Sigma J Eng & Nat Sci 34 (3), 2016, 349-363

Sigma Journal of Engineering and Natural Sciences
Sigma Mühendislik ve Fen Bilimleri Dergisi

Research Article / Araştırma Makalesi

A RECOMMENDATION OF DECISION-SUPPORT MODEL BASED ON GEOGRAPHICAL INFORMATION SYSTEMS FOR GENERATING REAL ESTATE EVALUATION MAPS: KAŞÜSTÜ/TRABZON EXAMPLE

Volkan BAŞER*[1], Cemal BIYIK[2], Bayram UZUN[2], Volkan YILDIRIM[2], Recep NİŞANCI[2]

[1]*Giresun University, Faculty of Engineering, Department of Geomatics Engineering, GİRESUN*
[2]*Karadeniz Technical University, Faculty of Engineering, Department of Geomatics Engineering, TRABZON*

Received/Geliş: 18.05.2016 Accepted/Kabul: 31.07.2016

ABSTRACT

Rapid growth of urban population also increases the supply for real estate. In this way, urban lands become a scarce resource, and real estate gains value. Therefore, formation from agricultural lands to the lands with building plot becomes inevitable. The value increase from land to plot satisfies both the society and the public with the new urban land arising. With this transformation, increasing real estate value returns to the national economy as more taxes.
For this purpose, the study has been focused on generating plot-based evaluation maps of the region by using nominal evaluation method for Kaşüstü town of Trabzon city where public services developed intensely, has become an attraction center for foreign investors and therefore value grow process has changed rapidly. Thus, tax losses to arise will be minimized with the evaluation to be done with income method and tax incomes will be increased. In this regard, a decision-support model based on Geographical Information Systems (GIS) has been created. With this model, the value increase with transition from rural area to urban land can be monitored dynamically. With this study, the impact of land plan changes on real estate was evaluated in terms of society and public.
In the application study performed on 41 building blocks and 215 plots on an area of 10 hectares, it was found that the unit price per sqm of the plots used as agricultural lands which was 40 TL (14 $) reached to 800 TL (285 $) by increasing 20 times when they were transformed into building plot as a result of development implementations.
Keywords: Real estate, evaluation, nominal value, GIS.

TAŞINMAZ DEĞER HARİTALARININ ÜRETİLMESİNDE COĞRAFİ BİLGİ SİSTEMLERİ TABANLI BİR KARAR-DESTEK MODELİ ÖNERİSİ: TRABZON KAŞÜSTÜ ÖRNEĞI

ÖZ

Kentsel nüfusun hızla artması taşınmaz mal arzını yükseltmektedir. Böylece kentsel toprak kıt bir kaynak haline gelmekte ve taşınmazlar sürekli değer kazanmaktadır. Bu nedenle tarım arazilerinden imar parselli arazilere dönüşüm kaçınılmaz olmaktadır. Araziden arsaya dönüşümde değer artışı hem toplumu hem de oluşan yeni kentsel arazi ile kamuyu memnun etmektedir. Bu geçişle artan taşınmaz değeri ülke ekonomisine daha çok vergi olarak geri dönmektedir.
Bu amaçla çalışma, kamu hizmetlerinin yoğun şekilde geliştiği, yabancı yatırımcı için cazibe merkezi haline gelen ve bu nedenlerle de değer artış sürecinin çok hızlı değiştiği Trabzon ili Kaşüstü beldesi için nominal değerleme yöntemi kullanılarak bölgenin parsel bazlı değer haritalarının üretilmesi üzerinedir. Böylece gelir yöntemi ile yapılan değerleme ile oluşacak vergi kayıpları minimize edilmiş ve vergi gelirleri arttırılmış olacaktır. Bu bağlamda Coğrafi Bilgi Sistemleri (CBS) tabanlı bir karar destek modeli oluşturulmuştur. Böylece, kırsal araziden kentsel arsaya geçişte oluşacak değer artışı dinamik olarak izelenebilecektir. Çalışmanın sonucunda arazi üzerindeki plan değişikliklerinin, taşınmaz değerine etkisi toplum ve kamu açısından değerlendirilmiştir.
10 hektarlık alanda 41 imar adası ve 215 parsel üzerinde yapılan uygulama çalışmasında, tarımsal arazi olarak kullanılan parellerin ortalama birim metrekare fiyatı 40 TL (14 $) iken, imar uygulamaları sonucunda imar parseline dönüşen arsanın ortalama metrekare birim fiyatı 20 kat aratarak 800 TL (285 $) olmuştur.
Anahtar Sözcükler: Taşınmaz, değer, nominal değer, CBS.

* Corresponding Author/Sorumlu Yazar: e-mail/e-ileti: volkan.baser@giresun.edu.tr, tel: (454) 310 17 40

1. INTRODUCTION

Buying and selling values of real estate under normal market conditions appear as value concept. Real estate evaluation is not only an area that the departments dealing with urban planning, design, property tax and economy are interested but also the departments dealing with finance, statistics and even private real estate are interested in closely [1]. The evaluation is the process of determining the characteristics of a particular piece of land and estimating its value during the process [2].

