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ICONARP
International Journal of Architecture & Planning
Received 26 September 2016; Accepted 17 October 2016
Volume 4, Issue 2, pp: 58-80/Published 20 December 2016
DOI: 10.15320/ICONARP.2016.7 - E-ISSN: 2147-9380

ICONARP

Hansen Re-visited: Alternative Methodology for Istanbul Land Use Pattern

Kerem Yavuz ARSLANLI*

Abstract

In this paper, Hansen Model applied to Istanbul districts and increasing the distribution of the population of 3 million were calculated. Istanbul, population and income growth, the service sector, based in the city's development as a result of advances in transportation and telecommunications, the restructuring of the city, and this encourages residential, commercial and office create opportunities for investments. Land use decision-making process is a very complex includes site selection. Estimates of population growth, starting from the development potential on the one hand, depending on the location of the settlements, and the physical, socio-economic, legal and political characteristics of the functional needs of the city overlaps with each other to create the most effective form is required. In addition, the sub-centers produced a gradual effect of the interaction and the environment as a result of a lot of alternatives for the purpose of evaluating the size of the new centers and, instead, may be decided taking into account the dimension of time. Thus, the development of the whole city and the economic development of the system to provide the

Keywords: *Urban development, population, distribution, Hansen modelling*

*PhD, İstanbul Technical University
Institute of Social Sciences. İstanbul,
Turkey. E-mail: arslanli@itu.edu.tr

most effective when planned. By investing just as it is today, at certain points, and the creation of high-quality urban services bringing the speculation, raising the quality of life of city-wide, but can provide a healthy socio-economic development.

INTRODUCTION

Rapid and unplanned growth after 1950 in Istanbul, including heavy industrialization, valuable city land and identity has been lost. Today, population growth and economic development of the service sector and as well as the growth and development of telecommunication technologies has encouraged the development of many sub-centres. After the 1980s, the developments of a multi-centre of major cities are found in many countries in Europe and in the United States (Gordon & Richardson, 1996; P. & K., 2006). McMillen and Lester (2003) had predicted in Chicago, the number of sub-centres in 1970, from 9 to reach 24 at 2040. In particular their model showed the centres to be evolved along the highways. In Canada, (Coffey & Shearmur, 2001) examined the development of a multi-centre, especially in Montreal. Rowland and Gordon (1996) as an example to developing countries in Mexico City and Vedia Dökmeci and Berköz (1994) in Istanbul demonstrated improvement in a multi-centre development. In addition, Richardson and Bae (2005) examined multi-centre developments in large number of developing countries.

The multi-centre development of Istanbul, has led to the collapse of the historic centre structural form. In addition, since the needs of modern office buildings, transportation network, and parks, and historic preservation district is unable to meet the needs of increased traffic due to the restructuring and growth control has encouraged the development of the new centres around the city (Dokmeci & Ciraci, 1999; Vedia Dökmeci & Çıracı, 1990).

New sub-centres, along the highways, close to the university and large public housing projects developed in such a large investment in socio-economic and physical environment has encouraged the restructuring. Meanwhile, for the revival of the historic centre and the historic neighbourhoods economic development projects have been started (Ergun, 2003). In 1990, the pedestrianization of Istiklal Street, the development of trade, and functional change has encouraged the restoration of the buildings.

The last 10 years there has been 10 to 15 times increase in the real estate market of Beyoğlu by national and international real estate investors (Ozus & Dokmeci, 2005). The historical peninsula, in the municipality of Fener and Balat UNESCO Funds investments in infrastructure and functional restoration of the



buildings has encouraged the exchange of population and gentrification. As a result of this development, the increases in prices, local and foreign investors are attracted to this region (Ergun & Dündar, 2004).

In the Golden Horn, the investments made for the cleaning of the surrounding encouraged a revival of important historical buildings (Baycan-Levent & Kundak, 2003). For example, Kadir Has University in Cibali Tobacco Factory, Eyüp Feshane Fairgrounds, Golden Horn Congress and Culture Centre, Silahtar Ağa Power Plant, Bilgi University Museum of Industry and Shipyards has been some examples of these important revitalizations.

And functional transformation of these buildings started economic development around the neighbourhood. As a result, sub-centres around Istanbul, re-triggering the recovery to economic development by investment in the city's historic neighbourhoods. The internal dynamics of the city's major economic opportunities mobilized for real estate investors.

In this study, the land and housing values in Istanbul, office and retail trade, real estate prices in the city such as the distribution of rental values were examined. Kindly read this notes carefully. This document serves as a template as well as an instruction to authors in preparing full paper submission.

MULTI-CENTRE DEVELOPMENT OF ISTANBUL

There are many factors that affect the real estate prices in Istanbul, for example, history, quality, and socio-economic characteristics, the location in the city, transportation facilities, natural beauty and views, (Ozus, Dokmeci, Kiroglu, & Egdemir, 2007). Istanbul, the development of a multi-centre circles around them, affect the functional restructuring of real estate values, and in particular to promote the restructuring of slums and the actual value of land in the city to redevelop a very precious opportunity created indirectly.

