relative to the number of inhabitants in its area) is Sarnaki (łosicki powiat), which has 21 bed places per 100 inhabitants. The lowest value was registered in Góra Kalwaria (piaseczyński powiat), where the value of this index equalled 0.1.

The analysis of the tourist function showed that Serock (legionowski powiat) has the highest level of all analysed indices. It has relatively the best developed tourist accommodation facilities which, thanks to its location on the national route no 62: Zakroczym-Wyszków-Łochów, is easily accessible. The biggest assets of this gmina is its situation by Lake Zegrzyński, which creates conditions for water sports and angling. In addition, Serock offers numerous attractions, such as embarkation point for boats and numerous walking routes (i.a. the springs walk and the gorge at Barbarka hill). What's more, Serock organises many cultural events even with international range, i.a. the above mentioned International Folk Festival "Kupalnocka".

It is also worth mentioning that the percentage of protected areas in Serock is 72.7% of the total area of the gmina. Hence, the presence of areas protected by law constitutes a tourist attraction and counts among the basic tourists resources, which can affect positively the volume of tourist traffic in a given area.

CONCLUSIONS

As a result of the analysis it can be stated that the presence of the areas protected by law in the areas of the studied gminas does not have a negative impact on the demographic and socio-economic development of these units. This statement is grounded on the additional analysis based on the **synthetic development measure**.

DESCRIPTION OF THE RESEARCH METHOD

In the calculation of the synthetic measure the following indices, included in the earlier part of the analysis, were used:

– Hellwig development measure,
– demographic ageing rate,
– natural increase per 1 thousand population,
– net migration per 1 thousand population.

The indices referring to the tourist function of gminas were not included in the calculations as half of the analysed gminas had no tourist accommodation facilities.

In the first step the objects (gminas) were ranked[14]. The most favourable value was assigned value equal , in the case of demographic ageing rate 1 means the lowest value of this indicator, in the case of the other variables 1 means the highest value.

Nest, for each object (gmina) the synthetic measure of the level of development was calculated according to the formula:

$$I = 100 - 100 \times \frac{R - N}{N(C-1)}$$

where:
I – synthetic measure of the level of development,
N – number of measures,
R – sum of ranks for a given unit,
C – number of territorial units.

The synthetic measure has values between 1 and 100, where a higher value of the index means a higher level of development.

The conducted analysis allowed to divide the studied area into four groups according the development. While grouping, the arithmetic means of the values of the synthetic measures for all studied gminas ($\bar{I} = 50{,}0$) and the standard deviation from the mean ($s_I = 24{,}321$) were used. On this basis the following groups were distinguished:

