Scientific Research and Essay Vol.4 (11), pp. 1286-1291, November, 2009
Available online at http://www.academicjournals.org/SRE
ISSN 1992-2248 © 2009 Academic Journals

Full Length Research Paper

Accessibility effect on urban land values

Mehmet Topçu

(Dr.) Selcuk University, Faculty of Engineering and Arhitecture, Department of Urban and Regional Planning, 42000, Campus/Konya/Turkey. E-mail: mehmetopcu@gmail.com. Tel: +90 332 223 19 95.

Accepted 29 September, 2009

There has always been a demand for real estate with the aim of accommodation and/or making investments. The real estate is also vital for a country's economy as urban land value is determinative in both urban planning and real estate activities in economies of today's world. Knowing the factors affecting the land values is an important advantage in identifying the future of urban development and anticipating probable changes. This study aims to discuss these values from housing perspective. There are many factors affecting housing land values. Among all, this study examined the accessibility factor related to housing land values. The study aims to discuss which accessibility factor affects mostly and to propose an original methodology with reference to Istanbul, a world metropolis. This study has been conducted using GIS database, statistical methods as well as space syntax method. The spatial configuration is examined based on two different integration parameters; local and global, used in space syntax approach. In the scope of this study, there are 18 different variables that are analyzed in 403 streets in Istanbul. The data collected is entered in GIS and statistical analyses have been conducted. Based on the analysis, the distances from the sea are the most related parameter affecting housing land values. The others are the distance from the central business district, spatial integration values, universities and sanitary facilities are effective factors in determining housing land values respectively. The other 13 parameters affect the results with low level. This study is important as it offers a possibility of integrating different approaches including space syntax, which examines factors affecting the housing land values. This study with its original methodology proposed is expected to contribute the further studies in city planning, urban design and real estate.

Key words: Accessibility, land values, space syntax, İstanbul.

INTRODUCTION

The reaction of the man to the environmental conditions is not only a natural reaction, but also a regulatory action (Hough, 1990). Cities are also a part of built environment that includes all the elements of the houses, working buildings, recreational areas and the technical infrastructure connects all these different functions to each other. Housing lands are the most extensive and bulky elements of the built environment. Service areas and networks which link those to each other play a key role in the formation of the built environment and give an image of a city or a basic identity.

An important matter about the housing lands, considered as both a living area and an investment tool, it is not only evaluated by the structural characteristics of the property but also evaluated by physiologically with other urban and spatial particularities of environs. It is very important to the production of healthy environments which provides all kind of needs of the human community socially, psychologically and physiologically. The rise of life standards in the world has increased the individual's expectations for an outdoor of high-quality.

Quality of the environment also affects land values. In many studies, these effects were argued by many researchers. In these studies, the researchers agree on the idea that the concept of urban accessibility, which generally takes part among the parameters of urban quality, has a significant effect on land and housing values (Muth, 1969; Weicher and Zerbst, 1973; Brown and Pollakowski, 1977; Li and Brown, 1980; Bajic, 1983; Richardson et al., 1990; Arimah, 1992; Daniere, 1994; Mozolin, 1994; Gat, 1996; Tse and Love, 2000; Bradbury et al., 2001).

Land value does not only depended to the physical characteristics of a building but also it is depended to the built environment surrounds to that building. In the valuation of any land value, the function of the land location,

externalities of the land and the accessibility are the most important factors.

This study discusses the housing land values which determine the direction of urban development in terms of the parameter of urban accessibility. Within this scope, the aim of the study is to determine the variables that exist within the concept of urban accessibility and to measure which of these variables has a significant relationship with the housing land values. As this topic is considered to be important in terms of urban development and planning, the present study introduces a scientific approach to the topic from the point of accessibility for the restructuring of cities, the planning of land use and the healthier production of the urban space in real estate investments by the decision makers.

