

**Monika Musiał-Malagó**

Cracow University of Economics

### **THE CHANGE IN THE STRUCTURE OF LAND USE IN CITIES. KRAKOW – A CASE STUDY**

**Summary:** The introduction of new rules in the area of land management and the new city management rules lead to key changes in the structure of land use and management of city land. The main objective of the article is to depict the changes of land management in the city of Krakow in the years 2005 – 2012. The spatial analysis of the change process was carried out in the scale of the whole city.

**Keywords:** the structure of land use, land management in cities, Krakow.

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#### **1. Introduction**

Cities in Poland have been formed as a result of historical urbanization processes, however, the current shape of their spatial structure has been significantly influenced by planned economy rules. New management conditions and new city management rules lead to key changes in the structure of land use and management of city land. The aim of the article is an assessment of changes of land management in the city of Krakow between 2005 and 2012, after Poland's joining the European Union structures. The spatial analysis of the change process was carried out in the scale of the whole city.

#### **2. Land management in cities**

Any forms of activity require suitable land where they can be performed. Business entities and institutions aim to occupy the land which allows them to achieve the goals they set in the most effective way. Areas utilized by the users constitute the structure of land use in a city.

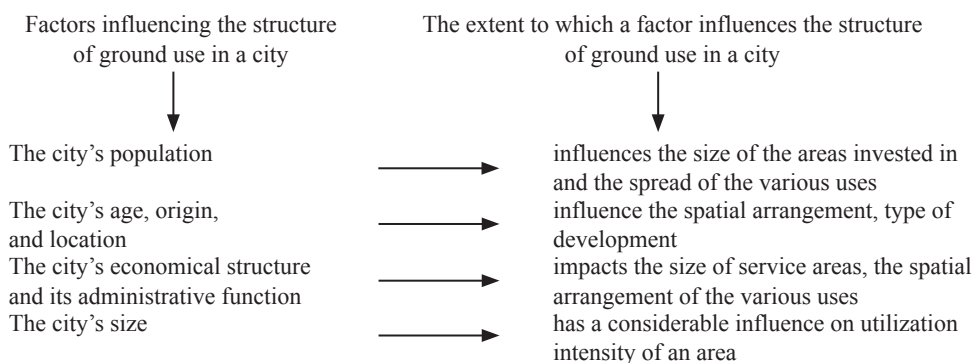
Functional-spatial structure research chiefly consists in analyzing land use within the limits of a city. The analysis is based on a description of the distribution of areas occupied by a certain kind of activity as well as the share of these areas in the overall city area [Słodczyk 2003]. The results of a functional-spatial analysis are useful in the context of evaluating the current state of land use, since they provide insight into the spatial development of a city as well as the intensity of human activity in the researched area.

The basic area types in cities are [Wierzchowski 2011]:

- Farmland – arable land, orchards, grasslands, pastureland, built-up farmland as well as land underneath ponds and ditches.
- Forest grounds, woodlands and shrublands.
- Built-up and urbanized land – including:
  - residential zones – land not used for agricultural or forest production, occupied by residential buildings and their functional amenities (courtyards, driveways, passageways, playgrounds, home gardens),
  - industrial zones – occupied by industrial production buildings, including water intakes, transformer stations, water treatment plants, warehouses and storage facilities, operational bings and dumps, as well as transport and renovation stations,
  - other built-up zones – areas occupied by buildings and facilities connected with administration, health care, trade, religious worship, craft, services, science, education, culture, leisure, and others.
- Urbanized undeveloped zones – undeveloped zones earmarked in zoning plans for development, excluded from agricultural and forest production.
- Leisure-recreation – not occupied by buildings: recreation centres, children’s play areas, squares, parks, urban greenery, verdures (excluding those within roads), national trust areas (castle ruins, gorges, mounds, natural monuments), sports areas (stadiums, sports fields, ski jumping hills, luge tracks, sports shooting ranges, lidos, areas intended for entertainment (amusement parks, theme parks), zoological and botanical gardens, uncultivated green areas not classified as forests, woodlands, or shrublands.
- Roads – land within public and private roads, occupied by: national, provincial (voivodeship), district (powiat), municipal, housing estate roads, farmland and woodland as well as public facilities’ driveways, parking lots, vehicle manoeuvre areas at railway and bus stations as well as airports, seaports and river ports and other public access to loading ramps and storage areas.
- Other areas – land occupied by opencast mines, railway areas, other transport areas.
- Land underneath bodies of water – land underneath inland marine water, land underneath surface flowing and still waters.
- Other areas – environmental use areas, uncultivated land, various areas (amongst others land earmarked for recultivation).