The value being close to the reality is a concept desired by the public and society. For that purpose, it has become a field of occupation that the scientists of advanced countries having right of private property have focused for fifty years and that they have endeavored to sort out according to the conditions of their own countries [3]. Real estate prices are in a state of flux with global/local competition and the pressure of market conditions, and academicians try to find a solution in valuation by following these changes [4]. Being unable to build the implementations about real estate and urban policies created on a particular model and to regulate land use are the root reasons of the problems based on real estate [5]. Especially the development of cadastre industry under the roof of International Federation of Surveyors (FIG) recently, defining cadastral parcel as land object, 3D cadastral approaches, and the directives of Infrastructure for Spatial Information in the European Community (INSPIRE) have revealed the necessity to consider in value-based cadastral systems by increasing the expectations from cadastre [6]. Considering the cost analyses highlighted in Cadastre 2014 [6] [7], such renewable studies should be conducted without delay [8]. In such practices, the values of all parcels within the application area can be updated with land registry and cadastre, and therefore they can be used as a basis in switching to second cadastre [9]. In Turkey, lands being small, consisting of several pieces, formless and scattered are among the major problems in land industry [10].

Urban growth created by social transformation and administrative decisions taken by the public has enabled agricultural lands to join into urban area. Since the possibility to increase real estate supply is limited due to the rapid growth of urban population, urban lands become a scarce source and real estate raise in value consistently. Therefore, formation from agricultural lands to the lands with building plot becomes inevitable. The value increase from land to plot satisfies both the society and the public with the new urban land arising. With this transformation, increasing real estate value returns to the national economy as more taxes [11]. As governments generate their incomes mostly from land market, they need systems and property tax reforms that will present value differences which may occur in time [12] [13]. Land management and sustainable development should be supported with taxation-based cadastral systems. This can only be possible with the reconstruction of traditional cadastral systems [14] [15] [7].

Urban population in Turkey has been increasing steadily since 1950s. Therefore, urban lands should be established in parallel with growing population. This is one of the most important responsibilities of local administrations [16]. While the transformation from agricultural lands to urban lands occurs by population growth and urbanization, urban plots are established by the infrastructures and development rights provided by the public. However, within the context of the master plan of building land, if the land is currently agricultural but has a structure group, it can be considered as building plot by administrative decision in terms of tax legislation.

Following factors can be listed among the reasons for the transformation of rural lands to urban lands:

- Population growth and migration,
- Demand,
- Inflation,
- Development right and utilization method,
- Providing public fittings and leading the value wave to be created with demand. In other words, it means to determine direction of public service investments in the city [11].

For that purpose, the study is focused especially on the local administrations to benefit the process of economic level of welfare arising out of the value increase of real estate. In this regard, proper and up-to-date valuation maps which can be dynamically generated with GIS-based decision-support model are required. The purpose of this study is to create this model and to test its efficiency by implementing in a pilot region.

2. METHOD

The evaluation method, experience and judgment ability can be described as evaluation process considered carefully on a real estate [17]. A good evaluation process can be possible by adding general and special factors affecting real estate value into evaluation process. The value of a real estate is directly proportional with the characteristics of that real estate as of its general position. Since there is no real estate evaluation program based on quantitative factors in Turkey, it is quite difficult to obtain directly the data which can be the basis for the evaluation [18]. Market values are taken as a basis for many real estate evaluation processes in practice. However, the units taken as a basis according to the evaluation method used may vary depending on the national economical structure. But the characteristics of real estate usually stay same. As these changes in market conditions also cause price speculations, it has become quite difficult to keep unit prices of real estate under control today. Besides, greatness of the areas to be evaluated and high number of real estate make the evaluation to be done difficult. Hence, such problems are seen in the evaluation practices done for real estate taxes. The values of real estate usually staying within the same region or street are always kept same within these borders. Yet, each real estate may have some positive or negative features economically compared to neighbor real estate. This fact shows that each plot has different value. In the end, it cannot be said that an actual real estate evaluation is performed with such a general approach [18].

The value of a plot is directly proportional with the characteristics of that plot as of its general position [19]. It is not possible to determine the exact value of any real estate; however, an approximate value can be determined of related plot by considering various criteria [20] [21]. From this thought forth, criteria and their formulation which may affect the value of a real estate are given below. Maximum unit sqm value in the evaluation of a real estate under the best conditions is considered as 100. Accordingly, each factor is scored over 100% according to their quality levels.

[22] determined the factors affecting unit plot value in his study performed for developing model of plot and land arrangement based on real estate values. These factors are provided in Table 1. The factor weights in Table 1 have been updated in the table with the study of [23]. With the studies performed on individuals conducting purchases and sales in the region, the evaluation factors and their weights have taken their final forms (Table 1).

Certainly it is not possible to limit the number of factors affecting real estate value. Accordingly, it is also difficult to determine the exact value of a real estate. Therefore, a "nominal" value can be created for each real estate from the combination of factors affecting real estate values in a region-based evaluation process. For that reason, it may be possible to express the factors affecting the value of each real estate with a *nominal* variable depending on the impact level of each of them.

Parametric value of each real estate (1) can be determined by its equity [24]. This equity reflects the total value of each real estate. The variable "f" in this formula represents the factors affecting real estate value. The value "f" is the impact of the factor determined on the real estate. Score of "f" can be a value between 1 to 10 and 1 to 100. In a plot-based evaluation process, each plot has an "f" score. Each factor affects real estate value with a different weight, and it is shown as "w" in weight coefficient (1). When determining factor values, it was considered that each factor's maximum value is 100 [25]. Therefore, each factor selected is evaluated over 100%.

$$V_i = S_i * \sum_{j=1}^{k} (f_{ji} * w_j) \quad (1)$$

Table 1. The factors and their weights affecting real estate value [24] [23].

