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A MODEL SUGGESTION FOR OBTAINING THE IDEAL URBAN TRANSFORMATION SYSTEM IN THE LIGHT OF DENSITY AND POPULATION PARAMETERS AND KEMALPASA AREA SAMPLE

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ABSTRACT

Especially after the August 17, 1999 Great Marmara Earthquake, urban transformation / renewal; has occupied the place in the country's agenda frequently. It has been one of the most important issues on which is being worked to minimize the effects/the hazards that the new possible earthquake causes. To define this issue, sometimes only earthquake is considered. Now and then the planning, the architectural ideas, engineering parameters, environmental impacts are gathering together in broader perspective to describe urban renewal.

The aim of this article is to describe interactive relations of 'density' and 'population' parameters for the reports of the master plan for urban areas. To reach the ideal model of urban transformation/renewal, two different software programs have been utilized.

At this stage in Province of Istanbul, Bagcilar district, Kemalpasa quarter which has been approved as ‘risky area’ with 6306 law that has been affirmed with number 2013/4689 by the Council of Ministers is taken as a model of comparison which has been idealized. This risky area consists of 11 city blocks, 219 parcels, 4,6 hectare with current population of 1400 people.

To determine the limit of the ideal model values, the example of Western countries, standards and norms have been researched. In this study; density within the regional plans of the area, motion within the population are explained by making the classification as part of town planning. Also some other examples in Turkey, especially in residential areas which has a grand amount of density have been gathered together to discuss the matter of ideal model of urban transformation/renewal.

Keywords: Urban transformation/renewal, ideal density, population

INTRODUCTION

According to Aristotle existing is “essence to reach its own form”. Surely all existence thought is a trend in this direction. By renovation meant essence is not to be destroyed substantially. Unlike that of, renovation is developing a sustainable study in the light of social, cultural, environmental impacts and civilization criteria. Urban renewal is a term of transforming to apprehend its own form without losing the main base with an appropriate manner of historical-cultural heritage.

In Turkey transformation concept had started to be argued with the Law of Slum Houses (Law No. 775) in 1966 (published in the Official Gazette of 20.7.1966, no.12362) and continued to be as a small footnote in the laws. It renovated repeatedly over the years with regulations and has received more and more within the laws. Ultimately, the Law of Transformation of Areas under the Disaster Risks (Law No. 6306) entered into force in 2012 (published in the Official Gazette of 31.5.2012, no.28309). The only issue of that Law was urban transformation which

handles renovation bases, mostly working on individual risky buildings, some residential areas under the risk and reserved areas. The scope of the law is to determine the procedures and principles regarding the rehabilitation, clearance, and renovations of areas and buildings under the earthquake risk in accordance with relevant standards with a view to creating healthy and safe living environment. That law was criticized for being motivated only by the earthquake. Despite that, in 2015 based on the results of a face to face survey study [1] conducted on the basis of disaster risk, with 2503 respondents live in Istanbul there has been a social consensus towards the necessity of urban transformation.

After the entry of Law and Implementation Regulation in question into force, urban transformation studies have accelerated and tried to weave itself around many other problems, have been looking for new ways and ideas of the ideal renovation discussed how it might be. Main issue that needs to be searched and answered is thought to be as follows:

- How to do urban transformation/renewal?
- What should be the main determinant in transformation/renewal?
- With which mathematic method should be established to achieve the best results by gathering together seismicity, planning principles, livable environment, urban, social, technical infrastructure and transport instruments.

All of these questions and the answers given will be the base to the creation of the ideal form that reaches to the integrative structure. 'Density' and 'population' parameters are two major carriers try to give an answer to the question, in order to obtain ideal urban transformation system with which calculation method and how to establish a model.

In this context; the model study is attempted for Kemalpaşa quarter which is declared as risky area by the council of ministers in the frame of Law No. 6306 with 2013/4686 decision number [2]. This area is 4,6 hectare in Istanbul city, Bagcilar district, including 11 building islands, 219 parcels with 1400 inhabitants. Based on the regional data, by utilizing 2 different software programs the area has been analyzed.