Distribution of Land Values

Examining the distribution of land values in Istanbul, as a port city in history, places of work to take place immediately behind the port and the transportation system to be developed as a centre of high land values in the centre and near seaside. In addition, recently-built highway intersections, and their paths along the sub-centres, land values increase in a stepwise fashion according to their importance. Meanwhile, despite being advantageous in terms of accessibility, which is still low value land areas will be investigated in the model.

Distribution of Housing Values

In this study, the distribution of housing values compared to that of 1990 and 2010. Istanbul's population to grow rapidly after the 1950s and 1980s due to the economic development and globalization, urban socio-economic and physical structure has led to undergo a wide range of transformation (Dökmeci and Berköz, 1994).

This transformation in the city, providing new business opportunities and revenue growth, has led to changes in the internal dynamics of housing prices (Dökmeci et al., 2003). In addition, inflation is higher than in previous years, as well as in other developing countries with similar conditions as Istanbul, safe and efficient as an investment in the real estate market has developed rapidly (Önder, 2000).

Socio-economic differences between the districts of the city, has caused the 3 focal points with high housing prices.

(1) With the world-renowned natural beauty and rich mansions and also important companies, the three universities and the second biggest shopping centre, close to the Bosphorus coast

(2) Situated on the west of Istanbul, such as the three largest shopping centre in Istanbul Ataköy and the establishment of a housing estate, which started life in the modern city with easy access to the centre and the ring roads Bakırköy

(3) In the countryside and the sea coast with luxury homes, 10 km. long street in Baghdad, including the luxury shops and entertainment facilities around the neighbourhoods with enhanced luxury, Kadıköy (Dökmeci et.al., 1996).

Three common characteristics of these high-demand residential areas are; geographical located on the seaside, once the summer resort for high-income families, Istanbul's richest income layer regions are preferred to locate, commercial shopping centres contain the most luxurious styles, that they have a highly acclaimed modern apartment buildings and villas. In 2010, the city-wide distribution of housing prices is not only beaches but also the luxuries of sites around the city have also seen that the high housing price.

These new residential units, close to the new sub-centres in the surrounding area, a high level of socio-economic environment, social facilities, and the physical environment on a regular basis to present a new way of life plays a role in the increase in housing demand and prices. In these examples, an international award winning and low density residential unit, Istanbul

Istanbul project, and on the Anatolian side of Istanbul, a very luxurious life with a high level of density “Up-Hill” project.

With newly emerging sub-centres of these settlements have a mutual interaction in terms of rent, the prices that provide dynamic and productive investment opportunities. In addition, to overcome the deterioration of the historic centre, investment in infrastructure has increased the house prices. Cihangir and Asmalı Mescit are given as an example for economic developments.

These developments are become opportunity to invest at the level of districts, but many neighbourhoods are not yet developed. Municipalities of Fener and Balat districts improved infrastructure in order to attract investors and accelerate urban transformations In addition, residential areas of Istanbul, which is surrounded by the sea on three sides of city, offers the opportunity to urban transformations.

For example, Salacak and Harem Coasts, world-renowned view of the famous Topkapi palace, real estate prices highly effected. In addition, the planned development of the socio-economic environment is the most important factor affecting the prices. For example, in the areas of slum housing prices, there are major differences between the prices of housing sites developed and planned.

Spatial Distribution of Office Rent Values

Economic accumulation of real estate investments is an important part of the people in Turkey (Önder, 2000), and this rate of investments in the office is increasing. After the 1980s, economic restructuring and globalization, international trade relations, the increase in per capita income and a strategic location between Asia and Europe in Istanbul, has led the size of the increase in the number of companies and therefore has encouraged the growth of the demand for office space. Istanbul office areas, in parallel with the development of the commercial potential of the city since 1970, with the support of the Bosphorus bridges and roads grow to the north of the city.

In particular, banks and insurance companies need a new and larger office spaces, between the years of 1960-1985, Karaköy-Salıpazarı-Fındıklı were satisfied with the built office buildings during this period, Turkey's largest corporate groups and foreign companies settled in these regions.

On the other hand, during the same period office needs of small and medium-sized firms, find their place formerly Taksim-Sisli, and later in Şişli-Gayrettepe axis obtained by converting housing into office space (Pamir & Soyuer, 1996). Since 1985, a

significant increase in the flow of foreign capital, consequently opening of the financial sector under the leadership of Turkey's economy booming emerging needs of modern office building, which was built Barbaros Boulevard and Büyükdere axes, were met with Class A office buildings (Pamir & Soyuer, 1996).

Istanbul's main office areas that make up the new sub-centres are described below:

Levent Zone

The presence of the ring road links to the Bosphorus bridges, with old industrial plants have large plots of Istanbul, the due to its proximity and easy access to other sub-centres (Maslak, Mecidiyeköy, Zincirlikuyu) Istanbul's developed a prestigious office buildings, multi-national companies, became the centre of a preferred business holdings. In 2000, the opening of the subway, and Levent and Etiler shopping areas, restaurants, cafes, social and cultural facilities, the presence of the attractiveness of the social demand for the region is become higher (Aksoy, 2005). Therefore, this region is the region of at least the vacancy ratio and the highest rent values.

