

# Methodology of Inventory the Real Estate Components for the Purpose of Their Valuation Due to Road Construction – Case Study in Krakow

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**Abstract.** The development of the communication systems determines the economic level of the country. In Poland, despite the successive investments in this area, it is still not enough beneficial solutions to the road network and international calls. The problem of the acquisition of property for public roads on both the valuation principles and the way of obtaining land for these purposes is constantly modified. These changes are intended to simplify the procedures, which have a significant impact on shortening of the investment process. The current provisions of law give the possibility of the start of road investment before a property owner receives compensation for land taken for this purpose. This situation requires an inventory of component parts of the property for the purposes of their valuation. The paper presents the methodology of inventory the real estate components for the needs of their valuation using modern measurement techniques GNSS and GIS.

**Keywords:** GNSS, GIS, public investment, compensation, property, valuation.

**Conference topic:** Technologies of geodesy and cadastre.

## Introduction

Construction and development of the communication system determines the economic development level of the country. In Poland, despite the successive investments in this area, it is still not enough advantageous solutions to the road network and international connections. This is the major economic barrier. Apart from the financial resources necessary for the development of the communication system the legislative changes are needed in the direction of streamlining the process of obtaining land for these purposes, obtaining investment decisions and determining fair compensations for land taken for public roads (Balawejder, Noga 2016; Bieda, Parzych 2013). In recent years, in Polish law, changes aimed at the partial realization of described tasks can be observed. These changes relate mainly to simplification of the procedures of land acquisition, which partially affect the shortening of the investment process.

The rules applicable in Poland, governing the acquisition of land for public roads are presented in the following diagram (Fig. 1).

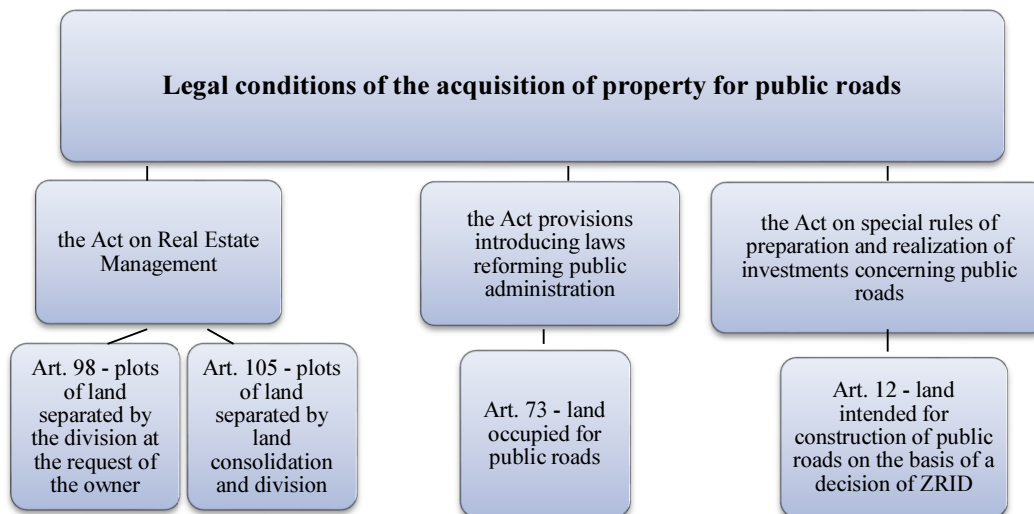


Fig. 1. Legal conditions for the acquisition of property for public roads (Siejka 2012)

In accordance with the provision of Art. 98 section 1 of the Act on Real Estate Management (Ustawa z dnia... 1997), the plots of land separated for public roads as a result of division of property made at the request of its owner, in accordance with the law are passed on the ownership of the State Treasury on the date on which the decision approving the division became final.

Another provision is Article 105 paragraph 4, (Ustawa z dnia... 1997), on rules concerning acquisition of land occupied for the roads resulting from the land consolidation and division of property. According to this provision the plots of land separated for new roads or for widening of existing roads, by force of law become the municipal property.