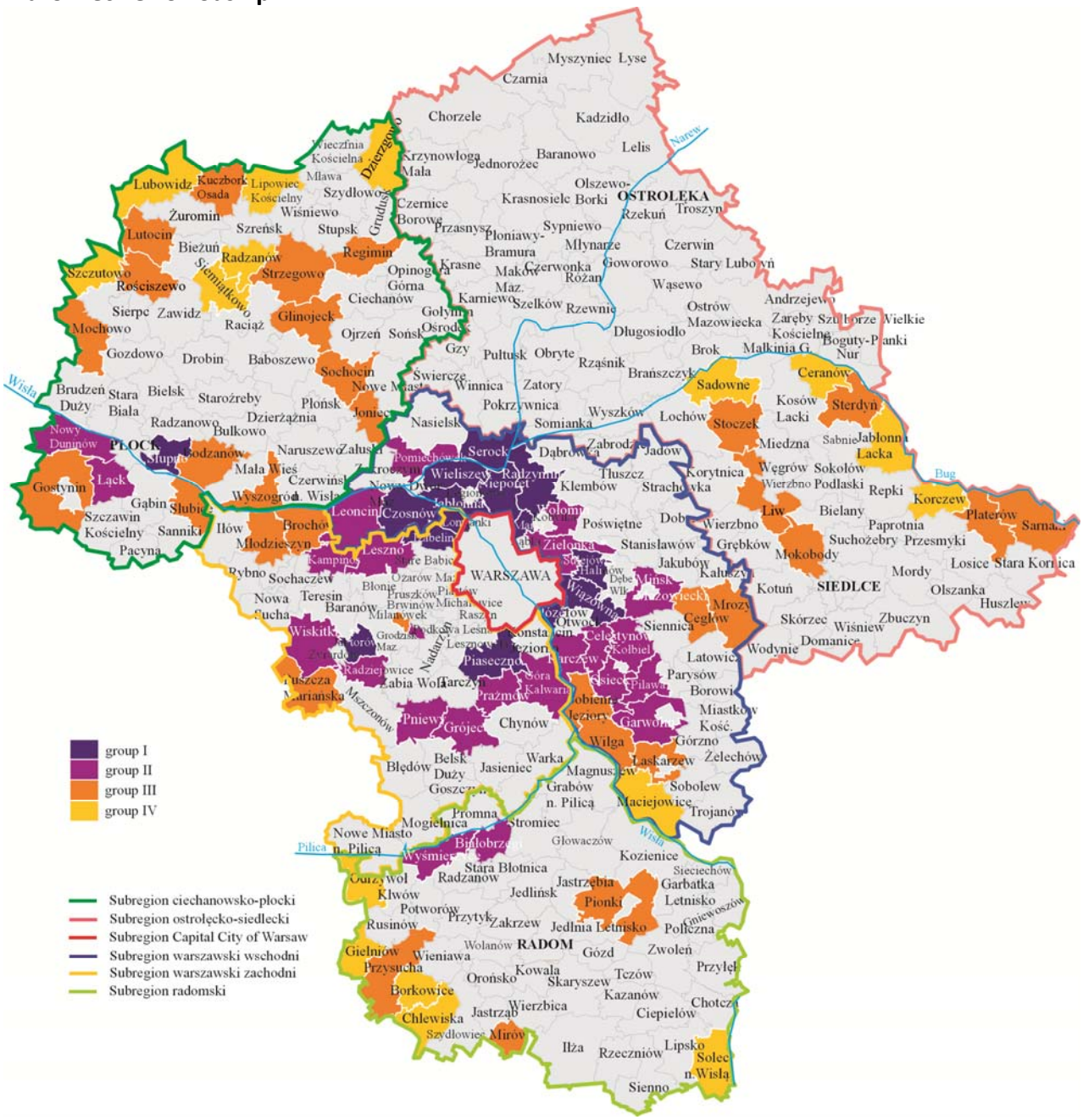
- **group I** – with **the highest** level of development ($I \geq \bar{I} + s_I$);
- **group II** – with **a high** level of development ($\bar{I} + s_I \geq I > \bar{I}$);
- **group III** – with a **low** level of development ($\bar{I} \geq I > \bar{I} - s_I$);
- **group IV** – with a very **low** level of development ($\bar{I} - s_I > I$).

[14] Ranking is used for putting objects in order, which, bearing in mind various premises and points of view, allows to conduct comparative and diagnostics studies.

where:
I – value of the synthetic measure,
$\bar{I}$ – arithmetic mean of the variable I (synthetic measure),
s_I – standard deviation of the variable I.

The spatial distribution of the values of the synthetic development measure is presented in Map 10, while the ranking of gminas according to the value of the synthetic development measure is presented in Table 2 (in the annex).

Map 10. **Spatial distribution of the synthetic development measure in selected gminas of Mazowieckie voivodship**



Among the gminas with the highest level of development there are both gminas with a high and with a low percentage of areas protected by law. The highest value of the measure was registered in the following gminas: Wieliszew and Nieporęt (legionowski powiat) and Piaseczno (piaseczyński powiat), where the percentage of areas protected by law is 62.9%, 65.5% and 93.1%, respectively.

In a similar vein in the gminas which registered low values of the development measure there are Ceranów (sokołowski powiat) and Borkowice (przysuski powiat), where the percentage of the areas protected by law is 81.0% and 65.1%, respectively. Therefore the presence of areas protected by law does not have impact on the level of development of the gminas.