LITERATURE REVIEW

The studies conducted on land values in the cities are based on different ideas, such as the classical, the neo-classical and the political economy approaches. The common point of departure for a significant part of the analytical models regarding the spatial distribution of land values is the 'Ricardo Von Thunen' model. Three alternative approaches have been developed in this regard. The most emphasized and the most commonly used of these approaches is the 'New Urban Economy', and it is based on the neo-classical economy. Alonso, Mills and Muth were the pioneers of this school.

The first approach is the theory developed by Alonso (1964) and Muth (1969), which is based on the spatial distribution of land and housing values, the density of land use, household income levels and the cost of access to central business districts (CBD). The second approach is the one developed by Harvey (1974, 1982) in the 1970s, which is based on political economy. The pioneers of this approach argued that the location models that were based on perfect competition would not yield the expected optimum results; on the contrary, they would cause inequality and instability (Sheppard and Barnes, 1990). The third and the last approach were developed by Scott (1989). According to this approach, metropolitan growth is regarded as the dynamics of the production system (Bölen et al., 2005). The starting point of the studies conducted on land values is based on these theoretical considerations.

There are a number of theoretical and empirical literatures on urban land value and accessibility relationship. These studies conducted by the researchers focus on the topics of access to CBD, sub-centers and economic activities, social facilities, public transport stations, water potential, recreation areas, prestige areas and University, locations on main corridors, closeness to rail system stations and expressway junction points (Brigham, 1965; Muth, 1969; Weicher and Zerbst, 1973; Brown and Pollakowski, 1977; Li and Brown, 1980; Bajic, 1983; Asabere and Harvey, 1985; Peiser, 1987; Johnson and Ragas, 1987; Mcmillen and Mcdonald, 1991; Richardson et al., 1990; Arimah, 1992; Daniere, 1994; Mozolin, 1994; Gat, 1996; Tezer, 1997; Tse and Love, 2000; Brabury et al., 2001).

In this study accessibility parameter is analyzed in two stages. Firstly; it is defined as the metric distance between every single street and the public service units stand at the nearest location of the streets. The public service units are characterized in this study as Primary schools, High schools, Universities, cultural zones, health services, commercial centres (CBDs, shopping centres, retails), entertainment areas, recreational areas (greenfields, sport area, children's playground), police stations, place of worship and seaside. Secondly; it is evaluated with Space Syntax method by spatial integration values.

The space syntax method, which enables us to comment on spatial construction and to evaluate the space numerically, is one of the effective scientific movements in the areas of architecture and urban planning as the whole of techniques used for examining the spatial patterns of buildings and cities and as a chain of theories that combine the space and the society (Hillier and Hanson, 1984). It is necessary to compare the integration values of different spaces in order to show the characteristics of the spatial organizations of cities. The mentioned integration values at the same time make it possible to comment on spatial quality and accessibility (Hillier, 1983). For this reason, the obtained spatial integration values were used as a stage in the evaluation of each accessibility parameter-land values relationship. This research is restricted by housing land values in urban areas.

METHOD

In this study, the land values of the residential areas were only evaluated for their accessibility effect and an original methodology was designed to measure this effect (Figure 1). In the context of the study it is considered that the streets in the neighborhoods were data collection scale and the neighborhood sizes were the data evaluation scale.

Data collection is the most important section of this study. In this section, firstly; the axial maps were shaped and every street was represented by an axis in the maps. Axis maps are formed by drawing the longest and the least number of lines or lines of sight which pass through everywhere accessible in an Urban area or building using a full-scale map as base (Space Syntax Limited, 2002-a). In the context of the study spatial integration values were calculated by using axial maps in DEPTHMAP computer program which helps us to make numerical comments related to space in Space Syntax Method (Turner, 2007).

In the second step the data of the sample areas according to the land values at street level are gathered from related institution (The Revenue Administration of Turkey). Thirdly the accessibility parameter is defined as the metric distance between every single street and the public service units mentioned above stand at the nearest location of the streets (Figure 2).