The upper group of the model is divided into four:

1. Urban areas, open spaces, infrastructure and transportation
2. Zoning
3. Cost
4. Seismicity

To achieve the said ideal model, calculations are made with 865 data and parameters taking into account planning, engineering and other disciplines associated with them and established mathematical model.
Two states for the model are discussed:
According to the first state; an ‘Ideal Urban Transformation Model’ (IUTM) is obtained in accordance with present data and ideal parameters. For this situation feasibility studies in the field should be completed and done the limit values set (Figure 1).
According to the second condition; the actual purpose of the calculation is to create a prediction of renewal needed area without studies in the field, only with 'project area' and 'population' data and determining the ideal limit values can be obtained a Relatively Ideal Urban Transformation Model (Figure 2).

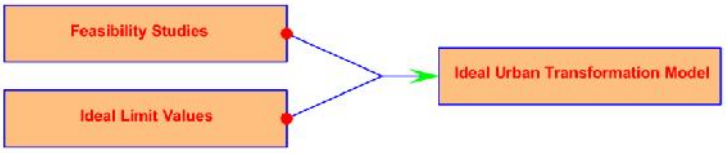

Figure 1. IUTM

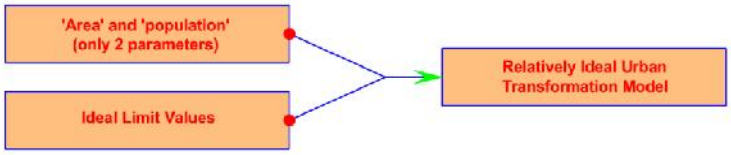

Figure 2. Relatively IUTM

Considering the sum of all 865 data, parameters and values would be more extensive than an article includes. That is why ‘density’ and ‘population’ parameters which belong to first upper group of the model which is; Urban areas, open spaces, infrastructure and transportation, have been studied with effects and interaction with other components in IUTM.

In particular, ‘density’ and the limit values of the model are investigated to be able to define ideal system in the light of the urban renewal examples in European countries and in Turkey, by bringing together the standards and norms set by the local governments.

DENSITY AND POPULATION

In urban transformation / renovation studies, ‘density’ and ‘population’ are the main components of the interaction with other data belonging to the master plan subjects.

Density*

According to planning principles, density contains two different types. One of them is ‘gross density’ taking into account the entire urbanized area which includes improvement lands, public improvements, technical infrastructures and transportation. The other one is ‘net density’ which consists of the settlements of the improvement lands. Gross density is the subject for City Master Plan and development plans obtain net density as a subject.

Gross density, in the master plan, the number of persons per hectare of zoning area. The zoning area is the sum of improvement lands, urban open spaces, social - technical infrastructures and transportation network.

The net density; is obtained by dividing the number of people living on a particular island to the area from middle of the roads surrounding the island.

Population Density in European Countries

Density definition in European countries is described as ‘optimum’, ‘maximum, 'non-economic' and 'uninhabitable’ (Table 1). As will be stated in the later phases of this article, the assumption of optimum gross density value 250 persons/hectare is thought to be far from exhibiting an inclusive and holistic approach. Because the density values in this table does not define a specific area. On the contrary, it reveals a more general approach to the pretty extensive planning area. Especially in large metropolitan areas; renovation with the optimum density level, as seen in Table 1, is thought to arise the problem of removal majority of the present population from the project area.

Density Definition	Gross Density (persons/hectare)
Optimum	250
Maximum	300
Non-economic	350
Uninhabitable	400

Table 1. Density definition of European countries in residential areas [5]

* In this article, unless otherwise specified 'density' is to be understood as 'gross density'

According to the current density statements prepared by the local authorities in the UK, generally gross density is 116 people / hectares at single-storey residential zone, 260 persons/hectare at low-rise housing zone, 520 persons/hectare at high rise (5storeys and more, 13 storey of average) housing zone. Density 520 persons/hectare of high density regions are London, Manchester, Cambridge, Oxford and Southampton [8].

