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DEFORESTATION AS AN ELEMENT OF PLANNING AND SHAPING SPACE

Abstract. This paper presents the extent of changes in the allocation of forest land for non-forest uses in local land use plans, and the extent, differences exclusions of forest land for non-forest purposes in Mazowieckie voivodeship. Unpublished materials from Regional Directorates of State Forests in Warsaw, Olsztyn, Łódź, Lublin and Radom, data collected by the Local Data Bank of the Polish Central Statistical Office and 2003–2017 *Leśnictwo* yearbooks are the basis for this study. The study period is 2002–2016. The analysis was conducted at district level. A comparative and descriptive method was used and a time series analysis was carried out. The results were presented in graphic form. The research revealed a dynamic increase in woodland area reallocated for non-forest uses in local land use plans. However, only a small proportion of this land is subsequently excluded from production. The Mazowieckie voivodeship ranks third in the country in the area of forest land excluded from production. In most cases, land excluded from production was allocated for mining, whereas the construction of water reservoirs was the least frequent purpose of reallocation.

Keywords: forest land, reallocation of land, exclusion from forest production, Mazowieckie voivodeship

INTRODUCTION

Deforestation is a process of transforming woodland into a non-forest area. Because forests play a significant role, e.g. in preserving biodiversity, have a positive environmental impact and address various human needs, deforestation is subject to legal regulations intended to prevent unreasonable reallocation of forest land for other uses (Fogel, 2012). Changes in the land-use should not disturb the environmental balance (Kurowska, 2017); they should preserve spatial order in the socio-economic development process (Domański, 1982).

Woodland is legally protected under the Agricultural and Forest Land Protection Act of February 3, 1995, as amended (i.e. Ustawa..., 2015). Pursuant to the Act, land may be excluded from forest production depending on its reallocation in the local land use plan. Forest land not allocated to a specific investment in a local plan may be excluded from production. In order for this to happen, it is necessary to amend the plan according to the provisions of the Land Use Planning and Development Act. The head of a rural municipality (wójt), mayor or president make a request for the reallocation of forest land for non-forest uses. If state-owned forest land is involved, the request shall include the opinion of the head

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of Regional Directorate of State Forests, whereas in the case of national parks an opinion of the park manager is required. In the case of state-owned forest land, the permit is granted by the minister of environment (or his/her delegate); and in the case of other woodland, by the voivodeship marshal (upon receipt of the opinion of a chamber of agriculture). The permit itself does not re-allocate land; the decision needs to be included in a local land use plan (Maćkiewicz and Motek, 2014). If no plan exists for the area considered, land may be reallocated based on the decision on land development conditions or the decision on the location of a public purpose investment (Hełdak, 2008; Kwartnik-Pruc et al., 2011a; 2011b; Prus, 2012; Czyżyk, 2016; Kurowska, 2017).

Practically, land is excluded from forest production after the permit is granted (Cymerman, 2012; Cymerman et al., 2012). The permit is required for all types of forest land, regardless of who the owner is. The heads of Regional Directorates of State Forests are authorized to deliver the decision. In the case of woodland located in national parks, the decisions to exclude land from production are issued by park managers.

Apart from administrative restrictions for deforestation, there are also economic ones. These include the annual fee, the fees for taking land out of forest production as well as a single compensation in case of premature felling of trees (Brzezicki, Flisz, 2013; Polna, 2017; Referońska-Chodak, 2017).

The objective of this paper is to present the extent of changes in the allocation of forest land for non-forest uses in local land use plans and the extent, directions of and territorial differences in excluding forest land from production in the Mazowieckie voivodeship.

RESEARCH MATERIAL AND METHODOLOGY

The research was based on unpublished data retrieved from annual reports on the implementation of provisions for the protection of forest land, as received from the Regional Directorates of State Forests in Warsaw, Olsztyn, Łódź, Lublin and Radom. This paper also relies on data from the Local Data Bank available in Polish Statistics and from 2003–2017 *Leśnictwo* (Forestry) yearbooks. The basic research unit is a district. The study period is 2002–2016. However, as regards spatial distribution of land taken out of production, it was narrowed down to 2010–2016, whereas changes in the allocation of forest land for non-forest uses were presented for 2007–2016.