The presented rules apply the situation of constructing new roads. While across the country we have a large number of roads that require adjustment of legal status. These are roads built on private land often without the knowledge and consent of their owners. In this case, these rules are governed by Article 73 of Act on the regulations (Ustawa z dnia... 1998), introducing acts reforming public administration. This provision applies to all real estates or parts thereof, occupied for public roads, which, on 31 December 1998 were in the possession of the State Treasury. These properties have passed by virtue of law on the property of the Treasury on January 1, 1999.

The last regulation on the acquisition of land for public roads is the Act of 10 April 2003 on special rules for the preparation and realization of investments of public roads. The Act defines the principles and conditions for the preparation of investment of public roads. Its most important goal is to significantly simplify the rules for the acquisition of property for roads, especially motorways. The basis for the acquisition of property for public roads is the decision on the permission of implementation of the road investment (ZRID) (Ustawa z dnia... 2003).

The public road is a social good, and the owner of the road is the State Treasury or the appropriate local government unit. The legal situation regarding the ownership of public roads becomes a problem in cases where the existing or planned roads are located on land which does not belong to the above-mentioned units. Then there is the need for land acquisition for these purposes or regulation of the legal status of land already occupied under public roads. In each of these cases, the owner is entitled to reasonable compensation, relevant to the value of the property. The process of determination of the amount of compensation based on the market value of the property is long and time-consuming. This is particularly clear in the case of road investments on a national or international scale, which run through dozens and often hundreds of parcels belonging to different owners. Therefore, the aim of this publication is to develop a methodology to carry out a inventory of components of real property seized for public roads. A detailed inventory will be the basis of valuation and consequently the basis for the payment of compensation. In addition, the process of determining the amount of compensation will not be holding back the start of investment.

## **Materials and methods**

The research was carried out for the object located in Krakow, Malopolska Voivodeship and was associated with the construction of a new tram line Wielicka Street – Lipska Street with tram overpass over the railway station Krakow – Plaszow (Fig. 2). It is IIB stage of the project, for the construction of the Krakow Fast Tram (KST) concerning the extension of the tram line linking the south-eastern quarter of the city (Kurdwanów) with the north-western quarter (Krowodrza Górka). Line, although technically difficult to be implemented is of considerable importance for improving the communication network of Krakow. This investment was financed in 59% of the funds from the EU funds.



Fig. 2. Location of investment KST IIB (Source: [www.geportal.gov.pl](http://www.geportal.gov.pl))

On 20 June 2013 the President of the City of Krakow issued a decision for investment within the project of expansion of the tram line KST stage IIB with the road system (Lipska Street – Wielicka Street) in Kraków. The decision concerned the extension of the Saska street with the reconstruction of the intersection with streets Lipska and Kuklinski, construction of Gromadzka Street, extension of Prokocimska Street, reconstruction of the intersection

of Wielicka and Prokocimska Streets, extension of Żołnierska Street with the expansion of the tram line with tram stops with the surface allowing the bus communication, as well as the passing of emergency vehicles. This investment was also associated with the construction of engineering structures such as overpass over the railway tracks, construction of acoustic screens, retention reservoir, rainwater pumping station, drainage, lighting, traffic lights, tram traction and other elements of technical infrastructure. Extension of tram line KST stage IIB along with the road system included 238 parcels located in four registration precincts (15,19,28,52) in the cadastral unit Kraków-Podgórze. This is an area developed as industrial and warehouse area. In connection with the construction of the road investment the demolition of many buildings and infrastructure was necessary (fences, sidewalks, roads and parking lots, advertising signs, etc.). Property owners had to get compensation for land, buildings and equipment existing on it. Compensation can only be determined after assessing the market value of the property. Valuation process is time-consuming, and its key element is a detailed inventory of the components of the property. Using modern measurement techniques, the information contained in the official databases and spatial information systems, it is possible to raise the accuracy and reliability of the inventorying work (Mika, Salata 2015; Siejka 2016a; Wróbel 2016).