The density is suggested as 450 persons/hectare for the dwelling settlements of 4000 inhabitants. At the center of some cities like; Rome, Milan, Bologna high density standards are in the ascendants [9]. In Scotland it is recommended to be 74 person/hectare at the detached houses zone and 371 persons/hectare at the multi storey building zone [10].

Density (person/hectare)		
USA	England	Italy
544 [7]	520 [8]	450 [9]

Table 2. Average density values of housing areas in some countries

(Values in a table are arranged and compiled by the author.)

Gross density has been implemented in a wide range as shown in Table 3, at urban transformation / renewal studies which has been applied in Europe. Density of Farum Midpunkt (Farum, Denmark) and Bellefontaine (Toulouse - Le-Mirail) is evaluated as 'low / medium density', and Pollards Hill (Mitcham, Surrey), Byker (Newcastle upon Tyne) and Thamesmead (1 Stage, London) is ‘medium density’. Aulnay 3000 (in Aulnay-sous-Bois, St. Denis) is formed in the class of medium / high density with 5 and 14 storey building types.Alsen Road (Islington, London) and North Peck ham (Southward, London) urban renewal applications are in 'high density' category and they are located by the dominant format of a typical cluster structures.Stockwell (Lambeth, London) is in a ‘very high density' class because in the zone there are 110 houses per hectares.

Country	**Zone**	**Year**	**Density**
Denmark	Farum Midpunkt, Farum	1969	135
France	Bellefontaine, Toulouse - Le-Mirail	1960	175
England	Pollards Hill, Mitcham, Surrey	1967	211
England	Byker, New Castle Upon Tyne	1968	237
England	Thamesmead (1. Stage), London	1963	261
France	Aulnay 3000, Aulnay-sous-Bois, St. Denis	1965	310
England	Alsen Road, Islington, London	1970	340
England	North Peckham, Southwark, London	1966	350
England	Stockwell, Lambeth, London	1968/69	385

Table 3. Density values in some European urban renewal projects [11]

Population Density in Turkey

There is similarity about ‘medium density’ value between Table 4 by Environment and Urban Planning Ministry of Turkey and Table 3 density values in some European urban renewal projects. However, Table 2 shows that the major metropolitan cities of the Western countries are expressed with a higher density criteria.

Spatial Planning and Building Rules which is in force in Turkey since 06/14/2014 offers some density ranges (low, medium, high, very high) but is thought to be insufficient in terms of comprehensiveness and applicability. In particular, any transformation to be made for dense areas of three major cities of Turkey; Istanbul, Ankara, İzmir with different density values,

causes very different results, including population. At this point, adapting the range of density criteria set by the regulations to the big cities need to be revised.

Residential Areas		
Present Residential Areas (gross density)	Very high	over 600 persons/hectare
	High	301-600 persons/hectare
	Medium	151-300 persons/hectare
	Low	51-150 persons/hectare
	Very Low	under 50 persons/hectare

Table 4. Gross density values in residential areas [12]

In Table 5; average value of the current density of some risky areas declared under the law number 6306 is 477.65 persons/ hectare and according to the values of Table 4 it is in the 'high density' class. In fact Esenler Oruc Reis neighborhood density value of 1097.93 persons/hectare and Zeytinburnu Sümer neighborhood density of 919.47 persons/hectare are in ‘very high density’ classification.

In residential areas, when interval of ‘medium density (151-300 persons/hectare)’ by Environment and Urban Planning Ministry of Turkey and in western countries ‘optimum density’ are thought to be matched, in particular planning Istanbul such a mega-city based on optimum-medium density value would create challenges about specifying population, housing area per person, floor area ratio and costs. Moreover, to be held urban renewal / renovation in the big city acquiring ‘medium density’ will make impossible to maintain the present public of the zone, there would be an obligation taken out of the local population.