This approach results from the availability of statistical data. A comparative and descriptive method was used and a time series analysis was carried out. The results are presented in graphic form, as charts and thematic maps.

RESULTS

In the last decade, the area of the woodland allocated for non-forest uses in local development plans grew steadily. In 2016, it reached 13,662 ha: nearly four times more than in 2007 (3,688 ha). The fastest growth in the area of land allocated for non-forest uses took place in 2015–2016, and was over 120% (Fig. 1). In 2007 and 2016, the Mazowieckie voivodeship ranked first in the area of land allocated for non-forest uses in local plans. Note that at the end of 2016, in accordance with local plans, 0.38% of the total voivodeship area and 1.63% of the region's forest area was allocated for non-forest uses, whereas in 2007 it was 0.1% and 0.46%, respectively.

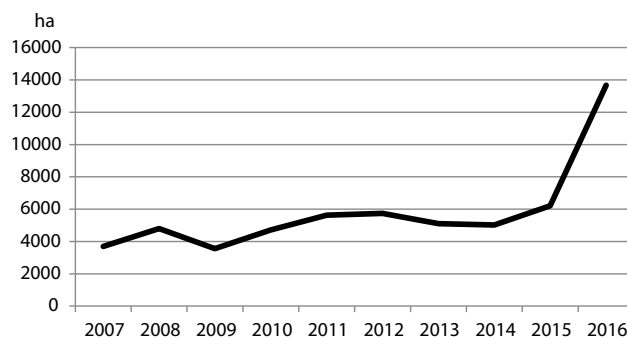


Fig. 1. Area of forest land allocated for non-forest uses in the local land use plan in 2007–2016
Source: own elaboration.

At district level, the area of forest land allocated for non-forest uses, as at the end of 2016, ranged from 1 ha in the city of Płock to 6,970 ha in the Węgrów district. Woodland located in the districts of Lipsk, Sierpc, Zwolen and Żuromin and in the city of Warsaw was not reallocated for non-forest uses, whereas the percentage of forest land reallocated in the local plans ranged from 0.01% in the Przasnysz district to 20.3% in the Węgrów district. In two other districts, the share of reallocated land was still significant, viz. in Legionowo (6.1%) and Piaseczno (7.6%). Other districts can be divided into

two groups. In the first one, the share of the forest land reallocated for other uses was below 0.7%. These districts formed three compact clusters located in the north, south and east of the voivodeship. In the second group, the percentage of reallocated land is over 1.4%. These districts are located north, south and east of Warsaw.

In 2002–2016, 774.8 ha of forest land was excluded from production in the Mazowieckie voivodeship. It accounts for 8.8% of total woodland area excluded from production in Poland during the same period. Only in two voivodeships (Łódzkie and Wielkopolskie), more forest land was excluded than in Mazowieckie in the study period. The average indicator of land excluded from production was around 0.9 ha per 1,000 ha of forest and was similar to the corresponding indicator calculated on a countrywide basis (1 ha).

The area of forest land excluded from production was subject to fluctuation (Fig. 2); the annual volume varied in the range of 23.28 ha (2013) to 81.95 ha (2016). The linear trend analysis ($y = 0.8595x + 44.777$) showed that the area of land excluded from production grew at an average annual rate of around 0.8 ha.

The largest area of woodland was excluded from production in the Ostrołęka district (107.05 ha, i.e. 29.1% of the total area of land excluded from production over the study period). Ranked second is the Otwock district with 39.53 ha (10.7%) of forest land taken out of production, followed by the Wołomin district where 33.73 ha (9.2%) of woodland was excluded. These districts account for

49% of forest area excluded from production in the Mazowieckie voivodeship. In 2010–2016, no woodland was excluded from production in the Gostynin and Siedlce districts.