The conducted analysis indicates that the factor determining the level of development is beyond doubt the situation of the gmina with respect to the centre of the region.

The best developed areas are first of all the gminas located in the proximity of Warsaw and other large urban centres as well as along the main communication routes. In the light of the performer studies these areas have a large population potential, belong to the group of demographically active units with the population growing mostly due to migration, with a favourable age structure and relatively low demographic ageing rate. Apart from that they feature a high level of socio-economic development.

In comparison the unfavourable processes concentrate in the rural gminas, located peripherally from the centre of the region. Gminas located on the fringes of the voivodship or far from any larger urban centres belong to the group of depopulating areas with unfavourable age structure, with the advanced process of the population ageing. In addition they have a relatively low level of entrepreneurship among the inhabitants, a low number of employed people and a high unemployment rate.

The presence of areas with valuable natural characteristics can become a chance for development for the analysed gminas. Skilful use of the natural capital of the areas protected by law can influence the socio-economic development and contribute to the welfare of the local community.

Annex 1

Table 1. **Selected gminas according to the value of Hellwig development measure (d_i)**

No.	Gmina	Powiat	Subregion	Value of the development measure d_i	Group
1	Słupno	płocki	ciechanowsko-płocki	0.696	I
2	Wiązowna	otwocki	warszawski wschodni	0.601	I
3	Podkowa Leśna	grodziski	warszawski zachodni	0.592	I
4	Wieliszew	legionowski	warszawski wschodni	0.574	I
5	Piaseczno	piaseczyński	warszawski zachodni	0.564	I
6	Łomianki	warszawski zachodni	warszawski zachodni	0.557	I
7	Czosnów	nowodworski	warszawski wschodni	0.556	I
8	Osieck	otwocki	warszawski wschodni	0.551	I
9	Nieporęt	legionowski	warszawski wschodni	0.519	I
10	Józefów	otwocki	warszawski wschodni	0.516	I
11	Izabelin	warszawski zachodni	warszawski zachodni	0.514	I
12	Zielonka	wołomiński	warszawski wschodni	0.506	I
13	Sterdyń	sokołowski	ostrołęcko-siedlecki	0.505	I
14	Grójec	grójecki	warszawski zachodni	0.502	I
15	Leszno	warszawski zachodni	warszawski zachodni	0.493	II
16	Karczew	otwocki	warszawski wschodni	0.483	II
17	Przysucha	przysuski	radomski	0.477	II
18	Serock	legionowski	warszawski wschodni	0.476	II
19	Słubice	płocki	ciechanowsko-płocki	0.472	II
20	Kampinos	warszawski zachodni	warszawski zachodni	0.469	II
21	Sarnaki	łosicki	ostrołęcko-siedlecki	0.469	II
22	Jaktorów	grodziski	warszawski zachodni	0.467	II
23	Góra Kalwaria	piaseczyński	warszawski zachodni	0.461	II
24	Mrozy	miński	warszawski wschodni	0.456	II
25	Marki	wołomiński	warszawski wschodni	0.452	II
26	Garwolin	garwoliński	warszawski wschodni	0.446	II
27	Strzegowo	mławski	ciechanowsko-płocki	0.445	II
28	Sulejówek	miński	warszawski wschodni	0.442	II
29	Leoncin	nowodworski	warszawski wschodni	0.428	II
30	Kołbiel	otwocki	warszawski wschodni	0.425	II
31	Pilawa	garwoliński	warszawski wschodni	0.423	II
32	Radziejowice	żyrardowski	warszawski zachodni	0.423	II
33	Radzymin	wołomiński	warszawski wschodni	0.422	II
34	Pniewy	grójecki	warszawski zachodni	0.422	II
35	Łąck	płocki	ciechanowsko-płocki	0.422	II
36	Jabłonna	legionowski	warszawski wschodni	0.415	II
37	Pomiechówek	nowodworski	warszawski wschodni	0.415	II
38	Halinów	miński	warszawski wschodni	0.414	II
39	Białobrzegi	białobrzeski	radomski	0.413	II
40	Joniec	płoński	ciechanowsko-płocki	0.411	II
41	Platerów	łosicki	ostrołęcko-siedlecki	0.409	II
42	Łaskarzew	garwoliński	warszawski wschodni	0.409	II
43	Wołomin	wołomiński	warszawski wschodni	0.408	II