District	**Zone**	**Population (person)**	**Area (hectare)**	**Density (persons/hectare)**
Bayrampaşa	Vatan Mah.	10.700	22,60	473,45
Beyoğlu	Örnektepe Sütlüce Mah.	1.200	2,50	480,00
Beyoğlu	Hacı Hüsrev Mah.	2.460	8,80	279,55
Esenler	Çiftehavuzlar ve Oruç Reis Mah.	4.888	12,94	377,74
Esenler	Havaalanı ve Tuna Mah.	5.430	9,70	559,79
Esenler	Oruç Reis Mah.	7.960	7,25	1097,93
Güngören	Tozkoparan Mah.	16.389	57,70	284,04
Kadıköy	Fikirtepe Bölgesi	40.000	134,00	298,51
Sarıyer	Derbent Mah.	7.920	28,19	280,95
Sultangazi	Cumhuriyet Mah.	3.750	18,50	202,70
Zeytinburnu	Sümer Mah.	3.494	3,80	919,47
			Average Density	**477,65**

Table 5. Current density of some risky areas declared under the law number 6306 in Istanbul[13]

(Values are taken from Environment and Urban Planning Ministry of Turkey and compiled by the author.)

As seen in Table 6; in general, settlements of Ankara which is a large city like Istanbul remain in high density class.

Quarter	Gross density (persons/hectare)
Aydınlık	267
Cebeci	351
Çankaya	293
Demetevler	387
Emek	314
Etlik	314
İlbank	302
İsrail Evleri	301
Küçük Esat	332
Mesa Sitesi	343
Örnek	295
Yıldız Evleri	290
Yukarı Ayrancı	347
Yüksel Sitesi	342
Average	**319,86**

Table 6. Density of some quarters of Ankara city [14]
(Values are taken from Environment and Urban Planning Ministry of Turkey and compiled by the author.)

IDEAL DENSITY and IDEAL POPULATION

The ideal density' term could be interpreted in a very wide range. Density value based on planning criteria is quite different from each other when the conditions of the region and the general characteristics of the planning area, the need for accessibility, sustainability and environmental effects are taken into account.

Idealized density is one of the factors playing the most active role in determining the future of the project area. Therefore, to idealize the density of an area, should be done a wide range of feasibility studies to make decisions on a large scale for the future population of area. In high-density areas transformation/renewal should be based on preservation of the current population on the provision of minimum density value. Thus, it is thought to prevent the migration of getting more capacity by maintaining the local characteristics of the area.

There is obvious fact that the areas under urban transformation/renewal are quite on top of their capacity of the density. When carried out urban renewal studies are analyzed at the project stage, the regions with high density by increasing the number of housing and building height are observed that evolved to a higher density. Therefore it is necessary to make decisions not to increase the population of the areas which have already reached the saturation point in terms of density.

In order to obtain IUTM, particularly the optimum density and many data with parameters simultaneously should be idealized and limited to the implementation of the appropriate renewal system. Ideal density, the most important of these parameters should be considered very carefully before embarking on a renovation work. Because ideal density is a precursor of all the other instruments which are necessary for transformation as a determinant of the ideal population of the area.

