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# MAPS OF TAXATION ZONES\*

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**Abstract:** Map of assessment zones is an effect of synthesis of two basic cartographic elaborations: the map of distribution of technical conditions as creative processing of settlement of local development plane in function of investment admissibility as synthesis of possibility of investment and the map with isovales which illustrate space configuration of variability of importance level as a result of analysis performed within partial immovables market.

**Keywords:** immovabilities, locate market, value of the ground, maps of taxation zones, maps of isovals.

In the model of general taxation, the authors<sup>\*\*</sup> have assumed the formation of three obligatory sets of source information: data on buildings and premises, maps of taxation zones, tables of correction coefficients.

In this model, the values of comparative units are adjusted to the conditions of a local market. This adjustment is obtained by using maps of taxation zones made for particular categories of comparative units, in particular:

- to determine the value of  $1m^2$  of the land in the zone – <u>a map of taxation zones of lands</u>,

- to determine the initial value of  $1m^2$  of the living space in dwelling-houses <u>a map of</u> <u>taxation zones of buildings</u>,
- to determine the rate of the basic rent of  $1m^2$  of the surface of business premises <u>a map of taxation zones of rents</u>.

In the authors' opinion, information obtained from a local market of real estates should constitute the basic source material.

The need to zone the area of the city of Łódź arose as early as 1990. On 19 December 1990, the City Council adopted a Resolution, which declared the division of the city area into four zones. Its aim was to determine 'the prices of the lands owned by the District', prices of the sale of premises, and rates of the rent for the lease of the land (Fig. 1).

However, the two-year functioning of this Resolution pointed to the necessity to correct the zones being introduced. Thus, in 1992, the City Council of Łódź adopted an appropriate Resolution, which effected a new division of the area of the city into five zones and distinguished several categories of the area within these zones. Prices of the communal land, prices of flats and rates of rents for the lease of business premises and land were

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<sup>&</sup>lt;sup>\*</sup>The article is prepared on the basis of the report on the research project of the Department of Geodesy of the Technical University of Łódź, financed by the Committee of Scientific Research (KBN) and a publication constituting an integral part of this report, in particular: 'A Model of Determination and Verification of the Range of Taxation Zones for the General Taxation of Real Estates', ed. by Technical University of Łódź, part I, Łódź 1994 and part II, 1995, developed under the supervision of the author by the following team: Z. Andrzejowski, M. Czochański, G. Kowalski, T. Kośka and W. Pawłowski, efficiently aided by Prof. A. Hopfer and Prof. R. Źróbek of the Academy of Agriculture and Technology, Olsztyn and Z. Adamczewski of the Warsaw University of Technology.

<sup>\*\*\*</sup>A. Hopfer, S. Przewłocki, M.Czochański, G. Kowalski, R. Źróbek: A Proposition of a Model of General Taxation of Real Estates on the Urbanised Grounds basing on an example of the City of Łódź, Scientific Bulletin, Technical University of Łódź, Łódź 1993.



Fig. 1 Taxation zones of land in 1990

adjusted to this new division of the city into zones and area categories by adopting successive appropriate resolutions.

The first conceptions of making maps of taxation zones consisted in making additions to maps of zones and categories of the city area. The additions contained quotations of unit prices from a market of real estates. Thus, unit prices established by an valuation expert and contained in the reports of valuation, market unit prices from notarial deeds, offered unit prices obtained from estate agencies and information from newspaper advertisements were introduced. At the same time, it was assumed that these quotations should be realised irrespective of the three categories of comparative units mentioned above, i.e.: lands, buildings and rents; this is how the first maps called maps of taxation zones: of lands, buildings and rents came into being.

Further investigations were carried out to develop an algorithm for determining the range of taxation zones, 'the algorithm for determining of the range of taxation zones of land estates' being in the focus.

According to this conception of the authors, the algorithm was reduced to the following four steps:

- I the construction of a database on land estates,
- II the segmentation of a market of land estates,
- III the parameterisation of the description of a market of land estates, and
- IV the analysis of a market of estates against the background of local economic conditions.

It is clear that the first three steps have a character of general procedures aiming at the construction of a database of a market of estates and its complex description, while the fourth steps specify the manner of the utilisation of these data as a function of time and

the goal of the analyses being made.