Code	*Evaluation Factor*	*Weight (%)*
1*	AVAILABILITY OF PUBLIC SERVICES	88
2*	LICENSED FLOOR NUMBER	82
3*	LANDSCAPE	85
4	ACCESS TO THE STREET	79
5	POSITION IN BUILDING BLOCK	81
6*	PLOT UTILIZATION AREA	81
7	ENVIRONMENT	82
8	FACADE	75
9	PLOT TYPE	70
10	DISTANCE FROM CITY CENTER	69
11	AVAILABLE AREA	69
12*	DISTANCE FROM THE DANGEROUS SECTIONS OF CITY	69
13	DISTANCE TO EDUCATIONAL CENTERS	64
14*	DISTANCE TO HIGHWAY	60
15	SOIL TYPE	59
16*	DISTANCE TO SHOPPING MALL	61
17	NOISE	66
18*	DISTANCE TO HEALTHCARE SERVICES	61
19	DISTANCE TO GREEN AREAS	58
20*	TOPOGRAPHY	61
21	DISTANCE TO PRAYER ROOMS	44
22	CURRENT SOURCES	56
23	DISTANCE TO PLAYGROUND	51
24	DISTANCE TO PARKING LOT	51
25	DISTANCE TO SEAWAY	33
26	DISTANCE TO RAILWAY	37
27	DISTANCE TO FIRE DEPARTMENT	38
28	DISTANCE TO POLICE STATION	39

**The factors to be considered in practice.*

V : *Total nominal value*
S : *Plot or pixel area*

f : *Factor value (score)*
w : *Factor weight*
k *: Total factor number*

With this method, it is aimed to determine the value of real estate together with the impact of factors varying based on environmental impacts [26].

2.1. Decision-Support Model for GIS-based Real Estate Value

Popularization of GIS technology and increase of its use by different disciplines have also increased the interdisciplinary cooperation. With GIS-supported valuation of real estate, fast, proper and economic solutions will be provided in many operations such as purchase and sales, leasing, expropriation and taxation related with real estate. GIS grows in importance for valuation of real estate due to the large number of location-based data and variability of country economies. With the establishment of real estate valuation system, the changes in factors affecting real estate values will be made easily and more appropriate and useful values will be obtained for buying and selling values [27].

Using real estate values in taxation depends on generating real estate values to be a basis for road-based real estate tax and updating dynamically. In the solution of such positional and integrated systems, GIS-based decision support models are used effectively.

In this study, data collection was done by obtaining graphic data and making price evaluation for buying and selling values in the region. To determine the most accurate results in obtaining buying and selling values of the plots in the region, the community in the application region and the contractors working in the region were interviewed. Mean values were used as buying and selling costs.

Agricultural lands were evaluated and annual net incomes that regional residents obtain from the real estate were learnt. Long-term buying and selling examples were determined in accordance with the long-term trend of actual value increase in real estate industry instead of buying and selling values for recent years. Information for real estate in the application region is provided in Table 2 and Fig. 1. Buying and selling prices in this example were obtained from real estate owners.

Table 2. Value increase process of a plot by years (1975-2001-2015)

Information	1975	2001	2015
Trabzon city; Kaşüstü Town, Hazelnut Garden	Land (Hazelnut Garden)	Land	Land
Infrastructure status in buying year	Out of master plan	Within master plan	Within master plan
Buying Price (TL/m^2)	0.006 TL		
Infrastructure status in sales year	Hazelnut Garden	Master plan for 4 floors, asphalt road, water, sewerage, phone infrastructure	Master plan for 14 floors, asphalt road, water, sewerage, phone infrastructure
Nominal Sales Price (TL/m^2) (A1, A2)		A1 = 65 TL (60 $)	A2 = 700 TL (235 $)
Total Tax Spending (B) TL		500 TL	2500 TL
Real value increase		1075% (A2/A1)	

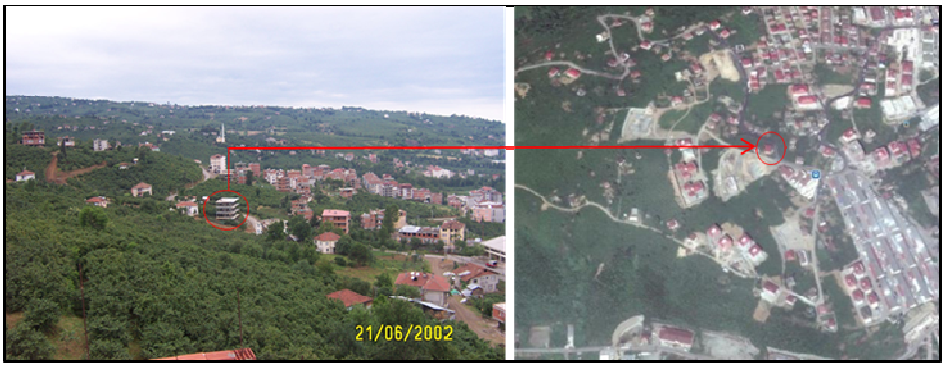

Figure 1. Change in the land by years (2002-2015).

Under the light of the data provided in Table 2, if the owner of the real estate preferred other investment tools, the earning would be lower than the one earned from real estate. Except those invested in real estate, all other investments are under the natural risk of the market. This shows the accuracy of investing on real estate.

In the application study, a decision support model evaluating current values on plot basis and calculating road real estate tax values automatically has been created (Fig. 2).