Maslak Zone

Development axis from south to north in the Central Business area of Istanbul represents the most northern point. In Maslak, surrounded by forest areas, it is impossible for CBD further enlargement Maslak business development centre, has pioneered by Alarko Company which had built new office buildings across ITU campus.

Istanbul's most luxurious office buildings and hotels built with high precedent for this has been the most important business centre. In 1995, the Istanbul Stock Exchange moved to new premises in İstinye, banks and brokerage firms were effective for the demand office space near Maslak. As Levent, Maslak, the presence of a wide range of suitable land and the accompanying high building permits, have allowed for the construction of high-rise office buildings.

Airport Zone

Airport, the surrounding low-rise office buildings are being developed on the E-5 and TEM motorways. Completed in 2001, the World Trade Centre of Istanbul, the largest office park in the region is an important investment increases the stock of office (Kuzeybatı, 2004). The development of this region, the large press and broadcasting organizations "Press Express Way" that centres on the support organizations that want to be close to them, as well as buildings in the area close to the factories tend



to move factories are effective in the management units (Aksoy, 2005). In the region vacancy rates are more than the other centres and rental values are significantly low.

Kozyatağı Zone

The richest region in terms of office stock in the Anatolian side is equipped with a combination of many different land uses. This region began to develop after 1995, and the presence of empty land, to be the intersection point and the surrounding commercial uses due to features such as luxury housing settlements primarily been a point of attraction for large shopping centres.

Besides regional commercial developments (Metro, Carrefour and Bauhaus) as well as the majority of this period, there has been a Class A office space development took place. (Çelen, 2003). In particular, the demands from multinational and foreign company's plazas began construction in 1997; the majority of office was put into service in 1998-2000.

The main reasons for foreign companies to choose this area are, accessibility, proximity to E-5 and TEM motorways and white-collar workers employed in these companies, the vast majority (65%) has the Anatolian side residence. In addition, the upper-middle income group experienced Kozyatağı residential areas (such as Ataşehir) office in certain areas not separated by a boundary, office space provides integration with other urban areas of activity. Residential, office and other commercial uses of the coexistence of urban scale, enabling the region to be active at any time of the day, although a certain degree of synergy between land uses (Çelen, 2003).

Altunizade Zone

Altunizade zone, starting with Koç Group and its companies have started to develop with a combination of administrative centres. Altunizade region that requirement when being closer to the city, the majority of which is classified as B, the occupancy rate varies according to economic conditions, mainly the structure of the company has an office administrative centres are located. Altunizade, suitable for the establishment of a new regional centres TEM connection with the company, but the height of the buildings limited due to prevent the negative effect on silhouette Camlica, the stock of the building cannot fully meet the needs of the market (Aksoy, 2005). Although one of the least vacant office stock, the rental value of the lowest in the city.

Kavacık Zone

Kavacık Zone is recently evolving office market as an alternative in the Asian side. Because of being near to Fatih Sultan Mehmet Bridge and close to Maslak region, Kavacık played a role in the development of the business centre. However, residential buildings, particularly the lack of permits, as well as the region's transport, energy, telecommunications, infrastructure and social facilities, such as a number of deficiencies and have lower standards of office in this region prevents the formation of high-quality tenant profile (Aksoy, 2005; Çelen, 2003). Office market rents rising on the European side, as well as the emerging demand for central of operations began for a new offices, and residential areas.

Still, Uskudar district, converted to industrial areas, large office buildings, with lower rental rates, especially banks and retail companies settles operations centres (Çelen, 2003). However, the planned new centres are needed and unplanned developments cause the loss of customers and revenue.

Distribution shopping centres in Istanbul

Istanbul, Turkey's largest and richest city due to a very lively and has a variety of types of retail trade. This commercial wealth of traditional trade routes between continents for centuries on the extremely important due to the fact that having a strategic position. In addition, the economic restructuring of the 1980s in Turkey as a result of displacement of resources and trade in the city of Istanbul has increased the participation of the world capitalist economy (Tokatli & Boyaci, 1999).

As a result, consumer culture, these changes due to the rapid increase in population and income, which has great potential for the development of retail trade in the city of Istanbul, the restructuring of commercially viable form, and encouraged the formation of new sub-centres and shopping centres (Terzi, Mutlu, & Dokmeci, 2006).

Retail trade constitutes 40 to 45% of the consumption of families and consumer spending rose from 8.8% in 2005, to 9.6% in 2006. 19th Middle of the century, department stores, has created an evolution in the development of trade. Shopping, entertainment an enjoyable way to spend time became the new bourgeois aims (Bowlby, 1985).

At the same time, large stores in major cities, the people as a symbol of prestige, prepared an environment plays a role in the creation of the national middle class culture. New community of people in big cities to impose themselves from clothing,



upholstery homes until every issue became a focal point of directing their lives (Miller, 1981).

Today this trend, with the effect of globalization on the international level, in the form of mega-markets, and increasingly continue. Recently, the mega-markets opened in Istanbul and their great potential in this area reveals that the interest. Increase in the level of income and car ownership, a new way of life and consumption met through the internet and TV people that require large investments in order to meet the demand for a wide variety of shopping centres have been established (Erkip, 2003). Istanbul for the first mega mall, Galeria, was founded in 1988 Bakırköy. Then the numbers began to increase rapidly, and today has reached 56.