In the proposed methodology, the data was gathered with various methods to be able to make an evaluation of the specific Urban

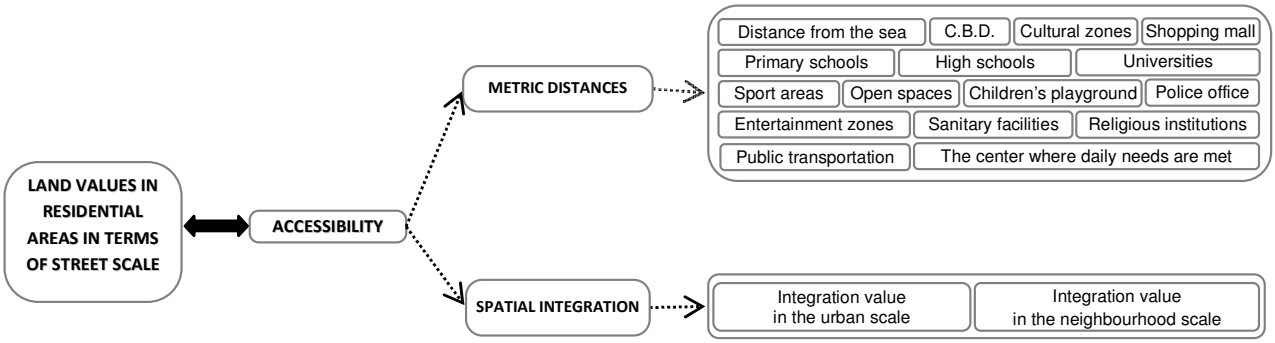

Figure 1. Designed methodology relating to land values and Urban parameters (Topçu, 2008).

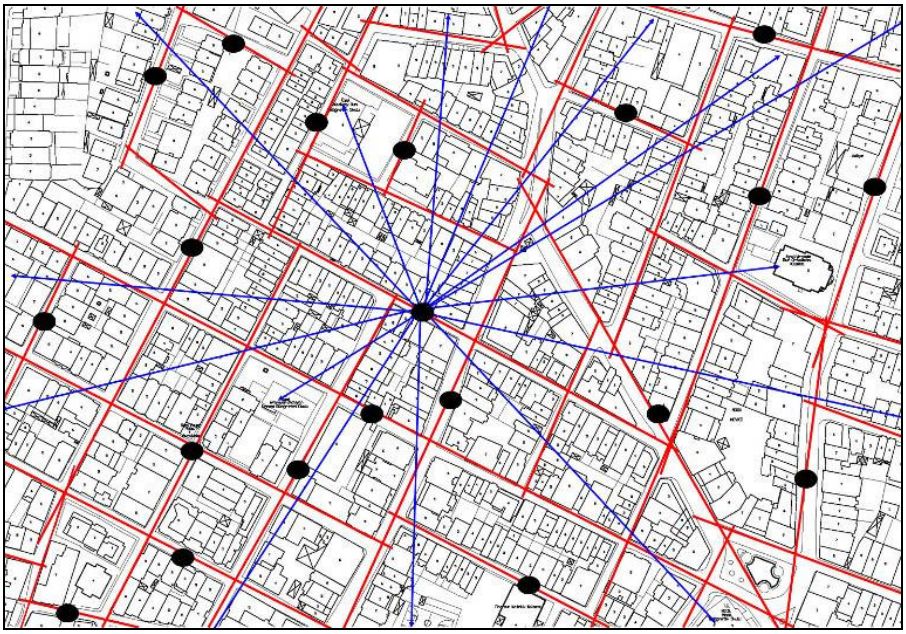

Figure 2. Distance measurement of streets to public service units (Topcu, 2008).

parameters (spatial integration, land values and accessibility) on a common ground (street level). Then, all the data gained from the proposed methodology were applied to GIS data base in the street scale.