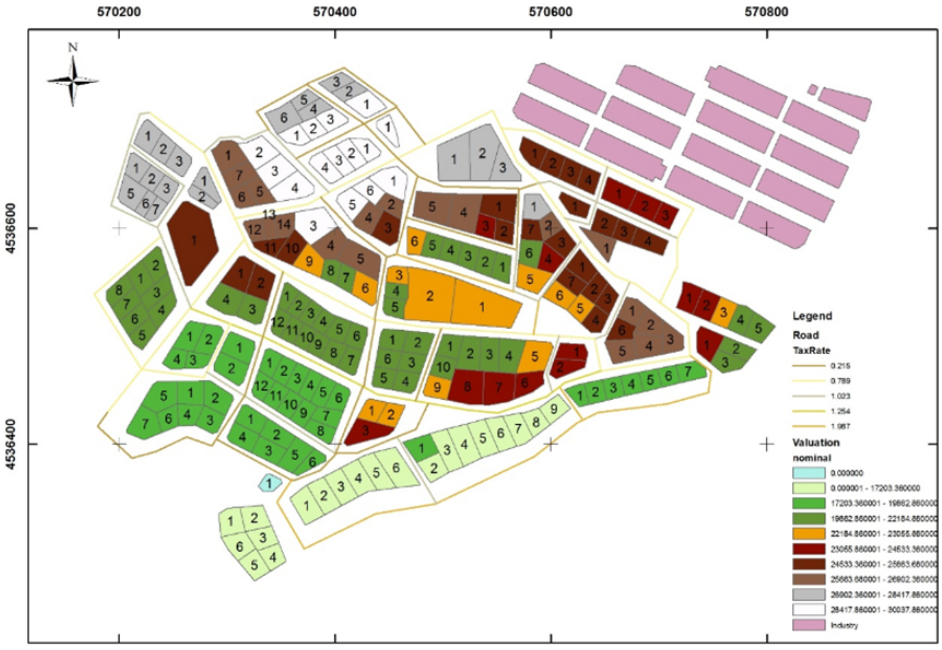

Figure 2. Plot-based current and real estate tax values

3. STUDY AREA

Yalı area of Cumhuriyet District in Kaşüstü town which was on 10 km east of Trabzon was chosen as study region. Since the region is within developmental area and has become one of the

main attraction centers for estate sales to foreigners, the values of real estate have had a great increase. The map of the region is shown in Figs. 3 and 4.

In accordance with the phases of formation from agricultural lands to urban lands, this study was carried out to compare the alternative real return of capital spent for real estate in Kaşüstü town which is one of the urban development areas of Trabzon.

Figure 3. The map of Trabzon-Kaşüstü study region.

Figure 4. Kaşüstü town.

4. RESULTS AND DISCUSSION

The results of the study are discussed in this section.

4.1. Valuation According to Income

The process of valuation according to income is based on estimating annual net income. Land value is found by dividing net income into the capitalization interest rate. Capitalization interest rate is usually determined according to the criteria such as the land type, vegetation, yield condition, distance between the land and market, land being a safe investment, work area [28].

In the evaluation carried out throughout Turkey, it was found that capitalization interest rate is about 4-5% for valuation of hazelnut lands. Considering the factors for determining capitalization interest rate above, the capitalization interest rate of the region was found as 4%. Valuation activities were performed according to the evaluations made for the region and information obtained from the residents of the region, and they were provided with some examples in Table 3.

Table 3. Valuation according to Income in Trabzon / Kaşüstü Town

Location	Trabzon / Kaşüstü		Location	Trabzon / Kaşüstü
Parcel No.	1319		Parcel No.	2506
Surface (m^2)	10300		Surface (m^2)	12400
Property	Hazelnut Garden		Property	Hazelnut Garden
Product amount obtained from 1 decare (kg)	210		Product amount obtained from 1 decare (kg)	180
Mean product price	11.75 TL/Kg		Mean product price	11.75 TL/Kg
Gross Income	210 Kg * 11.75 TL / Kg = 2,467.5 TL / da		Gross Income	180 Kg * 11.75TL / Kg = 2,115.00 TL / da
Manufacturing Cost (30%)	740.25 TL		Manufacturing Cost (30%)	635 TL
Net income obtained from 1 decare (A)	1,727.25 TL / da		Net income obtained from 1 decare (A)	1,480.50 TL / da
(m^2) value of real estate [(A / 0.04) / 1000]	43.13 TL / m^2		(m^2) value of real estate [(A / 0.04) / 1000]	37.01 TL / m^2
Location	Trabzon / Kaşüstü		Location	Trabzon / Kaşüstü
Parcel No.	1325		Parcel No.	2365
Surface (m^2)	15000		Surface (m^2)	13386
Property	Hazelnut Garden, Wooden House		Property	Hazelnut Garden
Product amount obtained from 1 decare (kg)	200		Product amount obtained from 1 decare (kg)	170
Mean product price	11.75 TL/Kg		Mean product price	11.75 TL/Kg
Gross Income	200 Kg * 11.75 TL / Kg 2,350.00 TL / da		Gross Income	170 Kg * 11.75 TL / Kg = 1,997.50 TL / da
Manufacturing Cost (30%)	705.00 TL		Manufacturing Cost (30%)	599.25 TL
Net income obtained from 1 decare (A)	1,645.00 TL / da		Net income obtained from 1 decare (A)	1,398.25 TL / da
(m^2) value of real estate [(A / 0.04) / 1000]	41.125 TL / m^2		(m^2) value of real estate [(A / 0.04) / 1000]	34.96 TL / m^2

Value map simplified to plot basis under the light of the data obtained with valuation according to income is provided in Fig. 5.

Figure 5. Value map obtained with plot-based income method.

4.2. Valuation According to Nominal Unit

In countries with unstable inflation rate like Turkey, valuation of real estate is a significant matter. Real estate values vary in periods extended over a period of time, and different values are obtained in the same period. Therefore, real estate values in countries with fast inflation rate should be cleared of inflation and personal parameters, and real estate values should be attributed to coefficients. Therefore, value maps are required absolutely.

Two kinds of data studies are required for obtaining value maps. First one is to obtain various factors affecting real estate value with the help of mathematical formulas, and the second one is the real buying and selling values to test real estate values.