The scope and pace of changes in the structure of land use is differentiated with respect to the various types of municipalities. In the structure of using land in rural municipalities this process occurs more slowly due to their predominantly agricultural use. Moreover, it usually comes down to excluding land from agricultural or forest use for non-agricultural and non-forest use. The changes in the structure of land use in urban municipalities have been taking place in a different way. In such municipalities there is a process of inner reorganization in the framework of the current structure of urban land use. A change in the structure of land use may be a result of activities which are meant to achieve development goals assumed by the municipality [Trojanek 1998].

The structure of land use in a city is not random. A number of determinants, i.e. population traits (material status, age), origin, location, size, physical and geographical conditions as well as the functional structure of the city can influence the distribution of land in a city as well as its size (Fig. 1).



**Fig. 1.** Factors influencing the structure of ground use in a city

Source: own work based on: J. Słodczyk, *City space and its transformation*, Opole 2003, p. 104; A. Harańczyk, M. Musiał-Malago, D. Jopek, *Financial aspects of the space management of Krakow*, Committee for Spatial Economy and Regional Planning, Polish Academy of Sciences, submitted for publication.

The changes in land use in a city are therefore influenced by endo- and exogenous factors [Gaczek 1992]. Both the former and the latter can under certain circumstances decelerate or accelerate the changes in land use. In periods of economic growth, internal factors (characterized by demand) play a decisive role in the transformation of urban space, while during periods of recession, the changes in land use are to a larger extent influenced by external factors which shape supply. Thus the pace and the process of changes in the structure of land use are a result of the activity of internal conditions defining the directions and course of this process in the described area as well as external conditions, which define the need for specific kinds of developed urban land.

### **3. The characteristics of the process of the transformation of the structure of ground use in the city of Krakow**

The transformation into a market economy as well as the introduction of new rules in the area of land management is connected with aiming for its more effective utilization and is characterized by a growth in the intensity of land exploitation [Gaczek 1998].

In 2012, almost half of the city of Krakow surface area was occupied by farmland, i.e. arable land, orchards, grasslands and pasture land. Over the researched period, the process of farmland shrinking was observed (a decrease by 169 ha). In 2005 the share of farmland in the whole of Krakow amounted to 47,5% and shrunk compared to 2011 by 2,2 percentage points. In 2012 the area of farmland increased to 47,0%. The increase of the index in percentage was caused by the fact that apart from arable land, orchards, grasslands, and pastureland (44,7%), this land category included other land, which occupied 761 ha of the city surface area. Farmland was dominated by arable land (31,4%), although its area decreased since 2005 by 443 ha, i.e. by 7,4 percentage points.

A considerable part of the city were housing estates. These occupied over 1/3 of the surface area of the whole city. The significant changes which took place with respect to urbanized and built-up areas indicate an increase in the intensity of space use in the city of Krakow. In 2012 the area of housing estates amounted to 10573 ha, which was over 32,3% of Krakow's total area. Within seven years, the share of built-up areas in the overall area of the city increased by around 10,8 percentage points.

The most significant changes indicating an increase in space use occurred with regard to built-up areas including residential ones. In 2005 these areas included 5555 ha of the city area, while in 2012 their area increased to 8940 ha. At the same time there was a slight increase in the area of undeveloped housing estate areas, which in 2005 occupied 564, and in 2012 their surface area increased to 580 ha. In turn the surface area of leisure-recreation areas decreased in the researched period. In 2005 public green areas occupied 898 ha, and 884 ha in 2012 (Table 1).

Minor changes occurred with regard to transportation areas, whose surface area in Krakow increased only by 168 ha, i.e. merely by 0,5 percentage point. The surface area of these in 2012 occupied 3467 ha altogether, i.e. 10,6% of the total city area.

In the researched years the overall area of forests increased in Krakow. In 2005 forests occupied 1125 ha, while in 2012 this increased to 1731 ha. Forests perform a leisure-recreation function for the city residents, which fosters the improvement of life quality and the community's health condition. The portion of land occupied by forests in the overall city surface area increased in the researched period from 3,4% in 2005 to 5,3% in 2012 (Table 1).