In the proposed methodology, accessibility data (metric distances) and spatial integration values were compared with the land values. The land values were chosen as dependant variable and specific Urban parameters mentioned above were chosen as independent variable in the model. In this context, these variables were used for the regression analysis to understand exactly what the most effective accessibility parameters on land values were.

RESULTS AND DISCUSSION

Istanbul is the pioneer city of Turkey at all meanings and it is the only city stands on the conjunction of two different continents in the world. It is maybe the most attractive city for people to settle in throughout the history (Kubat et al., 2007).

The population of Istanbul has increased very much during migration period and population increase has caused significant spatial change on the city's landscape. Existence of new sub-centers, construction of bridges and ring roads and development of some housing areas because of rapid growing of the city cause an increase in the difference of quality of life between different districts and these facts cause marked differences in residential and land prices between the localities (Dökmeci et al., 1994).

As mentioned above, to investigate the reasons of these value differences in terms of accessibility 10 neighborhoods and 403 streets in these neighbourhoods of Istanbul were selected from various districts with random sampling method (Figure 3). Three main criterions were used in the selection of the neighborhoods.

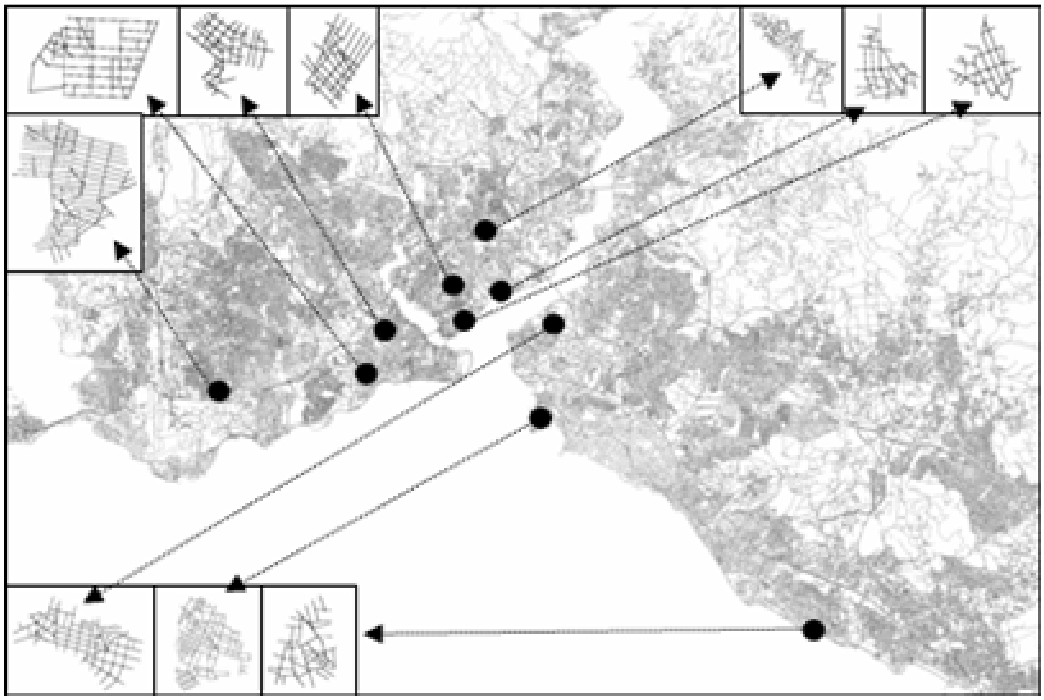

Figure 3. Positions and axis maps of selected neighborhood of Istanbul (Topçu, 2008).

i. These neighborhoods include mostly residential areas.
ii. The types of the houses are similar to each other in terms of form, height and density.
iii. The housing land values are different despite the house types are similar.

After sample area selections the accessibility concept was studied in the 10 selected neighborhoods. The accessibility distances of the residents, which are living in the selected streets, to the specific equipping were measured as air-distance. In the scope of these measurements, the land values on the streets and relational results were analyzed (Table 1). The analyses show that the most relevant parameters were the distance from the sea (0.435) and the distance from the city center (0.425). The next relevant parameters were the distance values from the sport areas (0.415) and entertainment zones (0.408). It is also confirmed that the least relevant parameter was the distance from the retail centers where daily needs are met (0.016).