The valuation criteria for real estate shown with "*" in Table 1 are the criteria used for nominal valuation in the application region. Nominal unit values were created after scoring the plots in the region according to the criteria (Table 4).

Table 4. m^2 prices of plots by nominal unit value and income

Ada N.	Par. N.	Nom. unit value	real buying-selling values (m2)(TL)	m2 value by income (TL)	Ada N.	Par. N.	Nom. unit value	Real buying-selling values (m2/TL)	m2 value by income (TL)	Ada N.	Par. N.	Nom. unit value	Real buying-selling values (m2/TL)	m2 value by income (TL)
121	1	21251	567	39,10	137	1	25932	692	43,130	161	1	30038	801	43,13
	2	21251	567	39,10		2	25201	672	43,130		2	30038	801	43,13
	3	21251	567	39,10		3	25201	672	43,130		3	30038	801	43,13
	4	21251	567	39,10		4	25201	672	43,130		4	27185	725	43,13
	5	22917	611	39,10	145	1	22038	588	39,10		5	27185	725	43,13
	6	24289	648	39,10		2	22038	588	39,10		6	27833	743	43,13
	7	23641	631	39,10		3	21390	571	39,10	162	1	29205	779	43,13
	8	23742	633	39,10		4	21390	571	39,10		2	27185	725	43,13

	9	22909	611	39,10		5	21390	571	39,10		3	27185	725	43,13
	10	21390	571	39,10		6	21390	571	39,10	163	1	29205	779	43,13
122	1	17935	479	39,10	146	1	23056	615	39,10	167	1	22139	591	41,125
	2	15768	421	39,10		2	23056	615	39,10		2	22139	591	41,125
	3	16416	438	39,10		3	23742	633	39,10		3	22139	591	41,125
	4	16416	438	39,10	147	1	15907	424	39,10		4	22139	591	41,125
	5	16416	438	39,10		2	15907	424	39,10		5	21491	573	41,125
	6	16416	438	39,10		3	16555	442	39,10		6	21491	573	41,125
	7	16416	438	39,10		4	16555	442	39,10		7	21491	573	41,125
	8	16277	434	39,10		5	17203	459	39,10		8	22139	591	41,125
	9	16277	434	39,10		6	16416	438	39,10	178	1	27727	740	34,96
126	1	28418	758	43,13	148	1	25560	682	34,96		2	27727	740	34,96
	2	28418	758	43,13	149	1	24773	661	41,125		3	27727	740	34,96
	3	28024	748	43,13		2	24773	661	41,125	179	1	27727	740	34,96
127	1	25436	679	43,13		3	22038	588	41,125		2	27727	740	34,96
	2	25181	672	43,13		4	22038	588	41,125		3	27727	740	34,96
	3	24533	655	43,13	151	1	30038	801	43,13		5	27079	722	34,96
	4	25829	689	43,13		2	30038	801	43,13		6	27079	722	34,96
	5	25829	689	43,13		3	30038	801	43,13		7	27079	722	34,96
128	1	21760	581	43,13		4	30038	801	43,13	182	1	25664	685	43,13
	2	21760	581	43,13	168	1	29205	779	43,13		2	25664	685	43,13
	3	21760	581	43,13		2	26616	710	43,13		3	25016	667	43,13
	4	21760	581	43,13		3	25282	675	43,13		4	25016	667	43,13
	5	21760	581	43,13		4	26654	711	43,13	183	1	24368	650	43,13
	6	22408	598	43,13		5	29390	784	43,13		2	24368	650	43,13
129	1	22694	605	43,13		6	29390	784	43,13		3	24368	650	43,13
	2	22694	605	43,13	131	1	25328	676	43,13	169	3	29390	784	43,13
	3	22694	605	43,13		2	24680	658	43,13		4	26801	715	43,13
	4	22046	588	43,13		3	25366	677	43,13		5	26115	697	43,13
	5	22046	588	43,13		4	25366	677	43,13		6	22833	609	43,13
130	1	27523	734	43,13		5	22631	604	43,13		7	22185	592	43,13
	2	26875	717	43,13		6	22593	603	43,13		8	22185	592	43,13
	3	25181	672	43,13		7	24680	658	43,13		9	22871	610	43,13
	4	23847	636	43,13	152	1	26254	700	43,13		10	25606	683	43,13
	5	22593	603	43,13		2	29499	787	43,13		11	25606	683	43,13
	6	21760	581	43,13		3	30038	801	43,13		12	26254	700	43,13
	7	24788	661	43,13		4	29390	784	43,13		13	26254	700	43,13
184	1	25201	672	43,13		5	26902	718	43,13		14	26902	718	43,13
194	1	19825	529	41,125		6	26254	700	43,13					
	2	19177	512	41,125		7	26254	700	43,13					

Cont'd (Table 4).