In particular, the mixed-used, i.e. in the form of land use, commercial, office, residential and shopping centres are planned in the form of (Akmerkez, Kanyon and Metrocity, etc.) seems to be very successful. The highest rental values, it is a successful shopping malls. Be explained by the spatial distribution of shopping centres in Istanbul rings. 1 Radius of 10 km from the centre. 1, which is ring, shopping centres, there are 46% and 50% of leasable area. This region represents 44.32% of GDP. 2 positioned around the first ring in the ring, shopping centres, and 54% of the leasable area is 50%. This area represents the 41.93% of the GDP. Although, leasable area is divided equally among the regions, shopping centres clustered particularly in rich districts. 12 units are not currently shopping centre located in the county. Their commercial potential is calculated, which are close to high-income neighbourhoods inhabited districts of the layers was found to have more potential (Terzi et al., 2006).

ALTERNATIVE METHODOLOGY FOR ISTANBUL LAND USE PATTERN

A city consists of different functions that serve different purposes and affect each other. Spatial layout of the city includes a wide range of elements in a network of relationships. Individuals, private firms, public sector, they all want to be close to the sources of labour and services. Therefore, based on a wide variety of purposes cities complex planning system according to one aspect is not possible. One of the most important tasks of urban planners is to determine the places, a variety of functions related to each other in an effective manner by objectives. Planning of these functions independently of each other is not possible. An error on one objective, not only for that functions, but may also be related to an effect on the other functions of the city in terms of functional and economic development. At the same time, the city may lead to an increase in operating costs. In

contrast, the selection of a function itself to be successful in the right place, as well as the development tool environment can be, for example, have the tool, such as the conservation of Historical Peninsula City Gardens surroundings.

A wide range of multi-purpose land use models are available for site selection. Carver (1991) on the selection of Land use in the multi-purpose assessment techniques, contrary to each other, according to the criteria and objectives for the evaluation of alternatives, combined with the use of GIS technique. In another study, solve the traffic congestion in an area, or if there is congestion and housing to solve the balanced distribution of work force planning technique is developed to describe in a multi-purpose modelling (Horner and Muray, 2003).

Location models previously developed a wide range of multi-purpose land use objectives to take into consideration, but ignore the impact of different land uses. Whereas this purpose, a number of functions play a major role in the selection of, for example, the minimum distance to a residential site and to benefit from the increase in value and as well as a proximity to a large shopping centre. Hence, in this model, two objectives are to evaluate alternative land use scenarios have been considered in the choice of: (1) the maximum of profit, and (2) to be the minimum distance between the inter-related functions (Dökmeci, et al 1993).

The first goal in the selection of an area of land use to do is to get the maximum profit. According to this purpose, the value of a plot of land in the surrounding environment due to the use of the land as it depends on the value of investments in the plot. For example, some of the other more suitable for the selection of land plots in residential, commercial and entertainment facilities of the place because they are more likely to. Therefore, this objective is being determined by the land use, so as to make maximum profit will be assigned based on the settlement.

Earlier (Alonso, 1964) and Mills (1972) studies, showed that a plot of land value changes according to the distance from the city centre. This assumption is valid for a single-centre city. However, the development of multi-centre cities, as a result of a plot of land in the vicinity of the city around the type of land use, these variables can affect more than the value of the land. For example, the value of a plot of land around the trade may vary according to whether residential or industrial. As a result, the structure of the city, urban functions arising in the competition for the selection of the most efficient in the use of land formed by the selection. Therefore, the purpose, the proceeds from a plot, it and the surrounding land to be a result of the interaction between land

use types have been formulated by the adoption. For example, the luxury residential as well as commercial area next to the park is located next to or higher than the rest of the district (Dökmeci, et al 1993).

On the other hand, creating some of the industry as well as environmental pollution, land use types have been caused a decrease in the relative values of the surrounding land. Therefore, the effect of any kind from the environment must be taken into consideration. Based on this purpose, the maximum was based on an investor's profit. This objective has been formulated as follows:

$$Max z = \sum_{i=1}^r \sum_{j=1}^r \frac{V_{ij}}{1 + d_{ij}^{\alpha}}$$

Z: The total revenue from land use in the region,
 V_{ij} : i and j are the interaction of land use types in terms of value,
 d_{ij}^{α} : the distance between i and j types of land use. α is taken as 2

As a secondary aim, functions as an important factor influencing land use decisions has been considered to be the minimum distance. In the city, more or less of each land use type has a link with the other. Thus, each unit of land use creates a harness around the relationships between units of transport. Thus, every unit is, relative to the location of each unit, so tightly bound to the other units. This is the minimum movement of goods and people between the units; the second purpose of this model is formulated as follows:

$$Min T = \sum_{i=1}^r \sum_{j=1}^r u_{ij} d_{ij} b_{ij}$$

Wherein,

T: total transport in the region,
 u_{ij} : transportation between units i and j, the amount of land use,
 b_{ij} : i and j $b_{ij} = 1$ if land use transport link between the units, or $b_{ij} = 0$