**Table 1.** Land in general in Krakow according to diverse type of use between 2005 and 2012

Type of land use	2005		2006		2007		2008		2009		2010		2011		2012	
	ha	%	Ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
<b>Farmland, including:</b>	<b>15 538</b>	<b>47,5</b>	<b>15 454</b>	<b>47,2</b>	<b>15 389</b>	<b>47,1</b>	<b>15 299</b>	<b>46,8</b>	<b>15 163</b>	<b>46,4</b>	<b>14 934</b>	<b>45,7</b>	<b>14819</b>	<b>45,3</b>	<b>15369<sup>1</sup></b>	<b>47,0</b>
arable land	10 716	38,8	10 666	32,6	10 624	32,5	10 576	32,4	10 510	32,2	10 448	32,0	10374	31,7	10273	31,4
orchards	734	2,2	725	2,2	715	2,2	709	2,2	694	2,1	673	2,1	654	2,0	633	1,9
grasslands	2 807	8,6	2 785	8,5	2 777	8,5	2 754	8,4	2 713	8,3	2 660	8,1	2645	8,1	2569	7,9
pasture land	1 281	3,9	1 278	3,9	1 273	3,9	1 260	3,8	1 246	3,8	1 153	3,5	1146	3,5	1133	3,5
<b>Urbanized and built-up areas, including:</b>	<b>7 017</b>	<b>21,5</b>	<b>7167</b>	<b>21,9</b>	<b>7 215</b>	<b>22,1</b>	<b>7 322</b>	<b>22,4</b>	<b>7 476</b>	<b>22,9</b>	<b>7 603</b>	<b>23,3</b>	<b>7727</b>	<b>23,6</b>	<b>10573<sup>2</sup></b>	<b>32,3</b>
residential areas and other built-up areas	5 555	17,0	5 621	17,2	5 685	17,4	5 804	17,8	5 964	18,2	6 106	18,7	6246	19,1	8940	27,4
urbanized, non built-up areas	564	1,7	658	2,0	643	2,0	633	1,9	623	1,9	615	1,9	594	1,8	580	1,8
leisure-recreation areas green areas)	898	2,7	888	2,7	887	2,7	885	2,7	889	2,7	882	2,7	887	2,7	884	2,7
<b>Transportation areas (roads, railways and other transportation areas)</b>	<b>3 299</b>	<b>10,1</b>	<b>3 316</b>	<b>10,1</b>	<b>3 326</b>	<b>10,2</b>	<b>3 328</b>	<b>10,2</b>	<b>3 343</b>	<b>10,2</b>	<b>3 374</b>	<b>10,3</b>	<b>3401</b>	<b>10,4</b>	<b>3467</b>	<b>10,6</b>
<b>Area of forests</b>	<b>1 125</b>	<b>3,4</b>	<b>1 131</b>	<b>3,5</b>	<b>1 158</b>	<b>3,5</b>	<b>1 142</b>	<b>3,5</b>	<b>1 184</b>	<b>3,6</b>	<b>1 351</b>	<b>4,1</b>	<b>1335</b>	<b>4,1</b>	<b>1731</b>	<b>5,3</b>
<b>Land underneath bodies of water</b>	<b>547</b>	<b>1,7</b>	<b>553</b>	<b>1,7</b>	<b>554</b>	<b>1,7</b>	<b>552</b>	<b>1,7</b>	<b>552</b>	<b>1,7</b>	<b>554</b>	<b>1,7</b>	<b>552</b>	<b>1,7</b>	<b>544</b>	<b>1,7</b>
<b>Uncultivated land</b>	<b>280</b>	<b>0,9</b>	<b>285</b>	<b>0,9</b>	<b>282</b>	<b>0,9</b>	<b>282</b>	<b>0,9</b>	<b>290</b>	<b>0,9</b>	<b>278</b>	<b>0,9</b>	<b>270</b>	<b>0,8</b>	<b>260</b>	<b>0,8</b>
<b>Various areas</b>	<b>742</b>	<b>2,3</b>	<b>739</b>	<b>2,3</b>	<b>701</b>	<b>2,1</b>	<b>717</b>	<b>2,2</b>	<b>696</b>	<b>2,1</b>	<b>658</b>	<b>2,0</b>	<b>673</b>	<b>2,1</b>	<b>661</b>	<b>2,0</b>
<b>other areas</b>	<b>4 132</b>	<b>12,6</b>	<b>4 041</b>	<b>12,4</b>	<b>4 061</b>	<b>12,4</b>	<b>4 038</b>	<b>12,3</b>	<b>3 986</b>	<b>12,2</b>	<b>3 928</b>	<b>12,0</b>	<b>3903</b>	<b>11,9</b>	<b>80</b>	<b>0,2</b>
<b>Total area</b>	<b>32 680</b>	<b>100,0</b>	<b>32 680</b>	<b>100,0</b>	<b>32680</b>	<b>100,0</b>	<b>32 680</b>	<b>100,0</b>	<b>32 680</b>	<b>100,0</b>	<b>32 680</b>	<b>100,0</b>	<b>32680</b>	<b>100,0</b>	<b>32685</b>	<b>100,0</b>