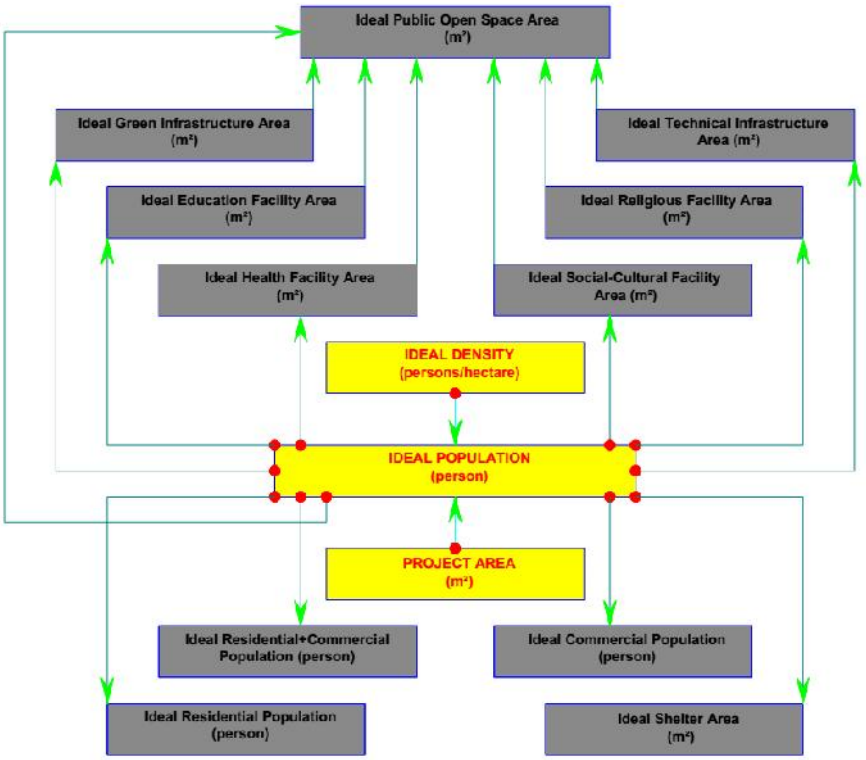

Figure 3. Interaction of ideal density and population

As seen in Figure 3. Interaction scheme of ideal density and population; constant project area and ideal density are the main determining factors of ideal population. The ideal population parameter plays an important role to obtain 'ideal residential population', 'ideal commercial population', 'ideal residential+commercial population', 'ideal shelter area', 'ideal green infrastructure area', 'ideal technical infrastructure area', 'ideal education facility area', 'ideal religious facility area', 'ideal health facility area', 'ideal social-cultural facility area' and 'ideal public open space area'. Besides the secondary effects of density and population parameters are transport network and land usage. Depending on relationship between transportation network which is an essential element of accessibility in urban areas and land usage, affects the economic and social life in large cities, has an active role to settle the kind of land use [15].

In the light of all of these standards, norms and works, specifying an absolute value of ideal density considered to be difficult for Turkey which country has major boundaries on a widespread scale, inter-regional population differences, house units per hectare, etc.

IUTM working areas which are very dense regions in context of the population and housing are in mega-cities. Therefore an ideal density value shall be chosen without departing outside of eligibility criteria in future planning of the project area.

Project area (hectare) x Ideal density (persons/hectare) = Ideal population (person) … (1)

As can be seen equation (1), in order to find ideal urban transformation system to be limited parameter is 'ideal population'. 'Ideal Population Limited Value' should be limited to no larger than 1,5 times of current population. By that the demographic structure shall be preserved.

Ideal population (person) ≤ Current population x 1,5 … (2)

Restricted 'ideal population' in Equal 2 helps to shed light on determination of value of the 'ideal density' parameter. The density whether selected ideal depends on all of the other restricted parameters. Also; selected density must be pulled down to the lowest value in which compatibility with other variables. Forasmuch such a limitation must be placed as a condition not to degradation of demographic structure.

In Istanbul; as a result of the Fener-Balat zone renewal project which consisting 59 islands and 909 parcels of 279,345.91 m² area, after preliminary design in 2010, 25% population left the region [16].

After the transformation of an area, 25% of the current population in the area is considered to move out for various reasons. Therefore, the 'ideal population' is thought to be up to 1.5 times of the current population of the area to prevent major changes in demographic structure after completion of the renewal.