Ada N.	Par. N.	Nom. unit value	real buying-selling values (m2)(TL)	m2 value by income (TL)	Ada N.	Par. N.	Nom. unit value	Real buying-selling values (m2/TL)	m2 value by income (TL)	Ada N.	Par. N.	Nom. unit value	Real buying-selling values (m2/TL)	m2 value by income (TL)
132	1	26199	699	43,13	155	1	19177	512	41,125	211	1	22038	588	41,125
	2	26199	699	37,01		2	19177	512	41,125		2	22038	588	41,125
	3*	26237	700	37,01		3	18529	494	41,125		3	22038	588	41,125
	4	26237	700	37,01		4	18529	494	41,125		4	22038	588	41,125
	5	26237	700	43,13		5	19177	512	41,125		5	22038	588	41,125
	6	25551	682	43,13		6	18529	494	41,125		6	22038	588	41,125
133	1	23454	626	37,01		7	18529	494	41,125		7	21390	571	41,125
	2	23454	626	37,01	157	1	19825	529	41,125		8	21390	571	41,125
	3	22806	608	37,01		2	19825	529	41,125		9	21390	571	41,125
	4	21973	586	37,01		3	19177	512	41,125		10	21390	571	41,125
	5	21287	568	37,01		4	19825	529	41,125		11	21390	571	41,125
134	1	23885	637	37,01	159	1	16667	445	39,10		12	21390	571	41,125
	2	20847	556	37,01		2	16667	445	39,10	212	1	19038	508	41,125
	3	20847	556	37,01		3	12755	340	39,10		2	19038	508	41,125
135	1	17796	475	37,01		4	12755	340	39,10		3	19724	526	41,125
	2	17796	475	37,01		5	12755	340	39,10		4	19724	526	41,125
	3	17796	475	37,01		6	12755	340	39,10		5	19724	526	41,125
	4	18444	492	37,01	213	1	19177	512	41,125		6	19724	526	41,125
	5	18343	489	37,01		2	19863	530	41,125		7	19863	530	41,125
	6	18343	489	37,01		3	19215	513	41,125		8	19863	530	41,125
	7	18760	501	37,01		4	19215	513	41,125		9	19863	530	41,125
136	1	24289	648	39,10		5	19863	530	41,125		10	19863	530	41,125
	2	23603	630	39,10		6	19177	512	41,125		11	19177	512	41,125
153	1	27727	740	34,96	214	1	Cemetery				12	19177	512	41,125
	2	27727	740	34,96										

*With reducing the value of plot on sales date in the inflation rate to 2015 September, nominal m^2 prices of other plots were calculated.

The most appropriate method to use in valuation procedures for plot-based lands is nominal valuation. The valuation was performed with the help of criteria mentioned above, value testing data were obtained and value maps were created for real estate in the region, and unit m^2 values were calculated for the plots. The plot-based value map is given in Fig. 6.

As a result of the evaluations performed, it was seen that the valuation procedure has been used by many public and private organizations. However, the organizations were conducting the valuation procedure internally, and no coordination was established with other organizations. In real estate valuation, many factors should be analyzed for valuation. Analyzing these factors with classical methods makes the procedure quite difficult technically. Today, modern information systems provided by the technologies speed up such practices and increase the efficiency. One of the most important practices is Geographical Information Systems used widely [29].

Under the light of all these data, it is seen that it is possible to determine value increase through the transformation from agricultural lands to urban lands by scientific methods. The most significant limitation for not performing these practices is the political concerns of local administrations.

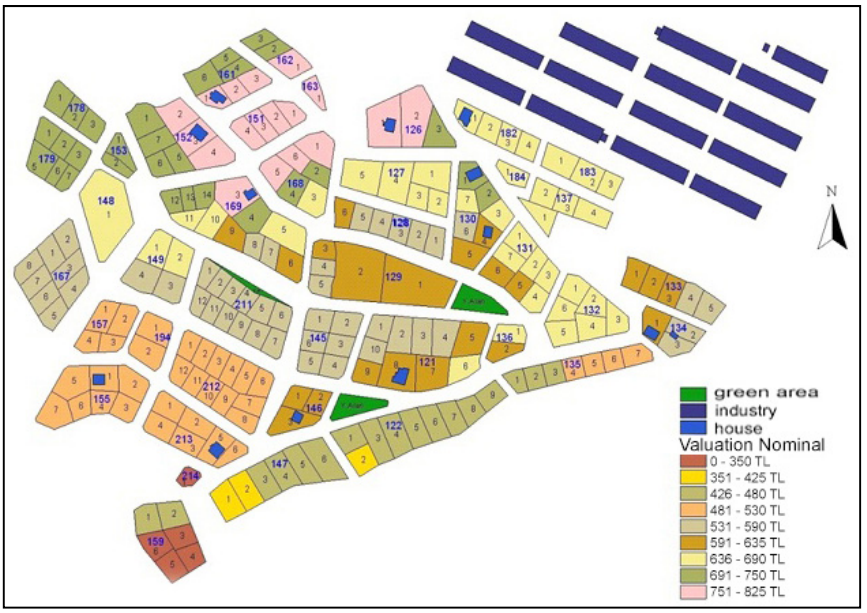

Figure 6. Plot-based nominal unit value map.

As a result of the studies performed as seen in Fig. 7 below, there is a parallelism between the plot values obtained according to nominal value and real buying-selling values obtained from the application region.

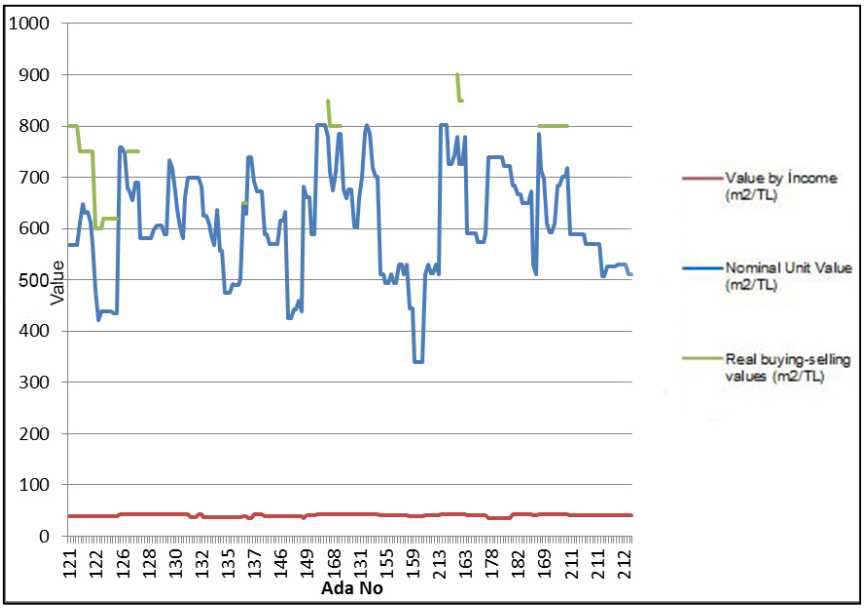

Figure 7. Real estate value diagrams of plots in the application region created according to the nominal value, daily buying-selling data and income method.