Space Syntax analysis was inquired through two different axial maps. The first one is the axial map of including whole İstanbul integration map and the other one is the axial maps of neighbourhoods (10 neighbourhoods) including the boundaries of these that selected as sample areas. Thus, space syntax method was included with two stages application.

In the first stage, it was asked the correlation between integration values and land values of the streets (403 streets that were selected as sample areas) represented in integration map prepared for whole Istanbul streets (Figure 4). In this inquiry, a small correlation rate of 0.11 was found between land values of each 403 streets and their integration values.

Table 1. Correlation results between accessibility parameters and land values.

Accessibility Variables	Correlation
Distance from the Sea	0.435
Distance from C.B.D.	0.425
Distance from Sport Activity Areas	0.415
Distance from Entertainment Zones	0.408
Distance from the Police Office	0.371
Distance from High Schools	0.300
Distance from Cultural Zones	0.298
Distance from Sanitary Facilities	0.259
Distance from Universities	0.203
Distance from Shopping Malls	0.172
Distance from Open Zones	0.171
Distance from the Public Transportation	0.127
Distance from Primary Schools	0.127
Distance from Religious Institutions	0.091
Distance from Children's Playing Fields	0.090
Distance from Center of Daily Needs	0.016

The second stage was the correlation between the integration values and land values of whole streets of 10 neighborhoods with their own limits separately (Figure 5). When we look to the correlation between all the re-

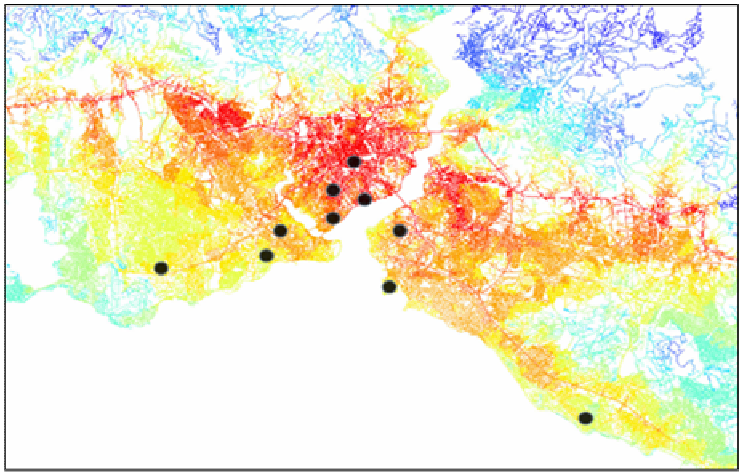

Figure 4. Positions of neighborhoods in the Istanbul integration map (Kubat et al., 2007).