The choice of two very different purpose of land use, exposes two very different outcomes. For example, the use of land in a way that accessibility priority, residential areas gathered around and business centres and industry. If we choose to use the land in a way that the maximum gains, residential areas, gathered around commercial activities, parks and water elements. Therefore, the aim of balancing the conclusion that both arrive, a multi-purpose decision-making method is needed. This multi-use decision making method can be as follows:

$$E(a) = \sum_{k=1}^n u_k e_k(a)$$

Wherein,

$E(a)$: (a) the total activity of the alternative,

u_k : k coefficient indicating the importance of the purpose,

Additive (a): (a) the alternative of k according to the intended activity,

n: Number of goals

Indicating the importance of the objectives coefficients were determined by sensitivity analysis. Accordingly, the first goal and the second goal weight coefficient 0.25 and 0.75 respectively. These coefficients are within reach of the investments made and the different types of land use, value of time lost in traffic will vary depending on the time according to the coefficients. According to an alternative with the highest total efficiency of both purposes, is considered to be the best choice in the land use.

Alternative for Istanbul Sub-Centre Silivri:

A multi-purpose land use, site selection model applied to Silivri, the newly designated sub-Centre for Istanbul. Consists of housing development, including university-industry-trade areas, recent development plan are taken as reference. The main function is planned to be placed in 4 different areas of transportation and value for interaction was prepared for. University, Industry, Trade and residential areas were evaluated according to the model of the fourth alternative. 250 meters of grid is taken as basis for cell size, the proposed plan is 5 km wide on seaside. Average lot size in the region is from 225 to 275 meters.

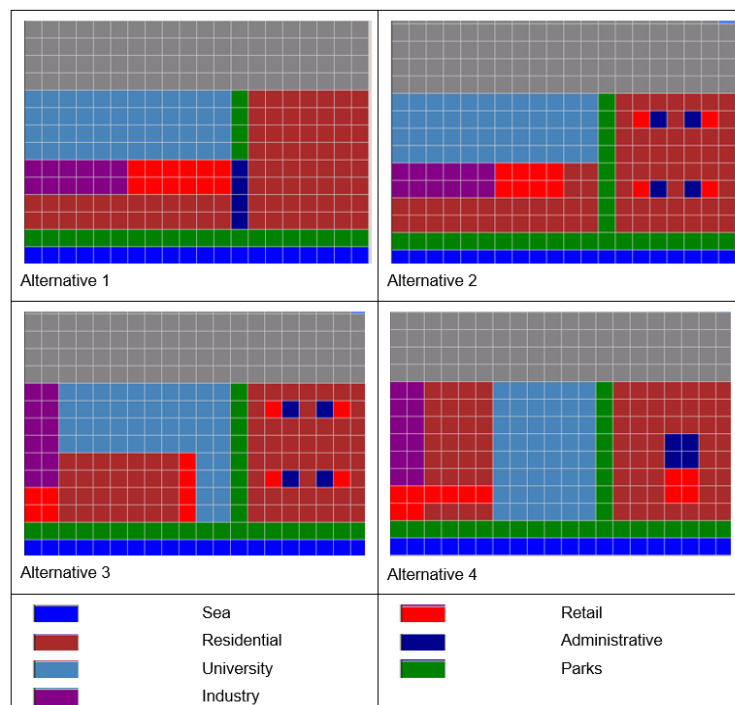


Figure 1. Different Land Use Model for Istanbul Silivri Sub-Centre



Table 1. The Amount of Transportation Between The Types Of Land Use Matrix (Arslanlı, 2016)

	Sea	Residential	University	Industry	Retail	Administrative	Parks
Sea	1	1	1	1	1	1	1
Residential	1	2	3	7	5	3	4
University	1	3	1	3	2	2	1
Industry	1	7	3	4	5	2	2
Retail	1	5	2	5	3	3	2
Administrative	1	3	2	2	3	2	1
Parks	1	4	1	2	2	1	1

Table 2. Value Interaction between Different Types of Land Use (Arslanlı, 2016)

	Sea	Residential	University	Industry	Retail	Administrative	Parks
Sea	0	10	10	10	10	10	10
Residential	0	5	3	10	2	6	8
University	0	3	5	1	6	5	7
Industry	0	-7	6	10	6	5	6
Retail	0	8	5	-1	10	8	7
Administrative	0	10	5	-3	8	10	8
Parks	0	8	6	3	6	6	10

Table 3. Total Values of Different Land use Alternatives (Arslanlı, 2016)

Land Use	1. Alternative	2. Alternative	3. Alternative	4. Alternative
Accessibility	0,0837	0,0819	0,0840	0,0847
Revenue	0,9990	0,9805	1,0932	1,1874
Total	1,0827	9,8870	1,1772	1,2721

Different from each other in different land use choices by considering four alternative land use evaluation method was developed and evaluated, and the results for each lot are given in Table 5. A single centre, two sub-centres and a large number of land use alternatives developed by the sub-centre activity was calculated. According to these results, based on the centre second and forth alternatives are higher than the current plan. Other second and third alternatives; expansion of trade, although with increased accessibility weakens the effect of the increase in value. In contrast, the effect of the increase in value as a single centre; decreased availability and are limited to only around the centre. Therefore, an alternative to the settlement with the two sub-centres, it can establish the best balance between the two objectives for the activity is the highest.