Table 1. **Selected gminas according to the value of Hellwig development measure (cont.)**

No.	Gmina	Powiat	Subregion	Value of the development measure d_i	Group
44	Liw	węgrowski	ostrołęcko-siedlecki	0.407	II
45	Mokobody	siedlecki	ostrołęcko-siedlecki	0.407	II
46	Stoczek	węgrowski	ostrołęcko-siedlecki	0.402	II
47	Glinojeck	ciechanowski	ciechanowsko-płocki	0.401	II
48	Puszcza Mariańska	żyrardowski	warszawski zachodni	0.400	II
49	Milanówek	grodziski	warszawski zachodni	0.397	II
50	Jabłonna Lacka	sokołowski	ostrołęcko-siedlecki	0.394	II
51	Cegłów	miński	warszawski wschodni	0.387	II
52	Lutocin	żuromiński	ciechanowsko-płocki	0.387	II
53	Celestynów	otwocki	warszawski wschodni	0.387	II
54	Wyszogród	płocki	ciechanowsko-płocki	0.382	II
55	Nowy Duninów	płocki	ciechanowsko-płocki	0.380	II
56	Kuczbork-Osada	żuromiński	ciechanowsko-płocki	0.378	II
57	Bodzanów	płocki	ciechanowsko-płocki	0.378	II
58	Korczew	siedlecki	ostrołęcko-siedlecki	0.376	II
59	Brochów	sochaczewski	warszawski zachodni	0.374	II
60	Prażmów	piaseczyński	warszawski zachodni	0.370	II
61	Mińsk Mazowiecki	miński	warszawski wschodni	0.362	II
62	Wilga	garwoliński	warszawski wschodni	0.361	II
63	Młodzieszyn	sochaczewski	warszawski zachodni	0.359	II
64	Regimin	ciechanowski	ciechanowsko-płocki	0.358	II
65	Wiskitki	żyrardowski	warszawski zachodni	0.358	II
66	Maciejowice	garwoliński	warszawski wschodni	0.353	II
67	Wyśmierzyce	białobrzeski	radomski	0.349	II
68	Sobienie-Jeziory	otwocki	warszawski wschodni	0.345	II
69	Sadowne	węgrowski	ostrołęcko-siedlecki	0.344	II
70	Odrzywół	przysuski	radomski	0.334	II
71	Radzanów	mławski	ciechanowsko-płocki	0.334	II
72	Sochocin	płoński	ciechanowsko-płocki	0.331	II
73	Mochowo	sierpecki	ciechanowsko-płocki	0.327	II
74	Szczutowo	sierpecki	ciechanowsko-płocki	0.322	II
75	Ceranów	sokołowski	ostrołęcko-siedlecki	0.320	III
76	Dzierzgowo	mławski	ciechanowsko-płocki	0.317	III
77	Solec nad Wisłą	lipski	radomski	0.314	III
78	Lipowiec Kościelny	mławski	ciechanowsko-płocki	0.312	III
79	Rościszewo	sierpecki	ciechanowsko-płocki	0.311	III
80	Chlewiska	szydłowiecki	radomski	0.307	III
81	Borkowice	przysuski	radomski	0.304	III
82	Gostynin	gostyniński	ciechanowsko-płocki	0.297	III
83	Gielniów	przysuski	radomski	0.279	III
84	Siemiątkowo	żuromiński	ciechanowsko-płocki	0.276	III
85	Pionki	radomski	radomski	0.275	III
86	Lubowidz	żuromiński	ciechanowsko-płocki	0.272	III
87	Mirów	szydłowiecki	radomski	0.213	III