A continuous progress related to the automation in the acquiring and processing information about cadastral and engineering objects may be observed currently (Busko *et al.* 2014). For inventory purposes, it is important to indicate unambiguously in the field border points of plots, based on the coordinates obtained from the National Geodetic Resources. Currently, due to the availability of integrated satellite measurements Multi-GNSS (Global Navigation Satellite Systems), using systems: GPS, GLONASS, GALILEO, BeiDou and geostationary satellites, it is possible to position points also in places previously inaccessible (Siejka 2014, 2015, 2016b). This applies to areas with limited access to the horizon in connection with the location of determined points in the vicinity of natural and anthropogenic obstacles (tall buildings, trees, power lines). For economic and time-sensitive reasons, the optimal methods of measuring are real-time satellite methods, using RTK/RTN techniques. They consist in determining the precise coordinates of the points in real time directly in the field, by using the correction from reference stations networks operating in a given area. Receivers performing measurements in the field communicate with the Computing Centre of the active geodetic network for example ASG-EUPOS, in order to obtain observation corrections to kinematic measurements. All services of real-time ASG-EUPOS system are available for a fee at [www.system.asgeupos.pl](http://www.system.asgeupos.pl). The characteristics of the accuracy of the available real-time ASG-EUPOS system services are presented in Table 1.

Table 1. Services ASG-EUPOS (Source: ASG-EUPOS 2017)

Type	Name	Surveying method	Data transmission	Estimated precision	Minimal hardware requirements
Real-time services	NAWGEO	kinematic (RTK/RTN)	Internet, GSM (GPRS)	up to 0.03 m (hor.) up to 0.05 m (ver.)	L1/L2 RTK receiver, communication module
	KODGIS	kinematic (DGPS)		up to 0.25 m	L1 DGPS receiver, communication module
	NAWGIS			up to 3 m	

After indicating the course of the borders of the plot occupied for investment, it is necessary to make a detailed inventory of its components. In the case of buildings, among other things: Usable area, Year of construction, type of construction (kind of used construction materials), technical condition, the standard of finish and equipment should be given. In the case of constructions subject to inventory are: fences, sidewalks, parking lots, internal roads, area lighting, engineering equipment for example: transformer stations, advertising signs and billboards. Additional items subject to inventory are elements of cultivated green e.g.: trees, shrubs, lawns, etc. Developed inventory methodology consists of three consecutive stages of field and office works.

#### STAGE I

Preparation of materials:

1. Acquisition of geodetic materials – map of the land and buildings register, coordinates of the plots border points, plots numbers and their areas.
2. Acquisition of data included in the land and mortgage registers – ownership, limited property rights, mortgage.
3. The use of the database of the Municipal Spatial Information System – orthophotomap.

#### STAGE II

Terrain survey:

1. Indication of the borders of plots.
2. Preparation of the protocol containing:
  - a) a detailed inventory and technical description of buildings,

- b) a detailed inventory and technical description of constructions,
- c) a detailed inventory and description of the cultivated green, specifying the type, species and age of plants.
- 3. Signature of property owner.
- 4. Making of photographic documentation of individual property components.

**STAGE III**

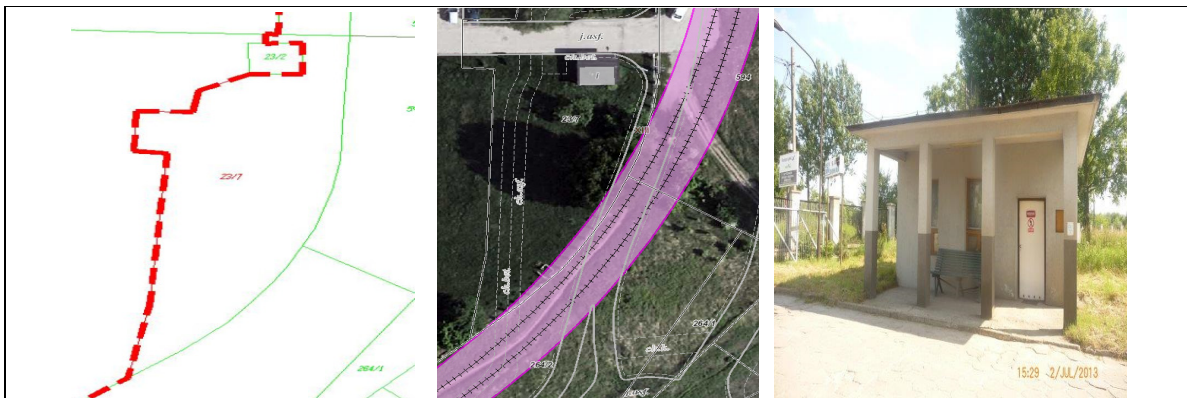
Elaborate of collected data in the form of inventory card for each property.