1 – in 2012 total farmland included other land (761 ha), hence its total surface area amounted to 15369 ha.

2 – in 2012 built-up and urbanized land additionally included other land (169 ha), hence its total area amounted to 10573 ha.

Source: own completion based on data provided by the Krakow City State Report 2005,2006,2007,2008,2009,2010,2011,2012.

Moreover, the structure of other land use in 2012 within the administrative limits of the city was as follows:

- various areas 2%,
- land underneath bodies of water 1,7%
- uncultivated land 0,8%.

Between 2005 and 2012 the percentage of land underneath bodies of water did not change, there was, however, a decrease in uncultivated land and various areas.

The structure of land use in the city of Krakow is presented in Table 1.

Taking into consideration the ownership criterion within the administrative limits of Krakow there is land constituting [Trojanek 1998]:

- state property – this is land constituting the property of the State Treasury or state legal persons,
- communal property – this is land owned by the municipality, other legal persons as well as inter-municipality associations,
- private property – land which belongs neither to the state nor to community.

The political and economic changes which began in the late 80s and early 90s of the 20<sup>th</sup> century in Poland significantly influenced the ownership structure of land use in Krakow. too.

At the initial stage of the transition the majority of land was in the hands of natural legal persons (including private ones – over 46%) and the State Treasury (43%). Other owners constituted a mere 11%. Since 2003 considerable influence of structural changes has been observed. The proportion of land owned by the State Treasury (about 27%) decreased by nearly half, while the share of other owners, including municipalities and inter-municipality associations increased. The proportion of land being used by natural legal persons did not change [Luchter 2010].

The ownership structure of the various categories, groups, and ways of land use in Krakow is differentiated. In 2012 private property dominated in the ownership structure of land in Krakow, including the largest areas occupied by natural legal persons (14809 ha). These constituted over 45% of the city's surface area. Within seven years we can observe a slight drop (0,5 percentage point) in the surface of the Krakow city area held by individual owners (Table 2, Figs. 2 and 3).

In 2012 the ownership structure of the grounds in Krakow showed that the grounds owned by the Treasury occupied 7894 ha, i.e. 24,1 % of the total town area, of which 3104 ha was granted under perpetual usufruct. As compared to 2005, the area belonging to the Treasury dropped by about 10,5 %.

Meanwhile, municipal grounds in 2005 occupied 15,9% of the city area and in 2012 this ratio was 17,1%, whereas along with the grounds belonging to the city but granted under perpetual usufruct they constituted 20,3%. Within seven years the area of the municipal grounds in Krakow increased by 7,4% (table 2).

The lands belonging to other entities, including cooperatives, churches and religious communities, poviats and voivodships, granted under perpetual usufruct in Krakow made up the area of 2271 ha in 2005 and by 2012 this area increased to 3344 ha (Table 2).

**Table 2.** Total land in Krakow according to ownership type in 2005 and 2012 (in ha)

Types of land use		The area of land		Including				
		total [ha]	%	farmlands	area of forests	urbanized and built-up areas	land underneath bodies of water	other areas (total)
State Treasury	a	5190	15,9	1393	474	2532	433	358
	b	4790	14,7	1164	432	2406	452	336
Municipal and inter-municipality association land	a	5195	15,9	1455	698	2719	33	290
	b	5582	17,1	1322	913	2994	34	319
State Treasury and municipal leased perpetually	a	5060 <sup>1</sup>	15,5	573	50	4255	46	136
	b	4163 <sup>2</sup>	12,7	413	40	3574	34	102
Natural legal persons	a	14970	45,8	12032	255	2505	24	154
	b	14809	45,3	11015	252	3399	12	131
Co-operatives	a	146	0,4	25	0	115	0	6
	b	306	0,9	18	0	286	0	2
Other entities	a	2125	6,5	1096	41	889	11	88
	b	3038	9,3	1440	94	1381	12	111
Total	a	32686	100,0	16574	1518	13015	547	1032
	b	32688	100,0	15372	1731	14040	544	1001

a – 2005 year, b – 2012 year

1 – including 3624 ha constituting State Treasury land perpetually leased as well as 1436 ha municipal and inter-municipality association land leased perpetually in 2005,