Model Application in the Project Area: Kemalpaşa

In the light of described all the data above, the ideal model exemplified by using regional data of Kemalpaşa quarter which is in province of Istanbul, Bagcilar district, declared as risky area which consists of 11 city blocks, 219 parcels, 4,6 hectares with current population of 1400 people within the framework of Law of Transformation of Areas under the Disaster Risks (Law No. 6306) by 2013/4689 Council of Ministers decision [17].

Figure 4. Bagcilar district, Kemalpaşa quarter, transformation area (2014)

The project area covers the parcels which are bounded by O-3 the north highway, Namık Kemal Avenue in the east, 2nd street in the northwest, 25th street in the east, 25/1 street in southeast (Figure 4). The area in general has slum characteristic, is unplanned and constructed illegally (Figure 5).

a) b)

Figure 5. Views from risky area[18]

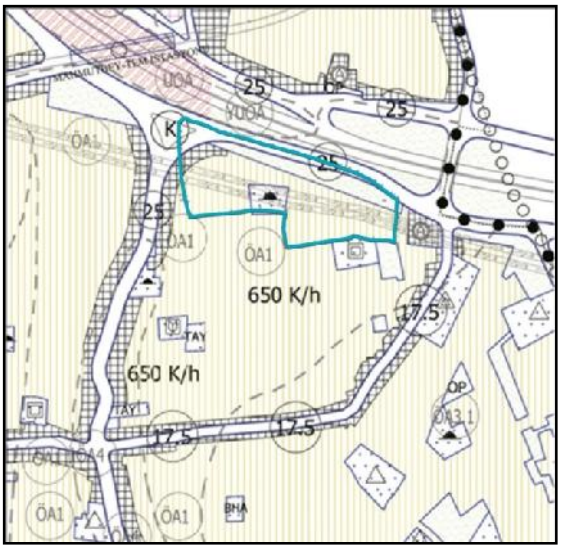

Figure 6. 1:5000 Master Plan of Kemalpaşa risky area [19]

According to 1:5000 Master Plan of Bagcilar district (Figure 6) the density of the project area is planned 650 (persons / hectare), and that value is in very high density (over 600 persons/ hectare) class (Table 4).
Current population: 1400 person
Project area: 46.139,00 m² = 4,6139 hectare
To obtain current density of an area by Equation 3;
Current population (person) / Project area (hectare) = Current Density (persons/hectare) … (3)
1400 (person) / 4,6139 (hectare) = 303, 43 ≈ 303 (persons/hectare)
In particular in Istanbul the result of low density (303,43 ≈ 303 persons/hectare) does not mean ideal density for the project area. On the contrary it is due to the increased number of low-rise slum structures, empty parcels and unplanned urbanization (Figure 7 and 8 - Table 7 and 8).