Although here, only two main objectives, land based location problems formulated, the purpose is based on the development of multi-criteria modelling. Balancing the conflicting interests of the various groups of land use objectives in the presence of solutions to the problem of selection, the goal is difficult as their numbers grow. For example, the slum transformation project varies according to each individual purpose. Decisions on this issue in accordance with the principles of democratic decision-making procedures are required to submit a multi-purpose (Ligtenberg et al., 2001). In this case, the model results, needs to be adapted according to other purposes.

Furthermore, we examine here only in models of land use, land use in the selection of the most efficient in order to meet the demand has been developed. However, nowadays, the choice of a town in the land use of a region, a country, or with the effect of globalization on the international level need to be determined in response to society needs. It will be for the creation of a new land use, as can be in the form of conversion of existing land use.

In addition, by evaluating alternative land uses; density, transportation, energy consumption and environmental pollution, on the one hand, increase better economic development, on the other hand site selection models are better for the development of sustainable land use patterns. At the same time, the decision of the density of residential, private and public facilities, schools, recreational facilities, fire brigade is also important for the determination of effective site selection. Over time, emerging technologies can be adapted to the requirements of land use systems have the flexibility to provide the efficient use of resources. Advances in transportation and communication; caused large-scale changes in the land use at the 19th century. In this context, developed 'smart growth' concept aims to reduce the negative impact of the spread of a city (Holcombe and Stanley, 2001), and a wide range of land use in the future will affect the choice of the cities.

However, the choice of land use patterns in the results of the decision-making process should be considered initially for solid economic fundamentals, and then fit the model taken into consideration social, political and other conditions should be adapted. Land use patterns in the selection of design, economic, sociological, and research and evaluation of the results of the traffic load as the subject of the proposed research to be conducted in the future.



Distribution of Population in Istanbul

One of the most important goals of planners is, taking into account the connection between the elements that make up the space within the city. Residential areas and business districts are considered as the most important elements that make up that structure (Özus, 2005).

There are a wide variety of variables that influence the choice of location of residential areas. Supply and demand for housing depends on the development of residential areas in the city (Green et al., 2005). Housing supply: is effected by, vacant land, land, and the price of housing, housing types, distance to work places, social facilities, socio-economic status, and the status of the buildings (Malpezzi & Mayo, 1997). Demographic and social characteristics of the population of a country are based on the demand for housing as well as economic factors. Variables related to the demand for housing, population growth, birth rate, marriage rate, age at marriage, family size, income, tax, interest rate, inflation rate, unemployment rate, (Arimah, 1992).

In order to predict future land use and density in a precise way, the past and the present land use and transportation system, depending on the density of the collected data must be evaluated. For the modelling of the whole urban area, each containing homogeneous function areas are divided into small areas, for example, residential, office, park, such as commercial and industrial areas. Therefore, the appropriate unit of area on the census can be considered as the basic units of the neighbourhood (Özus, 2005).

While there are many variables that influence the choice in residential areas, often models on this issue, using a small number of variables that have the greatest impact. Increase the cost of a very large number of variables, such as the use of the calculation process is also difficult. In this regard, based on the models of gravity theory, for a small number but they are formulated according to the data strongly preferred. Hansen is one of the models of this type of model. According to this model, the development of a residential unit, is inversely proportional to the distance from the business center, business center and the surrounding empty fields is proportional to the number of employees. The distance between the place of business of housing, especially in western countries, research, housing is emerging as an important factor in the choice of location (Levinson, 1997; Cervero, 2006).

Hansen Model formula given below:

$$G_j = G_t \left[\frac{L_j A_j}{\sum_{j=1}^n L_j A_j} \right]$$

wherein,

G_j: j district population to settle

G_t: City population growth

L_j: j district vacant land

A_j: Attractiveness Index

Of J Attractiveness index is formulated as follows.

$$A_j = \sum_{i=1}^n \frac{E_i}{D_{ij}^\lambda}$$

wherein,

E_j: j district, the number of employees

D_{ij} ^ λ: the distance between i and j districts

This model, as a result, increasing the population of the city districts that have empty fields, business opportunity, and how other districts will be divided according to the distance. Here the number of houses in general, can be calculated by dividing the number of households, the average number of population in the district. More specifically, the residential neighbourhoods to choose different types of families of different sizes for the calculation of the distribution must be taken into consideration, for example, unmarried and childless families, neighbourhoods close to the centre, garden houses or sites to choose the environment, such as families with children (Kim, Horner, & Marans, 2005) (Hoshino 2010). In addition, the income level of families to settle in the new districts and the distribution of both types of residential neighbourhoods, the distribution must be taken into consideration. Therefore, the demographic and socio-economic characteristics of families preferred neighbourhood characteristics are needed to be investigated (Dökmeci and Berköz, 2000).