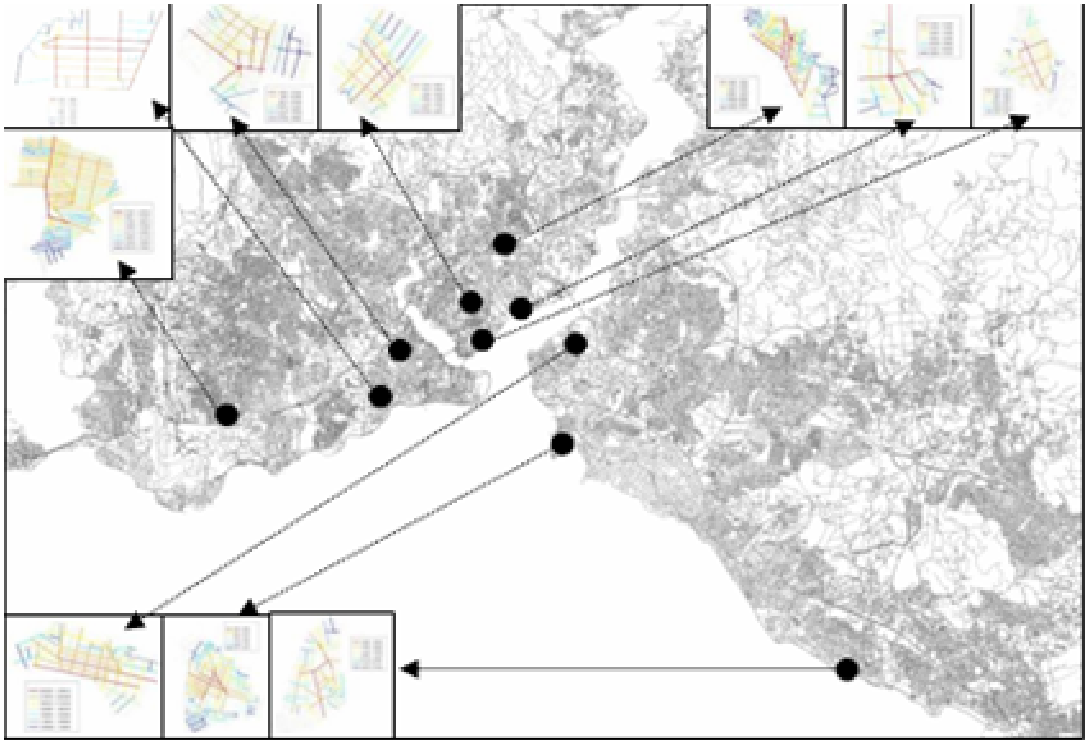

Figure 5. Integration maps of the selected neighborhoods (Topçu, 2008).

results obtained from the 10 neighborhoods and land values, a high correlation of 0.42 was found.

Then a stepwise regression analysis was made by using all the data gathered from the sample areas to determine which accessibility parameters affect land values mostly. In this analysis, land values were used as dependent variables and all the data gathered from the sample areas was used as independent variables (Table 2).

According to the results of stepwise regression analysis, the distance of the street from the sea were the first parameter used in the model for understanding the changes of land values (Adjusted R^2 0.184), secondly the distance to CBDs value was entered to the model. Istanbul was a multi centered city that's why CBDs are used here plural. The results were significant because the

Table 2. The results of regression analysis.

Model Summary				
Model	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**
Distance from the sea	.431	.186	.184	281.06178
Distance from C.B.D.	.556	.309	.305	259.34049
Integration values	.642	.412	.407	239.53735
Distance from the University	.711	.505	.500	219.94442
Distance from the sanitary facilities	.763	.582	.577	202.37726

land values were changed clearly according to the distance from CBDs (Adjusted R^2 0.305). The integration values, obtained by using space syntax method, were the third parameter used in the model for understanding the changes of land values but it was seen that integration values of the second stage analysis of neighbourhoods (10 neighbourhood) that is mentioned above including only the boundaries of these selected neighborhoods were meaningful.

Then the distance of the streets from to the university campuses were entered to the model. It represents the system with adjusted R^2 0.50. And finally the last parameter; distance from the sanitary facilities entered to the model (adjusted R^2 0.577). The stepwise regression analysis was applied to all these five parameters at the same time. As a result, R^2 was observed as 57, 7. In conclusion; system represents the accessibility - land value relations with 5 parameters within 18 parameters. The other 13 parameters affect the results with low level (3%).

Recent studies using mixed models evaluate different viewpoints to interpret the different techniques to get better results and reveals important new ways for developing model for future studies. Besides the Space syntax method method was represented an important improvement in terms of obtaining a more significant result by studying the correlation between the economical structure and the spatial configuration instead of using the urban design, the pedestrian mobility and morphology themes.

REFERENCES

Arimah BC (1992). Hedonic prices and the determinant for housing attributes in the third world city: the case of Ibadan, Nigeria. Urban studies. 29/5: 639-651.