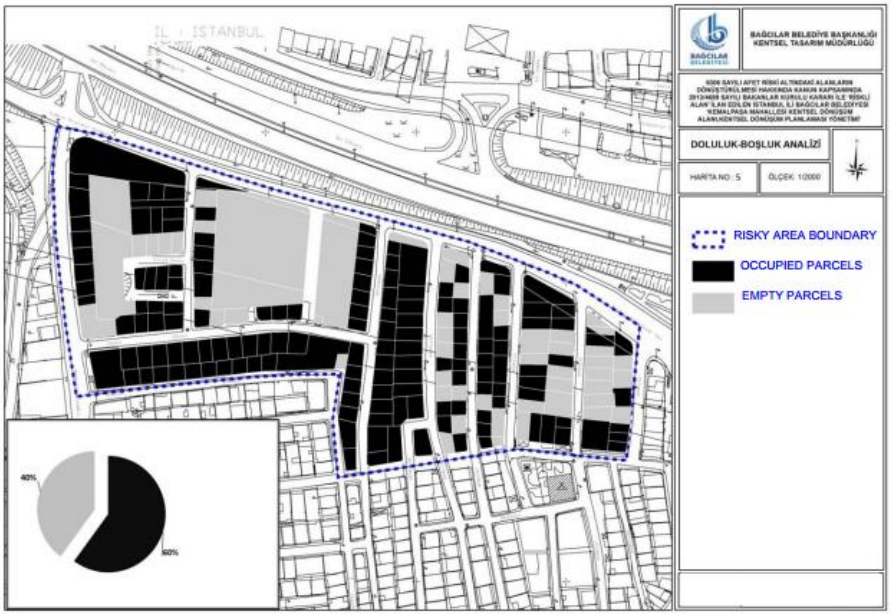

Figure 7. Kemalpaşa risky area empty/occupied parcels rate

	Quantity	**Rate**
Occupied parcel	163	74,43%
Empty Parcel	56	25,57%
Total Parcels	**219**	

Table 7. Kemalpaşa risky area quantity of emptyand occupied parcels

(Values are taken from Bagcilar Municipality and compiled by the author.)

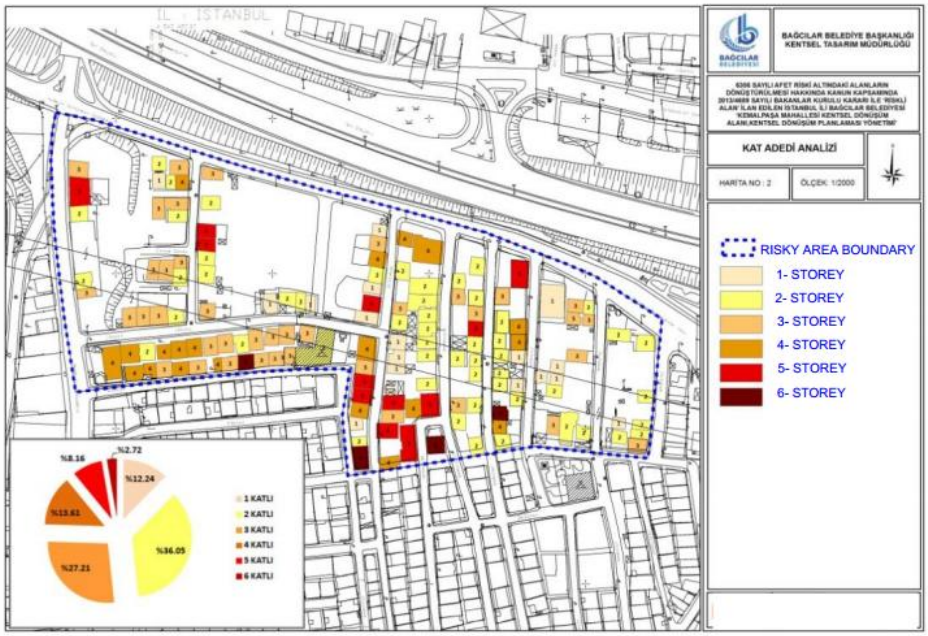

Figure 8. Kemalpaşa risky area storey analyses

Storey	Quantity
1 storey	18
2 storey	53
3 storey	40
4 storey	20
5 storey	12
6 storey	4
Total	**147**

Table 8. Kemalpaşa risky area number of storey

(Values are taken from Bagcilar Municipality and compiled by the author.)

As a chosen density value 310 persons/hectare, according to Table 4 gross density values in residential areas by Environment and Urban Planning Ministry of Turkey, is in high density class. However the said value appears to be a little above of medium density level. So, selected ideal density value (310 persons/hectare) for IUTM is considered to be 'low density level' for Istanbul city.

To get 'ideal population' by Equation 1:

4,6139 hectare x 310 persons/hectare = 1430 person

When the obtained ideal population value integrated to equation 2 calculation:

1430 (person) ≤ 1400 x 1,5 = 2100 (person) is found as limited value of the population and 1430 number of population is shown to be in limitation.