The concentration of woodland exclusions is spatially diversified. The largest areas (over 1.5 ha per 1,000 ha of forest land) were reported by 5 administrative units, including the districts of Legionowo (2.7 ha), Otwock (2.1 ha), Ostrołęka (1.6 ha) and the cities of Ostrołęka (23.2 ha) and Warsaw (1.7 ha). In turn, in the districts of Grodzisk, Mińsk and Wołomin and in the city of Radom, the corresponding ratio was around 1.2 ha per 1,000 ha of forest land. Low levels (up to 0.5 ha per 1,000 ha of forest land) were recorded in 28 territorial units (66.7%), which results from a smaller area of land being allocated to non-forest uses (Fig. 3).

Private land has a dominant share in woodland excluded for non-forest purposes. In 2002–2016, it extended over 632.4 ha, i.e. 81.6% of land excluded from forest production in the region. Łódzkie was the only voivodeship with a larger area of private woodland (799.3 ha) excluded from production than in the Mazowieckie voivodeship. The area of private land allocated for non-forest uses varied over the 2002–2016 period, with the largest area (68.7 ha) being excluded 2016 and the smallest one (22.4 ha) in 2013. Simultaneously, the share of private land in the total area of land excluded from production varied in the range of 60.1% in 2011 to 96.3% in 2013.

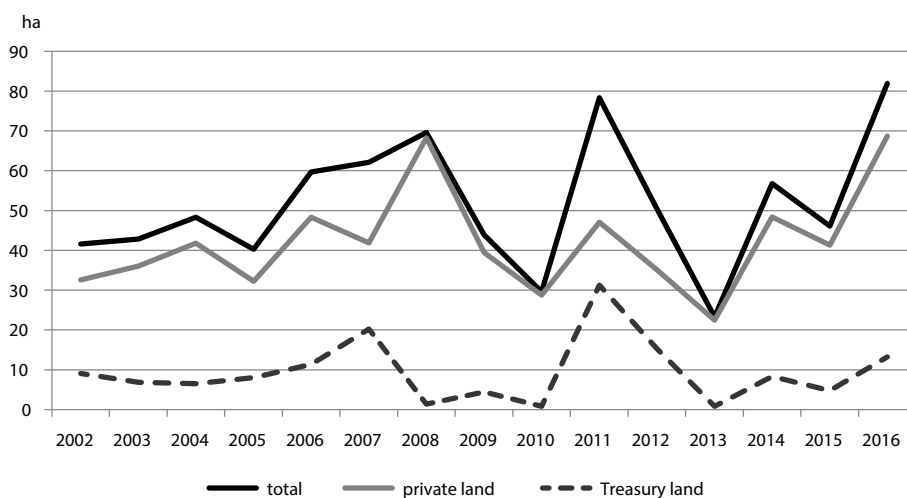


Fig. 2. Area of forest land excluded from production in 2002–2016
 Source: own elaboration.

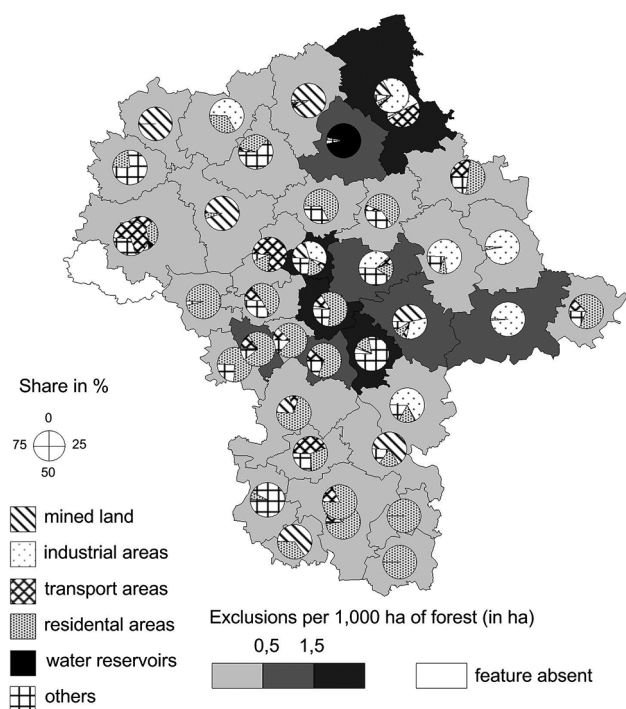


Fig. 3. Area and uses of forest land excluded from production in 2010–2016
 Source: own elaboration.