Hence, the fourth steps - as a function of the general taxation of estates for taxation purposes, for the development and monitoring of a market of estates, the improvement of the local planning and the development of infrastructure, and the protection of the loans granted – was a suppose to contain the following solution procedures:

#### 1. The Development of a Technical Layer

- the investigation and analysis of natural and social-economic conditions of the area in an aspect of their value factors,
- the valorisation of these conditions as a function of the aim of a study, the valorisation of the effect of determination of spatial land development to the rules of price levels,
- the cartographic study of a spatial variability of value factors,
- the selection of class divisions for result studies.

#### 2. The Development of an Economic Layer

- the segmentation and parameterisation of a market of land estates as a function of the goal and the time division of analyses accepted,
- the determination of a statistical surface of the land value,
- the cartographic study of a spatial variability of the analysed phenomenon intensity,
- the selection of class divisions for result studies.

#### **3.** Taxation Zoning and Value Zone Factor

- the synthesis of cartographic studies from the technical and economic layers,
- the geometrical determination of the range of areas of uniform technical and economic values as a function of the established class divisions of the variability of these factors,
- the formulation of mathematical relationships for the determination of value levels within the established units of the geometrical division of the area,
- the determination of value levels by means of the established class divisions.

#### 4. The Determination of the Range of Taxation Zones and Zone Values

Thus, the procedures of the accomplishment of the fourth steps presented above, form the proposed model of the determination of the range of taxation zones.

This model was verified on a specially selected test area. This area was contained within the old administrative borders of Łódź Górna district, formed by 52 record areas of a surface of 5270 ha, composed of 21027 lands of an average area of 0.25 ha.

The spatial distribution of the basic zones of the spatial policy of the PZP and zones of charges for the lease, usufruct and managing of the District land on the test area is shown on Fig. 2. The spatial distribution of the total number of notarial deeds with the disclosed transactional price of the land within the test area in the years 1993 and 1994 is shown on Fig. 3.

The studies made have confirmed the initial thesis of the basic dependence of the range of taxation zones on the spatial distribution of the natural and social-economic valorisation of the area and the statistical value of the lands.

Assuming that the general taxation of real estates should be implemented on the basis of the systematically prepared sets of source data, the tests made in the reality of an actual market of real estates have shown that the following are necessary and sufficient source of data:

- in an aspect of the technical valorisation a plan of land development as an essential value factor in an area where a local market of real estates is functioning,
- in an aspect of the economic valorisation a database of land estates integrated with a system of recording lands and buildings, finally connected with a national system of information on this area (SIT).



Fig. 2 Basic zones of the spatial policy and zones of charges for the lease usufruct



Fig. 3 Total number of the notarial deeds with the disclosed transactional price

In such a formulation of the problem, it has been assumed <u>that the map of taxation</u> <u>zones</u> will be a result of determinations synthesised from two layers: a technical and an economic layer.

<u>Maps of the spatial distribution of technical conditions</u> constitute the technical layer (Fig. 4).

These maps are made by transforming the determinations of a local land development as a function of investment permissibility as a synthesis of investment possibilities.



Fig. 4 Spatial distribution of technical conditions

The map is composed of: a map of the spatial distribution of valorisation of investment possibilities (Fig. 5) and a map of the spatial distribution of the value of degree of investment restrictions (Fig. 6).

The map of investment possibilities (Fig. 5) has been divided into five area categories: the areas of a practically completed ban on investment, to which a 0-1 point interval has been ascribed, and four areas intended for different types of investment, with intervals from 4 to 8, 10 to 15, 16 to 20, and over 21 points, respectively.

The map of the spatial distribution of the value of degree of investment restrictions (Fig. 6) has also been divided into five area categories, according to the value of the coefficient SO, which determines the ratio of the area value expressing its unavailability for investment activity to the value of this area expressing its availability for investment activity

# $SO = \frac{W_n (unavailability)}{Wd (availability)}$

The map of the spatial distribution of technical conditions (Fig. 4) was constructed on the basis of the determined values of the equivalent index of investment admissions. Six area categories have been specified here, the borders of which run along the regulation lines of streets or along the borders of land - register. It has been assumed that the areas of category I the lands of the highest index of investment permissibility, while the areas of category VI, i.e. lands where no investment is allowed.