5. RECOMMENDATIONS

The evaluations performed show that there is an organizational deficiency for making and auditing valuation for real estate. For that purpose, the presence of private companies performing real estate valuation should be reinforced. Also, it is inevitable to establish "value departments" to carry out auditing process. While these systems can be established by local administrations, they can also be established within the general directorates throughout Turkey. These organizations should have team members from engineering units focusing on real estate. These are survey engineer, urban planner, architect, civil engineer and agricultural engineer. Such organizations are required to establish an appropriate information system on real estate tax. Maintaining and keeping sustained the system to be established will be the duty of organizations in future. In order to carry out valuation in a healthy way, value maps of regions are required. Thanks to such organizations, valuation procedure will be out of the monopoly of real estate agents and therefore unfair income increase can be prevented.

One of the significant issues that should be on the value maps to be created is the map of objects which are subject to tax. Objects that are subject to tax should be described on such maps.

For a reliable evaluation, the characteristics of objects that are subject to tax, cadastral plots, surface area and plots should be known. Information flow should be provided by creating an appropriate interface among land registry offices, tax offices and value departments. "Value departments" to be created should provide data share and internet use service to the citizens.

Value increases or decreases which will arise as a result of public investments should be reviewed and they should be shared with the public.

Transformation from rural field to land should be enabled, and therefore it should be ensured that both citizens win by value increases to appear and the state wins by taxation.

Estate tax values received through the real estate should indicate a difference as in developed countries, taxpayers who have only one house should be protected against property tax, and the tax should be increased as the numbers increase. This practice should be kept same also for the lands.

Keeping the real estate empty for speculation after it is taken should be prevented, sufficient amount of lands should be provided to the market and real estate owners should be encouraged to use their real estate immediately by increasing the waiting costs in order to ensure that urban lands are used efficiently.

The value gained to a real estate with building right obtained via the master plan should be returned to the public under the name of zoning fee.

It is a legal tool which is used in some European countries to return to public the development value to be gained in the future due to the development right of an urban land given by the public or to pay the expropriation price by clearing the value of land required by the public from change or development value. In order to do this, real estate prices should be fixed according to a particular date, the beginning date of a project or the approval date of master plan, and expropriation procedure should be carried out by considering these values. In this way, acquiring high number of lands will not be profitable for real estate owners in the long-term, and it will be possible to prevent new land purchases for speculative purposes. Considering that the profit to be gained by real estate investment will decrease gradually, those who have too many lands will try to sell some of them. Prices may drop through such land supply.

6. CONCLUSION

Real estate valuation is inevitable for developing countries with economic disruption. That is to say, a good economy may survive with the taxes collected. In order to collect more taxes, there must be great number of lands registered. This indicates that the cadastre is the brain of economy.

In real estate valuation, value differences between field and land reflect to the tax. Therefore, local administrations should determine development areas well and carry out formation from field to land. In this way, both the citizens will be satisfied with the value increase to be created and the state with increasing taxes. The study performed in the application region showed that the value increase may reach up to 20 times in transformation from agricultural field to land with building plot.

To carry out all these issues, legal arrangements are required in our legislation and experts should be trained in this field.

Being unable to make real estate valuations in a realistic way leads to many economical, sociological and cultural problems. These are:

- State being unable to benefit economically from the value increase arising out of public investments (road, school, park etc.) (i.e. removal of unearned increment from value increase in some plots as a result of expropriation practices, so the government cannot benefit),
- Decrease of state influence on land market due to being unable to create value maps, so leading to unearned income,
- Title deed fee taken during buying-selling transactions are received according to the declaration of citizens, and this makes the tax to be low.
- The value concept stated in Article 18 of the Zoning Law No. 3194 corresponds to value difference on unit area between cadastre plots before the arrangement and building plots after the arrangement. This does not reflect the actual evaluation. In other words, the deduction is made according to the area instead of land value. This does not affect all evaluated plots equally.

Taxation of idle lands, charging fee for development right and suspending the price of urban lands which are all applied in developed countries widely are directly associated with valuation and land prices.

REFERENCES / KAYNAKLAR

[1] Krause, A. L. and Bitter C., 2012. Spatial econometrics, land values and sustainability: Trends in real estate valuation research, Current Research on Cities 29(2), 19–25.

[2] Droj G., Droj L., Mancia A., 2010. Nominal assets valuation by GIS Nyugat-Magyarországi Egyetem, Geoinformatikai Kar, Székesfehérvár.

[3] Ertaş, M., 1992. Kentsel Alanlarda Taşınmaz Değerlemesi ve Karatay İlçe Belediyesi İçin Bir Uygulama, Yüksek Lisans Tezi, Selçuk Üniversitesi Fen Bilimleri Enstitüsü, Konya.

[4] Bostancı, B., 2008. Forecasting analysis on real estate development and application of housing area model in İstanbul. Yıldız Technical University, Ph.D. Thesis, Istanbul, 217 pages.