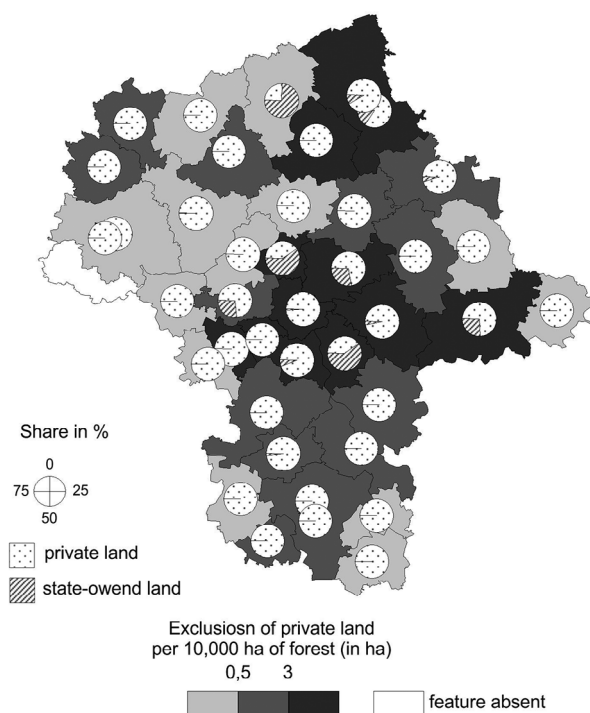


Fig. 4. Ownership structure of forest land excluded from production in 2010–2016
 Source: own elaboration.

Private land was allocated for non-forest uses in all districts (Fig. 4), having the largest share in 37 districts (92.5%) and a dominant share in 34 districts (85%). In more than half of the districts (57.5%; 23) only forest land held privately was subject to exclusions from production, whereas in three districts, namely Legionowo (41.2%), Otwock (40.5%) and Przasnysz (25.9%), the share of private land was below 50% of the total area of land excluded from production.

Private land excluded from production followed a distinct spatial concentration pattern, with more than half (51.9%) being located in three districts: Ostrołęka (97.43 ha), Mińsk (30.9 ha) and Wołomin (24.2 ha). In turn, the smallest area of woodland was allocated for non-forest uses in the districts of Zwoleńsk (9 ares) and Lipsk (6 ares). At the same time, the concentration of private land excluded from production varied strongly across districts covered by this study, from 0.04 ha per 10,000 ha of forest land in the Lipsk district to 194.2 ha per 10,000 ha of forest land in the city of Ostrołęka. A high intensification of woodland exclusions is also

characteristic of Warsaw (17.2 ha), Radom (14.6 ha) and the district of Ostrołęka (14.5 ha), that is, the land with a small area of private forests and a low indicator of forestation. In the spatial distribution, the districts with an intensification of exclusions of private forest land over 3 ha/10,000 ha of forest form two clusters in the central and north-eastern part of the voivodeship. Districts with a low indicator (below 0.5 ha) form a cluster in the north-western part of the region; there are also single districts in the east and south of the voivodeship.

In the study period, 142.2 ha of state-owned land was also excluded from production, representing around 18.4% of the total area of forest land taken out of production, i.e. over three times less than the average ratio for Poland (60.9%). In this category, the Mazowieckie voivodeship ranks last in the country. When it comes to the area of state-owned land excluded from production, the Mazowieckie voivodeship ranks at the bottom of the country, above Lubelskie, Podlaskie and Warmińsko-Mazurskie voivodeships.

The area of state-owned land excluded from production varied in the range of 0.85 ha in 2013 to 31.25 ha in 2011, whereas its share in the total area ranged from 1.9% in 2008 to 32.6% in 2007.