Table 2. **Selected gminas according to the value of the synthetic development measure *I***

No.	Gmina	Powiat	Subregion	Percentage of protected areas	Value of the synthetic development measure *I*	Group
1	Wieliszew	legionowski	warszawski wschodni	62.90	95.49	I
2	Piaseczno	piaseczyński	warszawski zachodni	65.50	93.60	I
3	Nieporęt	legionowski	warszawski wschodni	93.10	93.02	I
4	Słupno	płocki	ciechanowsko-płocki	79.60	92.15	I
5	Wiązowna	otwocki	warszawski wschodni	67.80	89.97	I
6	Marki	wołomiński	warszawski wschodni	69.80	89.53	I
7	Jabłonna	legionowski	warszawski wschodni	69.90	89.53	I
8	Serock	legionowski	warszawski wschodni	72.70	88.37	I
9	Łomianki	warszawski zachodni	warszawski zachodni	71.90	87.79	I
10	Radzymin	wołomiński	warszawski wschodni	53.30	87.35	I
11	Józefów	otwocki	warszawski wschodni	68.60	80.96	I
12	Halinów	miński	warszawski wschodni	53.10	79.65	I
13	Izabelin	warszawski zachodni	warszawski zachodni	85.90	78.92	I
14	Jaktorów	grodziski	warszawski zachodni	60.80	76.89	I
15	Czosnów	nowodworski	warszawski wschodni	100.00	76.31	I
16	Garwolin	garwoliński	warszawski wschodni	54.40	74.13	II
17	Grójec	grójecki	warszawski zachodni	61.60	73.69	II
18	Prażmów	piaseczyński	warszawski zachodni	66.20	73.55	II
19	Kampinos	warszawski zachodni	warszawski zachodni	62.00	71.80	II
20	Nowy Duninów	płocki	ciechanowsko-płocki	71.80	71.37	II
21	Łąck	płocki	ciechanowsko-płocki	74.00	70.78	II
22	Pilawa	garwoliński	warszawski wschodni	60.50	69.91	II
23	Góra Kalwaria	piaseczyński	warszawski zachodni	53.40	69.91	II
24	Wołomin	wołomiński	warszawski wschodni	53.20	69.62	II
25	Leszno	warszawski zachodni	warszawski zachodni	69.60	68.90	II
26	Mińsk Mazowiecki	miński	warszawski wschodni	55.20	68.17	II
27	Karczew	otwocki	warszawski wschodni	53.80	65.84	II
28	Celestynów	otwocki	warszawski wschodni	100.00	63.52	II
29	Sulejówek	miński	warszawski wschodni	100.00	62.94	II
30	Kołbiel	otwocki	warszawski wschodni	80.60	62.35	II
31	Radziejowice	żyrardowski	warszawski zachodni	88.20	60.90	II
32	Pomiechówek	nowodworski	warszawski wschodni	87.10	60.76	II
33	Leoncin	nowodworski	warszawski wschodni	69.10	58.87	II
34	Białobrzegi	białobrzeski	radomski	100.00	58.72	II
35	Zielonka	wołomiński	warszawski wschodni	76.70	57.12	II
36	Wyśmierzyce	białobrzeski	radomski	98.60	55.23	II
37	Osieck	otwocki	warszawski wschodni	87.90	54.07	II
38	Pniewy	grójecki	warszawski zachodni	78.90	53.34	II
39	Wiskitki	żyrardowski	warszawski zachodni	82.40	53.20	II
40	Podkowa Leśna	grodziski	warszawski zachodni	99.70	50.73	II
41	Joniec	płoński	ciechanowsko-płocki	80.70	49.71	III
42	Glinojeck	ciechanowski	ciechanowsko-płocki	87.80	49.42	III
43	Łaskarzew	garwoliński	warszawski wschodni	57.10	48.69	III
44	Milanówek	grodziski	warszawski zachodni	95.00	48.55	III
45	Bodzanów	płocki	ciechanowsko-płocki	50.30	46.51	III
46	Słubice	płocki	ciechanowsko-płocki	71.40	45.78	III