The value of the equivalent index of investment admissions ranged from 0.01 to 0.78and the average value of this index, 0.367, has been assumed as the boundary of the divi-sion of areas into the main trends of investment:

- ecological investment for < 0.367,

- urbanised investment for > 0.367.



Fig. 5 Spatial distribution of investment possibilities



Fig. 6 Spatial distribution of investment restrictions

<u>Izowal maps</u> (Fig. 7), constitute the economic layer. Izowal maps illustrate the spatial shape of the variability in the intensity of the value level and are the result of analyses made within a local market of real estates. The isoval map was constructed using a set of 452 information items about the price of 1 m<sup>2</sup> of the land ascribed to the surface units of reference. To isolate value factor range, an average value of the land on the test area (10 Zl per 1 m<sup>2</sup>) and the standard deviation from this value ( $\delta = \oplus 4$  Zl per 1m<sup>2</sup>) have been assumed.



Fig. 7 Isovals

Three zones of value factor have been established:

zone I < 6 Zl per 1 m<sup>2</sup> (10 Zl -  $\delta$ ) zone II 6 to 14 Zl per 1 m<sup>2</sup> (10 Zl  $\oplus \delta$ )

zone III > 14 Zl per 1 m<sup>2</sup> (10 Zl +  $\delta$ ).

When the isoval map (Fig. 7) is superimposed on the technical conditions map (Fig. 4), the lines of a given category of area of the technical layer overlap the lines of the surface of the statistical value of the land of the economic layer.

As a result, ranges of uniform (similar) technical and economic values, i.e. <u>maps of taxation zones</u> (Fig. 8) can be determined by means of a graphical-analytical method. Naturally, there are a number of conditions to be taken into account during the construction of these maps. Some of these conditions can be considered by using cartographic methods of investigations.

### R e s u m é Mapy taxačných zón

V navrhovanom modeli všeobecného oceňovania sa predpokladá vytvorenie troch záväzných druhov informácií: údajov o budovách a zariadeniach, máp oceňovacích zón a tabuliek korekčných faktorov.

V tomto modeli hodnoty porovnávacích jednotiek sú prispôsobené podmienkam miestneho trhu. Prispôsobenie sa získa pre každú plošnú jednotku tak, že sa určí:

hodnota 1m<sup>2</sup> pôdy v zóne – mapa cenových zón pôdy,

počiatočná hodnota 1m<sup>2</sup> úžitkovej podľažnej plochy obytnej budovy – mapa cenových zón budov,



Fig. 8 Taxation zones

- základný výnos (renta) z 1m<sup>2</sup> plochy zariadenia – mapy oceňovacích zón výnosov.

- Za predpokladu všeobecného oceňovania údajov o nehnuteľ nostiach, výskumom konkrétneho trhu s nehnuteľnosťami zistili, že nepostrádateľným zdrojom údajov môžu byť z hľadiska:
  - technického ocenenia plán vývoja ceny ako základný cenotvorný element na miestnom trhu nehnuteľností,
  - ekonomického ocenenia banka údajov nehnuteľností integrovaná z pozemkov a budov, s cieľom spojenia so štátnym informačným systémom o území (SIT).

V takomto ponímaní problému je mapa oceňovacích zón výsledkom syntézy, ktorej sa zúčastňujú dva druhy máp:

- mapy distribúcie technických podmienok ako výsledkov tvorivého spracovanie osídlenia na lokálnom pláne rozvoja vo väzbe na možnosti investícií (takéto mapy pozostávajú z dvoch zložiek: z priestorovej distribúcie ocenenia možnosti investícií a ich obmedzenia, a tiež z priestorovej distribúcie hodnoty limitujúceho stupňa investícií),
- mapy izočiar rovnakej ceny (izovál), ktoré ilustrujú priestorovú konfiguráciu variability dôležitých hladín ako výsledok analýzy vykonanej v rámci parciálneho trhu s nehnuteľnosťami.
- Obr. 1 Cenové zóny pôdy z r. 1990
- Obr. 2 Základné zóny poistenia a poplatkov za užívanie Obr. 3 Celkový počet notárskych listín so zistenou kúpnou cenou
- Obr. 4 Priestorové rozloženie technických podmienok
- Obr. 5 Priestorové rozloženie investičných možností
- Obr. 6 Priestorové rozloženie investičných obmedzení
- Obr. 7 Izovaly Obr. 8 Taxačné zóny

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