The largest area of state-owned land was excluded from production in districts of Otwock (23.52 ha) and Legionowo (24.2 ha). More than half of state-owned forest land excluded from production (57.4%) is concentrated in these two districts. In two other districts (Ostrołęka and Wołomin), the area of state-owned land excluded from production was still significant, at 9.62 ha and 9.51 ha, respectively. In other districts, the area of land excluded from production for non-forest purposes did not exceed 5 ha. The smallest area of state-owned woodland was excluded from production in the districts of Wyszaków (9 m²), Nowy Dwór Mazowiecki (11 m²), Grodzisk (30 m²) and Płońsk (35 m²).

As shown by the analysis, in 2002–2016, forest land was mostly excluded from production for mining uses. The area excluded from production for open-cast mining was 214 ha, representing 27.6% of the total forest area excluded from production. Although the ratio is half the level recorded for the country as a whole (57.6%), it is higher than in Śląskie (27.5%), Lubuskie (9.0%) and Kujawsko-Pomorskie (4.5%) voivodeships. Nearly 1/4 (174.1 ha; 22.5%) of the area of woodland was taken out of production for industrial uses; 170.5 ha (22%) of forest land was allocated for housing (settlement areas), while 63.9 ha (8.35% of the total area excluded from production) for transport uses; the construction of water reservoirs contributed to exclusion 16.1 ha (2.1%) of woodland from forest production.

Forest land is excluded from production for mining uses at a varying pace (Fig. 5). The highest concentration was observed in the first seven years of the study period when 158.16 ha, i.e. 73.9% of the total area, was excluded from forest production. The process slowed down after 2008. In 2011, the area excluded from production was still 11.59 ha (5.4%), but decreased to 2.69 ha¹ (1.3%) in 2014, reaching the lowest level of the entire 15-year period. In turn, it went up to 6.62 ha (3.1%) in 2016.

The decisions to exclude from forest production for mining uses were issued with respect to land located in nine districts (Fig. 3). The area subject to decisions varied

in the range of less than 1 ha in the district of Grójec (0.4 ha), Szydłowiec (0.63 ha) and Płońsk (0.68 ha) to 17.64 ha in the district of Ostrołęka. In the latter case, land was excluded from forest production in the municipalities of Troszyn (9.28 ha), Czerwin (6.08 ha), Olszewo Borki (1.24 ha) and Kadzidło (1.04 ha). A significant area of land excluded from production was also recorded in the Mińsk district (15.02 ha), in Dobrze (14.72 ha), Mędrzechów (0.26 ha) and Siennica (0.04 ha) municipalities. The decisions to exclude from production were related to the extraction of gravel and, in some cases, sand.

The share of the analysed purpose in the total area excluded from forest production was diversified. In the Żuromin district, it was the only purpose of the exclusion from forest production; in the districts of Płońsk and Przasnysz, it was the dominant one. Also, it prevailed in two other districts (Kozienice, Szydłowiec). In the remaining administrative units, its share did not exceed 50%.

The importance of exclusion of forest land from production for industrial uses increased over the study period. However, in 2005–2008, the area of land excluded from production went down from 9.12 ha to 0.54 ha, i.e. by 94.1%. Still, in subsequent years, it visibly increased to reach 46.59 ha in 2016. Compared to 2002, this was an almost 14-fold increase. The share of this direction in the total area excluded from forest production increased from 8.1% in 2002 to 56.9% in 2016.

This direction of exclusions was observed in 12 districts concentrated in the central-eastern part of the voivodeship; single exclusions of land excluded from production took place in its northern and western parts and in Ostrołęka and Warsaw. However, over 53% (75.9 ha) of the area excluded from production is located in the Ostrołęka district. The reasons for exclusions of forest land out of production include the construction of the 400 kV power line between Ostrołęka and Olsztyn Małki, the extension of the Ostrołęka power station and business activities. There were considerable differences in the area of land excluded from production between other districts. In four subsequent districts, it was even above 10 ha (10.04 ha in the Mińsk district, 11.2 ha in the Legionowo district, 13.1 ha in the Wołomin district, 18.3 ha in the Siedlce district); in the next four districts, it was over 1 ha (1.7 ha in the Węgrów district; 2.1 ha in the Otwock district, 2.6 ha in the city of Ostrołęka, 6.2 ha in the Garwolin district). These exclusions were mostly

¹ Land was excluded from production in the districts of Kozienice (1.02 ha), Ostrołęka (1.04 ha) and Szydłowiec (0.63 ha).