**Results**

The developed methodology of the inventory of the property components has been used in the initial stage of the project. For the purposes of completing all the data necessary in the process of property valuation, a form of inventory card was created. An example of one of the 238 inventory cards made for the valuation of real properties seized for the construction of the KST is shown in Table 2.

Table 2. An example of inventory card for the cadastral plot 23/7 obr. 28 Krakow-Podgorze  
(Source: own research based on Siejka 2013)

**Property inventory card prepared based on the terrain survey: 02.07.2013**



Graphic elements of the protocol: a) The part of land and buildings registry map with the investment border (red), the border of plots (green), b) orthophotomap part – MSIP, c) photographic documentation – part

**General information**

Commune:	Kraków
Evidence unit:	Podgórze
Precinct:	28
Plot number:	23/7
Plot area:	1807 m <sup>2</sup>
Land register number:	KRIP/00025678/4
Owner:	XXXXXXXXXX
Limited property rights:	Lack
Mortgage:	Lack

**The components of real estate**

**Buildings**

Porter's Lodge	<p>Year of construction: 1980</p> <p>Technology: concrete hollow block, insulated with Styrofoam, covered with flat roof covered with tar paper, wooden windows, paneled doors, reinforced concrete roofing on the 4 pillars 0.3×0.3 m – area 13 m<sup>2</sup>, under the roofing concrete slabs.</p> <p>Number of floors: single-storey building</p> <p>Usable area 25 m<sup>2</sup></p> <p>Volume: 78 m<sup>3</sup></p> <p>Installations: electricity, water, sewage</p>
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Constructions				
Fence:	<ol style="list-style-type: none"> <li>1. A fence made of steel mesh in the steel frames on the brick pillars of size 0.4×0.4×1.70 (from the foundation), długość ogrodzenia 72.15 m, height h = 1.50 m, (span dimensions 2×1.5 m, pillars – 39 pcs.) foundation of brick with a height of 0.50 m and a width of 0.5 m, elements of brick covered with plaster (Numerous defects of plaster)</li> <li>2. two-winged sliding gate 2×5.30 m length, made of flat bars</li> </ol>			
Squares and roads:	Internal road of trylinka – area 225 m <sup>2</sup>			
Sidewalks:	Band around the building of concrete paving – pow. 9 m <sup>2</sup>			
Other:	<ol style="list-style-type: none"> <li>1. In the porter's lodge the electrical switchboard, from which the internal power supply lines are derived</li> <li>2. Advertisement board on a steel structure with the board 4×3 m</li> <li>3. 4 advertisement boards on steel structures with the boards 1.5×1.5 m</li> <li>4. 6 lighting poles, 1– lampholder, steel</li> </ol>			
Cultivated green				
Trees	Name	Breast height diameter (cm)	Number of trees	Age (years)
	willow	48	3	
	maple	38	8	
		25	4	
		22	2	
		28	1	
	pine		19	3
	black lilac		1	5
walnut		2	5	
Lawn:	Lawn of area 432 m <sup>2</sup>			

## Conclusions

Elaborated in this publication methodology of inventory using integrated satellite measurements Multi-GNSS enables precise identification of plot borders vertexes and a detailed inventory of the components of these plots. Field collected data supplemented by information contained in the land and mortgage registers and in land and buildings registry, represent full essential information for performing the valuation of the property. Therefore, the valuation process can be carried out independently of the stages of the construction (the execution of the investment). Thus, the start of the investment is not stopped because of lack of the value estimation of property seized under construction. Because the proposed solution significantly reduces the time of investment, it is beneficial for the investor, contractor and the user.

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