According to the calculation method to preserve the demographic structure of the studied region:

1400 person x 1,5 = 2100 person (ideal population value limit)

1400 person x 25%= 350 person (number of carried out from the project area)

Number of persons remain from current population

1400 – 350 = 1100 person

Maximum number of new acceptable persons:

2100 - 1100 = 1000 person

To preservethe demographic structure the equal of limit value provides:

Number of persons remain from current population > Maximum number of new acceptable persons

1100 > 1000

Also; although there is no precise value for determining the ideal density, highest and lowest values are available.

For IUTM if selected ideal population is osculated to the ideal population limit value by Equation 4:

Ideal population (person) / Project area (hectare) = Ideal density (persons/hectare) … (4)

2100 (person) / 4,6139 (hectare) = 455, 15 ≈ 455 (persons/hectare)

Despite that; necessary to idealize all the data that matters in IUTM, the best approach to determine ideal density within the limit values is considered to choose the minimum value taking into account all interaction components' circumstances and the region's living standards. Perchance using the density value of master plan that improved by Bagcilar Municipality in Equation 1:

4,6139 (hectare) x 650 (persons/hectare) = 2999 person

In addition, the population is found over the limited value by the Equation 2.

2999 person ≥ 1400 x 1.5 = 2100

Number of new acceptable persons is found:

2999 - 1100 = 1899 person

As a result of all these calculations, to preserve the demographic structure:

Number of persons remain from current population > Maximum number of new acceptable persons

1100<1899

Obtained population value of master plan (1899 person) is not taking a place of limits (1100 person).

CONCLUSION

The ideal population and ideal density are two key parameters to obtain Ideal Urban Transformation Model System. The term of density in Western countries, especially in view of the huge metropolises is known to be similar to those megacities in Turkey. Fundamentally density proximity of West's major metropolitan areas and Istanbul's residential areas, unfortunately, does not mean that planning, infrastructure, public open spaces of Istanbul city are similar to theirs. When focused on the main determinants such as the green area per capita, health care facilities, education facilities, it is difficult to say the big cities of Europe they achieved certain standards and in this regard Istanbul is considered to have similar standards. In this context; the ideal density and the ideal population affect aforementioned social and technical infrastructure is shown in Figure 2 calculation algorithm.

In this article, to exemplify the IUTM, in Province of Istanbul, Bagcilar district, Kemalpasa quarter which has been approved as 'risky area' with 6306 Law that has been affirmed with number 2013/4689 by the Council of Ministers is taken as a model. Current population of the 4,6 hectare area is 1400, density is 303 persons/hectare. If the density value stated in the Master Plan of the area is taken as 650 (persons/hectare) for calculations the future population is considered to be 2999 people and that makes the region eligible to have more and more habitants. High number of new population in the project area would make the density much higher than the current situation and damage the region's demography character. In this context; the ideal population should be limited. In IUTM restricted density, based on limited population value, calculated as 455 persons/hectare and ss a result of the calculation ideal population is limited to 2100 people. However, considering all other parameters that directly affect the density value; the standard of values and norms, ideal density selected as 310 persons/hectare which is within the range of the limited values in the project area and estimate the ideal population as 1430 people (Table 9).

	Density (persons/hectare)	Population (persons)
Current	303	1400
Master plan	650	2999
Ideally maximum	455	2100
Ideally selected	**310**	**1430**

Table 9. Kemalpaşa risky area population and density calculations

As a result; being provided in low and medium density ranges shown in Table 4 by Environment and Urban Planning Ministry of Turkey is seen to be impossible especially in Istanbul districts which have already reached the enormous size of population and from earthquake perspective urban transformation/renewal most needed areas such Bağcılar, Esenler Gaziosmanpaşa, Güngören, Sultanbeyli, Sultangazi, Sancaktepe, Ümraniye, Zeytinburnu. In order to achieve the level of optimum density could be considered as medium density based on Table 4; even not possible providing appropriate infrastructure that serves the current population of the area, increasing the density and population should not be in question. Accordingly, the range of density criteria set by the regulations must be revised for metropolises which have unplanned and illegal construction a lot like Istanbul.

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