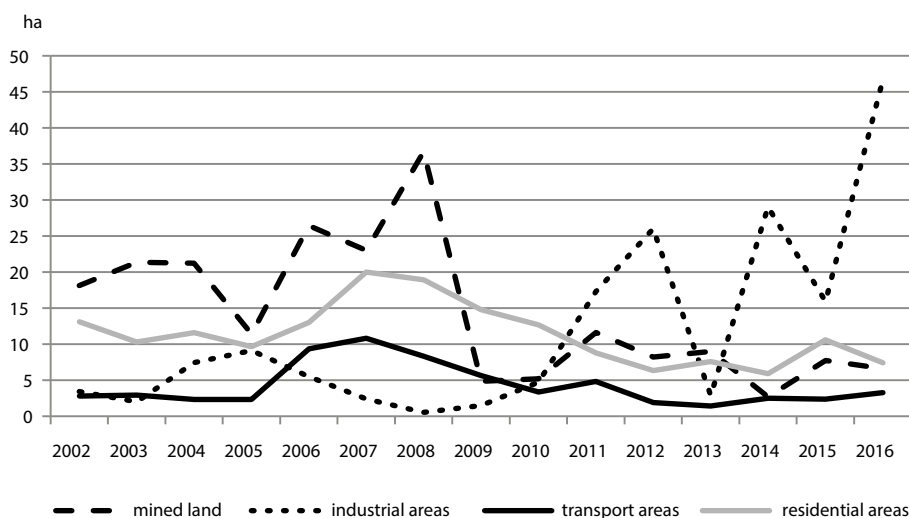


Fig. 5. Directions of forest land exclusions in 2002–2016
 Source: own elaboration.

related to the construction of the 400 kV power line between Koźnice and Siedlce Ujrzanów and between Miłosna and Siedlce Ujrzanów and to the construction of substation facilities under the Poland-Lithuania electric power bridge project. Note that in most districts, the share of this direction of exclusions was below 50%. Only in two districts (Siedlce and Sokołów), it was the dominant direction.

The total area of exclusion of forest land for housing and industrial uses was similar. However, until 2010, the exclusions for residential development prevailed over industrial uses, whereas it was the opposite in the last six years. The area of exclusions for housing purposes varied over the study period (2002–2016). From 2002 to 2005, there was a decrease in the area excluded from forest production. Afterwards, it increased up to 2007, in order to then decline again up to 2016. A similar trend was visible in the share of this direction in the total area of land excluded from production. Generally, over the 2002–2016 period, it dwindled from 31.5% to 9%.

The Żuromiński district and the city of Płock were the only locations where no land was excluded from production for housing purposes. In many other cases, small areas were affected. Only in three administrative units, the area of exclusions exceeded 5 ha (7.39 ha in the city of Warsaw; 7.06 ha in the Piaseczno district; and 5.9 ha in the Otwock district) and varied in the range of 1 ha to 5 ha in other 10 administrative units. The share of this

direction of exclusions in the total area of land excluded from forest production varied across the region. It was the prevailing direction in three districts (the cities of Radom, Radom and Sochaczew) and the only direction in two other ones (Lipsk and Zwoleń). The exclusions of land for housing prevailed in districts clustered in the western and central part of the region, and was of minor importance (below 10%) in the districts located in the north-eastern and eastern part of the voivodeship (Fig. 3).

The exclusion of forest land for transport uses was carried out on a small scale. The area concerned varied in the range of 1.39 ha (2.2%) in 2013 to 10.81 ha (16.9%) in 2007. The share of this direction in the total area of exclusions increased over the first half of the study period (from 6.7% in 2002 to 17.4% in 2007). After 2007, it visibly decreased to 4% in 2016. Although forest land was transformed into transport areas in around 2/3 of districts, these were small amounts of land. Only in 8 districts, the area of land excluded from production was over 1 ha. In the city of Ostrołęka, it reached the highest level of 2.77 ha, whereas in half of the districts (13) the area of exclusions did not exceed 0.5 ha. Thus, in ca. 46% of administrative units, the share of exclusions for transport uses was below 10%. The district of Nowy Dwór Mazowiecki (75.1%) and the city of Płock (69.7%) reported a share above 50%.