Table 2. **Selected gminas according to the value of the synthetic development measure *I* (cont.)**

No.	Gmina	Powiat	Subregion	Percentage of protected areas	Value of the synthetic development measure *I*	Group
47	Strzegowo	mławski	ciechanowsko-płocki	94.90	45.64	III
48	Puszcza Mariańska	żyrardowski	warszawski zachodni	61.80	44.33	III
49	Pionki	radomski	radomski	64.40	44.19	III
50	Przysucha	przysuski	radomski	52.20	44.04	III
51	Mrozy	miński	warszawski wschodni	61.70	42.30	III
52	Liw	węgrowski	ostrołęcko-siedlecki	50.20	41.57	III
53	Mirów	szydłowiecki	radomski	80.80	38.95	III
54	Brochów	sochaczewski	warszawski zachodni	99.00	38.66	III
55	Regimin	ciechanowski	ciechanowsko-płocki	79.60	38.37	III
56	Gostynin	gostyniński	ciechanowsko-płocki	58.50	37.35	III
57	Stoczek	węgrowski	ostrołęcko-siedlecki	60.50	37.35	III
58	Młodzieszyn	sochaczewski	warszawski zachodni	65.20	35.76	III
59	Lutocin	żuromiński	ciechanowsko-płocki	99.70	35.76	III
60	Sochocin	płoński	ciechanowsko-płocki	80.40	35.61	III
61	Wilga	garwoliński	warszawski wschodni	100.00	35.17	III
62	Mokobody	siedlecki	ostrołęcko-siedlecki	71.20	34.45	III
63	Sarnaki	łosicki	ostrołęcko-siedlecki	55.70	34.01	III
64	Rościszewo	sierpecki	ciechanowsko-płocki	55.10	30.81	III
65	Cegłów	miński	warszawski wschodni	69.00	29.94	III
66	Platerów	łosicki	ostrołęcko-siedlecki	55.00	28.49	III
67	Mochowo	sierpecki	ciechanowsko-płocki	77.00	28.05	III
68	Kuczbork-Osada	żuromiński	ciechanowsko-płocki	53.90	27.91	III
69	Sterdyń	sokołowski	ostrołęcko-siedlecki	70.70	27.33	III
70	Sobienie-Jeziory	otwocki	warszawski wschodni	98.30	27.18	III
71	Wyszogród	płocki	ciechanowsko-płocki	50.00	25.73	III
72	Radzanów	mławski	ciechanowsko-płocki	70.20	23.84	IV
73	Sadowne	węgrowski	ostrołęcko-siedlecki	100.00	23.40	IV
74	Korczew	siedlecki	ostrołęcko-siedlecki	94.30	22.97	IV
75	Lipowiec Kościelny	mławski	ciechanowsko-płocki	95.20	22.53	IV
76	Jabłonna Lacka	sokołowski	ostrołęcko-siedlecki	72.10	20.93	IV
77	Maciejowice	garwoliński	warszawski wschodni	99.20	19.48	IV
78	Szczutowo	sierpecki	ciechanowsko-płocki	99.90	18.90	IV
79	Siemiątkowo	żuromiński	ciechanowsko-płocki	98.80	18.90	IV
80	Chlewiska	szydłowiecki	radomski	51.90	17.73	IV
81	Odrzywół	przysuski	radomski	95.70	16.28	IV
82	Lubowidz	żuromiński	ciechanowsko-płocki	97.90	15.70	IV
83	Solec nad Wisłą	lipski	radomski	100.00	15.26	IV
84	Dzierzgowo	mławski	ciechanowsko-płocki	54.80	14.83	IV
85	Gielniów	przysuski	radomski	60.80	12.50	IV
86	Borkowice	przysuski	radomski	65.10	5.81	IV
87	Ceranów	sokołowski	ostrołęcko-siedlecki	81.00	4.36	IV