[5] Başer, V. ve Bıyık, C., 2002. Tarım Arazisi İken İmar Parseline Dönüştürülmüş Arazilerde Değer Artış Sürecinin İrdelenmesi: Trabzon Kaşüstü Örneği, Karadeniz Teknik Üniversitesi, Yüksek Lisans Tezi, Trabzon.

[6] Yıldız, O., Çoruhlu, Y., E., Demir, O., 2015. A Visional Overview to Renovation Concept on Cadastral Works in Turkey, Sigma Journal Engineering and Natural Sciences, 33 (4), 503-519.

[7] Demir, O., Uzun, B., Çoruhlu, Y.E., 2015. Progress of cost recovery on cadastre based on land management implementation in Turkey, Survey Review, 47, Issue 340, 36-48, DOI: 10.1179/1752270614Y.0000000091.

[8] Demir O., Çoruhlu Y.E., 2009. Determining The Property Ownership on Cadastral Works in Turkey, Land Use Policy, vol.26, pp.112-120.

[9] Boztoprak T., Demir O., Çoruhlu Y.E., Nişancı R., 2015. Arazi Toplulaştırmasının Tarımsal İşletmelere Etkilerinin Araştırılması, Selçuk Üniversitesi Mühendislik-Bilim ve Teknoloji Dergisi, vol.1, pp.1-11

[10] Boztoprak T., Demir O., Çoruhlu Y.E., 2016. Comparıson of Expropriation and Land Consolidation on The Regulation of Agricultural Land, Sigma Journal Engineering and Natural Sciences, 34 (1), 43-55.
[11] Uzun, B., 2000. Çevre Yolu Mülkiyet İlişkilerinin İmar Hakları Açısından İncelenmesi ve Arazi Düzenlemesi Yaklaşımı İle Bir Model Önerisi, Doktora Tezi, KTÜ Fen Bilimleri Enstitüsü, Trabzon.
[12] Nitikin, D., Shen, C., & Zou, H., 2012. Land taxation in China: assessment of prospects for politically and economically sustainable reform. Annals of Economics and Finance, 13(2), 489-528.
[13] Zhang R., Du Q., Geng J., Liu B., Huang Y., 2015. An improved spatial error model for the mass appraisal of commercial real estate based on spatial analysis: Shenzhen as a case study, Habitat International, 46, 196-205.
[14] Cete, M., Yomralioglu, T., 2013. Re-engineering of Turkish land administration, Survey Review, 45, Issue 330, 197-205, DOI: 10.1179/1752270612Y.0000000027.
[15] Döner, F., 2015. Evaluation of cadastre renovation studies in Turkey, Survey Review 47, Issue 341, 141-152, DOI: 10.1179/1752270614Y.0000000101.
[16] Cete, M., 2010. Turkish Land Readjustment: Good Practice in Urban Development, Journal of Urban Planning and Development, 136, Issue 4, 373-380, DOI: 10.1061/(ASCE)UP.1943-5444.0000031.
[17] Dale, P. F and McLaughlin, J. D., 1988. Land Information Management, Oxford University Press, New York.
[18] Yomralıoğlu, T., 1995. Taşınmazların Değerlendirilmesi, Ders notaları, KTÜ, Trabzon.
[19] Frizzel, R., 1979. The Valuation of rural property, Lincoln College, New Zealand.
[20] NRC (Natural Reserch Council) 1983. Procedures and Standards for a Multipurpose Cadastre, p.73., Natıonal Academy Press, Washington D.C.
[21] Myhrberg, O., 1987. Cost and Price Factors of Building Sites in Dispersed Developed Areas in Finland, Surveying Science in Finland, No.2, pp. 26-47.
[22] Yomralioglu, T., 1994, A Value-Based Approach for Urban Land Readjustment, FIG.XX International Congress, Commission 8, Paper no:805.4, pp.1-10, Melbourne, Australia.
[23] Nişanci, R., 2005. Coğrafi Bilgi Sistemleri ile Nominal Değerleme Yöntemine Dayalı Piksel Tabanlı Kentsel Taşınmaz Değer Haritalarının Üretilmesi, KTÜ Fen Bilimleri Enstitüsü, Trabzon.
[24] Yomralioglu, T.,1993, The Investigation of a Value-based Urban Land Readjustment Model and its Implementation Using Geographical Information Systems, PhD. Thesis, Dep. of Surveying University of Newcastle upon Tyne, UK.
[25] Yomralıoğlu, T., Nişanci R., Uzun B., 2007. Raster Tabanlı Nominal Değerleme yöntemine dayalı arsa-arazi düzenlemesi uygulaması, TMMOB Harita ve Kadastro Mühendisleri Odası, 11. Türkiye Harita Bilimsel ve Teknik Kurultayı, 2 – 6 Nisan 2007, Ankara.
[26] Erbil, E.H., 2014. Taşınmaz Mal Değerleme Amaçlı Coğrafi Bilgi Sistemi Tasarımı, 5. Uzaktan Algılama, CBS Sempozyumu (UZAL-CBS 2014), 14-17 Ekim 2014, İstanbul.
[27] Torun, M. K., Yanalak, M., Seker, D. Z., 2009. Taşınmaz Değer Haritalarının Cbs İle Üretilmesi, TMMOB Harita ve Kadastro Mühendisleri Odası, 12. Türkiye Harita Bilimsel ve Teknik Kurultayı, Ankara.
[28] Mülayım, Z. G., 1986. Bilirkişi, Ankara.
[29] Yomralıoğlu, T., 2000. Coğrafi Bilgi Sistemleri Temel Kavramlar ve Uygulamalar, 1. baskı. Seçil Ofset, İstanbul.