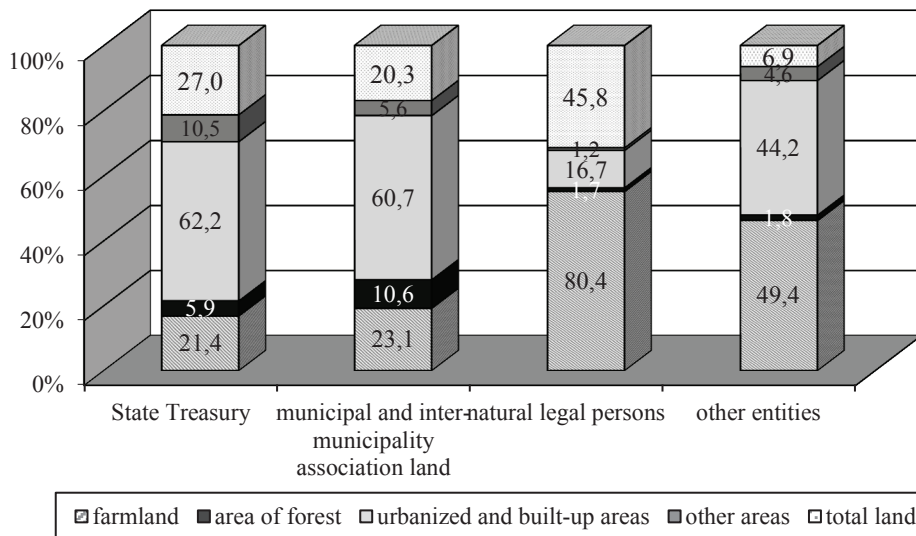
2 – including 3104 ha constituting State Treasury land perpetually leased as well as 1059 ha municipal and inter-municipality association land leased perpetually in 2012,

Source: own completion based on data provided by the Board of Surveying and Cartography of the Krakow Municipal Office (unpublished data).

In 2012 the greatest share of private ownership, i.e. individual owners, was arable land (more than 74%) (Fig. 3). In the analysed years one can observe a visible drop in the area of arable land owned by individuals, which is related i.a. to the increase in the area excluded from farming in the city. The smallest percentage of such lands, both in 2005 and in 2012, was managed by authorities other than local.

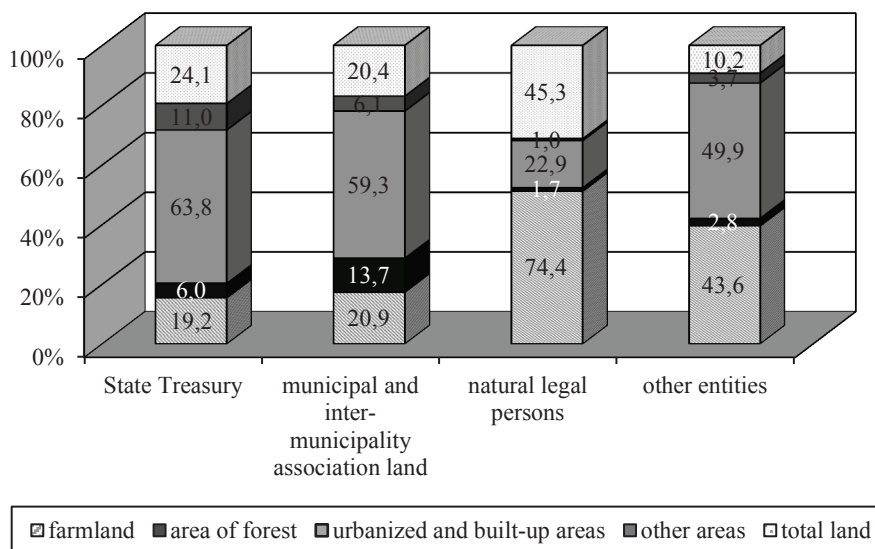
The greatest surface of land belonging to the State Treasury, both in 2005 and 2012, were built-up and urbanized areas, which constituted respectively 62,2% and 63,8%. Likewise, the largest percentage of built-up and urbanized areas were the lands held by communes and commune unions (60,7% in 2005 and 59,3% in 2012) (Figs. 2 and 3).