The results obtained with the model of Hansen residential areas are in need of social, cultural, economic, and recreational areas can also be used in the planning. Establishment of new settlements and the growing population of the city of new centres to be built in these areas can lead to the restructuring of the business relationship of housing all over the city. This model could be run as sequentially until, residential and business areas



as a result of the implementation of certain land use change obtained.

In addition, the scope of the variables in this model can be expanded or different aspects can be addressed. For example, the space used to refer to the 'L' variable does not exist or is empty in less dense areas, the density to be increased at any time, the difference between the target density and current density can be expressed in the formula (Özus, 2005).

Model adjustment (calibration), coefficient α by giving different values, different times as a result of the model by comparing the value detection are carried out as the best expression of the real trend. The distance can be expressed as the Euclidian or time of commute (Özus, 2005). Generally, individuals seek a balance between the theoretical cost of land and transportation (Alonso, 1964). But the key to this, as well as other features that relatives and the social environment (Dökmeci and Berköz 2000), school quality, commercial facilities, green spaces, leisure facilities, prestige zones (such as Baghdad street) and revitalization projects (in Beyoğlu etc.) may influence the choice of residential location.

Population Distribution Model

TURKSTAT employment data is used in the model for 32 district of Istanbul. Recently Istanbul districts changed to 39 with 7 newly established administrative units. Due to the data constraints previous 32 districts date employed. Assumed to be 3 million people added to the population and employment in the total population of 15 million will be allocated according to Istanbul (Table 1). Districts with more free space available in the European side are one of the most highly populated districts. Küçükçekmece the second largest free space (14.4%), and the third largest in the labour force (6.39%) will have the highest population (26.56%). In the meantime, Eyüp, both empty fields (2.19%) as well as labour force (1.76%), the second largest population group, although more (24.54%) allowed to produce its own due to its central location. Eyüp district to the free space (2.4%) as well as labour force (3.8%) due to its central location, although it is less than the third largest population group (12.12%) will attract. Nevertheless, the Silivri district of Istanbul, the largest free space (38.5%), although with the lack of employment opportunities (1.0%) due to its distance from the city centre much less population (2.77%) be allowed to produce its own.

Table 4. Population of Istanbul Districts (Arslanlı, 2016)

Districts	Population	Model Population	Employment	Empty Land Ha
AVCILAR	97904	421924	33252	676
BAKIRKÖY	89446	374367	57647	113
BAĞCILAR	23255	792727	69625	21
BAHÇELİEVLER	33207	681592	78109	35
BAYRAMPAŞA	52023	380290	52786	35
BEŞİKTAŞ	16812	268881	76277	14
BEYKOZ	4490	287760	18547	36
BEYOĞLU	17741	341868	69480	10
EMİNÖNÜ	5363	80598	107345	3
EYÜP	736340	1073726	33474	375
FATİH	17447	561225	44582	15
GAZİOSMANPAŞA	363750	1285327	73323	423
GÜNGÖREN	65917	441104	83251	35
KADIKÖY	19942	931597	136278	55
KAĞITHANE	27615	494481	65421	33
KARTAL	46201	504486	62108	305
KÜÇÜKÇEKMECE	797083	1610095	121556	2466
MALTEPE	98287	560426	42188	537
PENDİK	24282	570146	49878	180
SARIYER	11924	336615	13749	69
ŞİŞLİ	31730	405715	177858	35
TUZLA	105782	244623	39472	1450
ÜMRANİYE	5940	617775	81128	158
ÜSKÜDAR	28679	713714	55210	27
ZEYTİNBURNU	13924	345024	84524	25
ESENLER	38350	635895	30857	36
SULTANBEYLİ	6921	248604	12442	78
BÜYÜKÇEKMECE	112741	192423	86604	2168
ŞİLE	802	36739	1775	75
SİLİVRİ	83227	166054	19506	6581
ÇATALCA	22877	58595	21163	913
Total	3000000	15664396	1899400	17067

The model considered to have a more balanced distribution on the Anatolian side. Tuzla (3.52%) and the Maltepe (3.27%) counties circles break, even if a higher proportion of the population, ranking sixth and seventh are required on the

European side. Üsküdar and the effect of the precedent raised to increase the space and tries to give the new sub-centre.

As a result, this model calculates empty areas in the districts, the potential labour force, and taking into account the distances to the centre of Istanbul's growing population. Among them, particularly, Küçükçekmece, Eyüp and Gaziosmanpaşa have great potential in the future development of the districts. Then the model reveals their potential for transformation in slum areas. Therefore, the model results, investors, planners and managers of great importance for the city and the region.