In the study period, forest land excluded from production for the construction of water reservoirs was of

minor importance. A significant share (20%) of this type of conversion was reported in 2011. In the Różan municipality (Maków district), 15.67 ha (93.7%) of forest land was excluded from production. It was related to the decision on building permit for a flow-through recreational reservoir on the Różanica river in the area of Zawady-Ponikiew and Szygi villages.

CONCLUSION

1. In 2007–2016, the Mazowieckie voivodeship experienced a dynamic increase in woodland area reallocated for non-forest uses in local land use plans, which is indicative of a nationwide trend. This results from socio-economic advancements and the need for new investment areas. However, a small proportion of rezoned land is subsequently excluded from production.
2. The Mazowieckie voivodeship ranks third in the country in terms of area of forest land excluded from production in 2002–2016. The intensity of exclusions fluctuates around 0.9 ha/1,000 ha of forest land and is below the country's average level of 1 ha.
3. Private land prevails in the ownership structure of woodland excluded from production for non-forest uses. The rate of private woodland excluded from production is higher than in the case of state-owned land. This is different from the situation observed in the country which demonstrates a higher rate of state-owned land excluded from production.
4. In the Mazowieckie voivodeship, woodland excluded from production is mostly allocated for mining. This trend is followed by 27.6% of the total forest area excluded from production, which is half the rate calculated at countrywide level (57.6%). The share of this direction in 2002–2016 follows a downward trend and varies across districts.
5. There is an increase in the importance of the exclusion of forest land for industrial use. This is manifested by both the growing area (from 3.4 ha in 2002 to 46.9 ha in 2016) and the growing share (from 8.1% to 56.9%, respectively) in the total area of exclusions. What is also characteristic of this direction is a high level of spatial concentration: 53% of the area of land excluded from production for industrial uses is located in the Ostrołęka district.
6. Exclusions for the construction of water reservoirs are the least important in the voivodeship and their share (2.1%) is similar to the average one in the country.

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WYLESIENIA JAKO ELEMENT PLANOWANIA I KSZTAŁTOWANIA PRZESTRZENI

Abstrakt. W artykule przedstawiono skalę zmian przeznaczenia gruntów leśnych w miejscowych planach zagospodarowania przestrzennego na cele nieleśne, jak również skalę, kierunki oraz zróżnicowanie przestrzenne wyłączeń gruntów leśnych na inne cele w województwie mazowieckim. Podstawę opracowania stanowią niepublikowane materiały uzyskane w Regionalnych Dyrekcjach Lasów Państwowych w Warszawie, Olsztynie, Łodzi, Lublinie i Radomiu, dane zawarte w Banku Danych Lokalnych Głównego Urzędu Statystycznego oraz roczniki Leśnictwo z lat 2003–2017. Zakres czasowy pracy obejmuje lata 2002–2016. Analizę przeprowadzono w ujęciu powiatów. W pracy zastosowano metodę porównawczo-opisową i analizę szeregów czasowych. Uzyskane wyniki zaprezentowano w formie graficznej. Badania wykazały dynamiczny wzrost powierzchni, dla których dokonano zmiany przeznaczenia w miejscowych planach zagospodarowania przestrzennego na cele nieleśne, jednak niewielki odsetek tych gruntów zostaje następnie wyłączonych z produkcji. Pod względem powierzchni gruntów leśnych wyłączonej z produkcji województwo mazowieckie znajduje się na trzecim miejscu w kraju. Przeważającym kierunkiem wyłączeń gruntów leśnych są wyłączenia pod użytki kopalne, a najmniejsze znaczenie mają wyłączenia pod budowę zbiorników wodnych.

Słowa kluczowe: grunty leśne, zmiana przeznaczenia gruntów, wyłączenia z produkcji leśnej, województwo mazowieckie