Asabere PK, Harvey B (1985). Factors influencing the value of urban land: evidence from Halifax-Dartmouth, Canada. Areuea J. 13/4: 361-377.

Bajic V (1983). The effects of new subway line on housing prices in metropolitan Toronto. Urban stud. 20/2: 147-158.

Bölen F, Türkoğlu H, Yirmibeşoğlu F (2005). İstanbul'da arazi değerleri ve yapılaşma yoğunluğu ilişkisi. Dünya şehircilik günü 29. kolokyumu, planlamada yeni politika ve stratejiler "riskler fırsatlar", ITU, 203-216, İstanbul.

Bradbury KL, Mayer CJ, Case KE (2001). Property tax limits, local fiscal behavior and property values evidence from Massachusetts under proposition. J. Public Econ. 80: 287-311.

Brigham EF (1965). Determinants of residential land values. Land Econo. 41: 325-334.

Brown G, Pollakowski H (1977). Economic valuation of shoreline. Rev. Econ. Stat. 59/3: 272-278.

Daniere AG (1994). Estimating willingness to pay for housing attributes: an application to Cairo and Manila. Reg.l Sci. Urban Econ. 2: 577-599.

Dökmeci V, Berköz L (1994). Transformation of İstanbul from a monocentric to a polycentric city. Eur. Plan. Stud. 2: 193-205.

Gat D (1996). A compact hedonic model of greater Tel Aviv housing market, J. Real Estate Liter. 4/2: 163-172.

Hillier B (1983). Space syntax: a different urban perspective. Arch. J. 178: 47-66.

Hillier B, Hanson J (1984). The social logic of space. Cambridge university press. Cambridge.

Hough M (1990). Out of place. Yale university press.

Johnson MS, Ragas WR (1987). CBD land values and multiple externalities. Land Econ. 63/4: 337-347.

Kubat AS, Kaya HS, Sarı F, Güler G, Özer Ö (2007). The effects of proposed bridges on urban macroform of Istanbul: a syntactic evaluation. Proceedings of 6th international space syntax symposium. 1/003, İstanbul.

Li MM, Brown HJ (1980). Micro-neighborhood externalities and hedonic housing prices. Land Econ. 56/2: 125-141.

Mcmillen DP, Mcdonald JF (1991). A simultaneous equations model of zoning and land values. Reg. Sci. Urban Econ. 21: 55-72.

Mozolin M (1994). The geography of housing values in the transformation to a market economy: a case study of Moscow. Urban Geogr. 15/2: 107-127.

Muth R (1969). Cities and housing. University of Chicago press, Chicago.

Peiser RP (1987). The determinants of non residential urban land values. J. Urban Econ. 22: 340-360.

Richardson HM, Gordon P, Heikkila R, Peiser P (1990). Residential property values, the CBD and multiple nodes: further analysis. Environ. Plan. A. 22: 829-833.

Sheppard E, Barnes TJ (1990). The capitalist space economy, Unwin Hyman, 1-15, London.

Tezer A (1997). Kentsel ulaşım planlamasında (KUP) arazi kullanım-ulaşım etkileşiminin modellenmesi: İstanbul üzerine bir değerlendirme. Phd dissertation, Istanbul Technical University, İstanbul.

Topçu M (2008). Konut değerleri değişiminin kentsel etmenlerle ölçülmesine yönelik bir yöntem denemesi; İstanbul örneği. Phd dissertation, Istanbul Technical University, İstanbul.

Tse RYC, Love PED (2000). Measuring residential property values in Hong Kong. Prop. Manage. 18/5: 366-374.

Turner A (2007). UCL depthmap 7: from isovist analysis to generic spatial network analysis. New development in space syntax software. 6th international space syntax symposium, Istanbul tecnical university, İstanbul.

Weicher JC, Zerbst RH (1973). Externalities of neighborhood parks: empirical investigation. Land Econ. 49/1: 99-105.