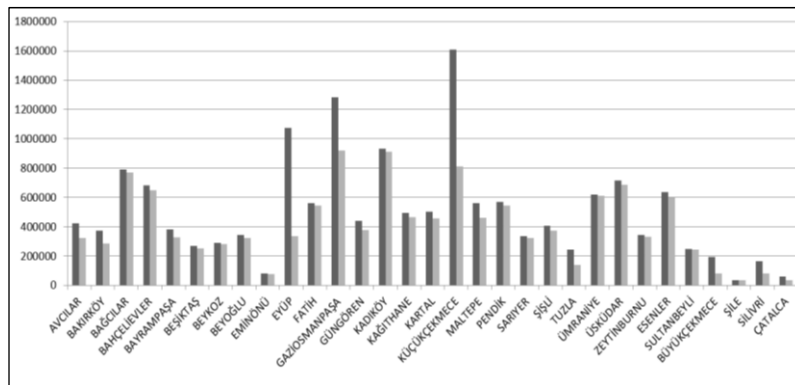


Figure 2. Model Projection and Actual Population in Istanbul

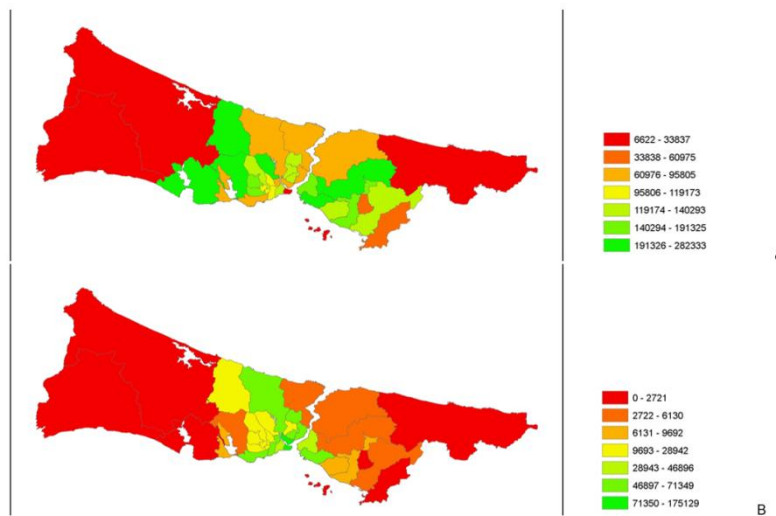


Figure 3. A-Actual Population of Districts, B-Distribution of Population according to Model in Istanbul

CONCLUSIONS AND RECOMMENDATIONS

Istanbul, population and income growth, the service sector, based in the city's development as a result of advances in transportation and telecommunications, the restructuring of the city, and this encourages residential, commercial and office create opportunities for investments Land use decision-making process is a very complex includes site selection. Estimates of population growth, starting from the development potential on

the one hand, depending on the location of the settlements, and the physical, socio-economic, legal and political characteristics of the functional needs of the city overlaps with each other to create the most effective form is required.

Hansen Model applied to Istanbul districts and increasing the distribution of the population of 3 million were calculated. Küçükçekmece district attracts largest population due to its workforce and empty land. Eyup and Gaziosmanpaşa become second and third, although have small empty land and business areas because of closeness to the center. However, with the most available space Silivri, labour, and far from the center because of the potential to be less able to attract population. On the Asian side, in order to create a new sub-centers, Ümraniye and Atasehir population increased.

Multi-purpose land use, site selection model, applied to a portion of the of Silivri district. Developed four different alternative land use. These alternatives are developed, one in the center, the two sub-center and calculated in two different activities according to the purpose of each alternative. As results being evaluated, including two sub-center was the highest efficiency alternative. single center alternative is not satisfactory in terms of accessibility. Thus, settlement plan with two sub-center has a satisfactory result in terms of both purposes.

In studied together these models can be used to complete each other. At the same time, it is possible to use these models as a dynamic, new development areas designated for the city-wide appeal to all business centers, taking into account new population density of each sub-region, centers and essential services, and this process can be calculated as a result of any change. Thus, when the size of a city-wide alternative settlement proposals, taking into account all the most effective results can be achieved as a result of the evaluation.

In addition, the sub-centers produced a gradual effect of the interaction and the environment as a result of a lot of alternatives for the purpose of evaluating the size of the new centers and, instead, may be decided taking into account the dimension of time. Thus, the development of the whole city and the economic development of the system to provide the most effective when planned. By investing just as it is today, at certain points, and the creation of high-quality urban services bringing the speculation, raising the quality of life of city-wide, but can provide a healthy socio-economic development.

Furthermore, we examine here only in models of land use, land use in the selection of the most efficient in order to meet the demand has been developed. However, nowadays, the choice of a

town in the land use of a region, a country, or with the effect of globalization on the international level need to be determined in response to a need. It will be for the creation of a new space, as can be in the form of conversion of existing space.

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Resume

Dr. Kerem Yavuz ARSLANLI is currently employed at Istanbul Technical University Institute of Social Sciences. He has been worked at ITU Urban and Environmental Planning and Research Center 2002-2012. His PhD titled "Spatially Autoregressive House Price Index Model for Istanbul Metropolitan Area" won AREUEA 2009 Doctoral Session Grant. He worked at University of Alicante Institute of International Economics in 2010 and Cass Business School Dept. of Finance in 2011. After completion of his PhD, he has started to give lectures, "Real Estate Finance" and "Urban Transformations and Real Estate Sector", at I.T.U. Real Estate Development Master Programme. He has academic articles in international/national journals and several conference papers in international conferences. He has been a member of the board of directors of the European Real Estate Society (ERES) and President 2016-17, the leading real estate research and education organisation in Europe. (www.eres.org)