In the analysed years, individual owners and other entities (i.a. churches, religious communities, land communities and others) held a high percentage of the sur-



**Fig. 2.** The structure of land management according to ownership form and use mode in Krakow in 2005 (in %)

Source: own completion based on data provided by the Board of Surveying and Cartography of the Krakow Municipal Office (unpublished data).



**Fig. 3.** The structure of land management according to ownership form and use mode in Krakow in 2012 (in %)

Source: own completion based on data provided by the Board of Surveying and Cartography of the Krakow Municipal Office (unpublished data).



face occupied by residential areas. Residential areas, therefore, constituted the basis on the spatial structure of the cities.

In turn, the highest percentage of land belonging to other entities was concurrently constituted by farmland, and built-up and urbanized areas (over 40% in the two analysed time intervals).

## 4. Conclusion

The considerations included in the article facilitate distinguishing certain tendencies which occur in the structure of land use within the Krakow city limits.

- Within the ownership structure of the grounds in Krakow, private grounds (45,8% of the city area in 2005 and 45,3% in 2012) and state-owned grounds (27% and 24% respectively) are dominant.
- Communal grounds constitute the smallest area in the city; since 2005 there was a slight growth in the area of communal grounds in the city from 6631 ha in 2005 to 6641 ha in 2012.
- Within the period studied in Krakow there was an increase of surface area of built-up and urbanized areas, where the most significant changes occurred with regard to housing estates.
- Within the analyzed period the process of shrinking of farmland was observed.
- An increase of the total city surface area occupied by forests was a characteristic feature of land use structure change in Krakow.
- At the same time there was a slight increase of the surface area of transportation areas in the structure of land use.
- The surface area of green areas in Krakow slightly diminished.

The analysis of the statistical data regarding land records in Krakow revealed relatively small changes with respect to spatial structure in the studied time period.

The insufficiently long analysis period does not allow to decide unequivocally on the direction of changes in the structure of land use and ownership in Krakow in the future. However, the pace and scope of these changes will depend on external factors independent of the city as well as internal factors, i.e. dependent also on the execution of local land policy.

## Reference

- Gaczek W.M., *The process of changes in land use in urban areas illustrated with an example of Poznan*, EA in Poznan Research Bulletin, Poznań 1992.
- Gaczek W.M., *Land management as part of an active policy of spatial*, Bulletin of Committee for Spatial Economy and Regional Planning, Polish Academy of Sciences, no. 181, Warsaw 1998.
- Harańczyk A., Musiał-Malago M., Jopek D., *Financial aspects of the space management of Krakow*, Committee for Spatial Economy and Regional Planning, Polish Academy of Sciences, submitted for publication.

Krakow City State Report 2005,2006,2007,2008,2009,2010,2011,2012.

Luchter B., *The Changes in the Use of Land in the Development of the City of Krakow*, University of Economics, Krakow 2010.

*Residential construction land data base for the city of Krakow*, The Institute of Urban Development in Krakow, Krakow 2011. [www.irm.krakow.pl](http://www.irm.krakow.pl).

Słodczyk J., *City Space and its Transformation*, Opole 2003.

Trojanek M., *The changes in the property and use of land*, Bulletin of Committee for Spatial Economy and Regional Planning, Polish Academy of Sciences, no. 181, Warsaw 1998.

Wierzchowski M.W., *Land use in the Polish cities*, Institute of urban development, Krakow 2011.

## ZMIANY STRUKTURY UŻYTKOWANIA TERENÓW W MIASTACH. STUDIUM PRZYPADKU KRAKOWA

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**Streszczenie:** Wprowadzenie nowych zasad w zakresie gospodarki gruntami i nowych zasad zarządzania miastem prowadzi do istotnych przemian w strukturze użytkowania i w sposobie zagospodarowania terenów miejskich. Celem artykułu jest ocena zmian w zagospodarowaniu terenów w Krakowie w latach 2005-2012. Analiza przestrzenna procesu przemian przeprowadzona została w skali całego miasta.

**Słowa kluczowe:** struktura użytkowania gruntów, gospodarka gruntami w miastach, Kraków.