Int. J. Adv. Eng. Pure Sci. 2023, 35(3): 297-311
DOI: 10.7240/jeps.1234574

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

Creating City Based Zoning Plans with Game Theory Approach, Example of 1000 Plans

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Abstract
Zoning plans are the formation of rules that will regulate all kinds of needs of a group of people living on a certain piece of land. While the plans are being formed, they are in a flow from the development plans to the latest implementation plans in the hierarchy from the top to the bottom scale. Subsequently, a zoning application is made in the area determined depending on the population density. In this application, various zoning parameters are formed in accordance with a certain rule. It meets the needs of people by creating a subject, trade, official institution or many social reinforcement areas. It is created for this purpose in plans of 1000 called applications. It is created by making use of approaches such as game theory. Game theory is the task of determining the best strategy within the framework of the rules in an application that is considered a certain game. In planning, it will be possible to determine the formation of the best housing, commercial or social facilities and the determination of development areas with area-based correlation within the planning rules, with game theory. As a game theory element, it was tried to explain how to create the best open application development plan with the integral function of population, population growth amount, area-based surface area amounts according to plan definitions. The study area was about how to examine the parts of an application or revised zoning plan with game theory based on the city-based Elazığ.
Keywords: City Development plan, Game Theory, 1000's plan, Plan Elements, Use of Defined Integral.

Öz
İmar planları belli bir kara parçası üzerinde yaşayan insan grubunun her türlü ihtiyacını düzenleyecek kuralların oluşumudur. Planlar oluşurken üstten alt ölçeğe doğru olan hiyerarşide kalkınma planlarından en son uygulama planlarına kadar bir akış içerisindedir. Bundan mütevellit nüfus yoğunluğuna bağlı olarak belirlenen alanda imar uygulaması yapılır. Bu uygulamada çeşitli imar parametreleri belli bir kural bütününde hareketle oluşur. Konut, ticaret, resmi kurum ya da birçok sosyal donatı alanı meydana getirilerek insanların gereksinimini karşılar. Uygulama denilen 1000'lik planlarda bu amaçla oluşturulur. Oluşturulurken oyun teorisi gibi yaklaşımlardan yararlanılarak meydana getirilir. Oyun teorisi, belli bir oyun olarak değerlendirilen bir uygulamada kurallar çerçevesinde en iyi stratejiyi belirleme işidir. Planlama da ise plancılık kuralları içerisinde alan bazlı korelasyon ile en iyi konut, ticari ya da sosyal donatıların oluşumu, gelişim alanlarının tayinini belirlemek oyun teorisi ile mümkün olacaktır. Oyun teorisi öğe olarak nüfus, nüfus artış miktarı, plan tanımlarına göre alan bazlı yüz ölçüm miktarları tanımlı integral fonksiyonu ile en iyi gelişime açık uygulama imar planı nasıl oluşacağı açıklanmaya çalışıldı. Çalışma alanı şehir bazlı olarak Elazığ kapsamında baz alınarak oyun teorisi ile bir uygulama ya da revize imar planı kısımlarının nasıl irdeleneceği hakkında olmuştur.
Anahtar Kelimeler: Şehir İmar planı, Oyun Teorisi, 1000'lik plan, Plan Öğeleri, Tanımlı İntegral Kullanımı.

I. INTRODUCTION

Zoning plans are generally the arrangements that enable the functional use of a certain land, make evaluations in terms of population, and help to take steps for a regular and healthy urbanization in the future. Although the zoning plans are made specific to a certain land, in fact, a model is drawn from a land for the whole city to be healthy and prosperous [1-2]. The basis of the zoning activities carried out within the framework of the Zoning Law is the preparation of the zoning plan and the implementation of this plan within a specific program.

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Submitted: 15.01.2023**, Revised:** 21.07.2023**, Accepted:** 28.08.2023

Regular urbanization of a region, benefiting from infrastructure and superstructure services in a healthy way, bringing it to livable standards in accordance with contemporary needs, first of all, make it necessary to prepare, put into effect and implement a zoning plan and program for the region [3]. Settlement areas, the behavior of the people living there and the relations of people with these areas should be regulated and controlled. It is in the nature of man to settle in a place and own an immovable in that place. The issues mentioned here are also human rights. The right to live comes first among the rights related to settling in a place [4].

In addition to the right to live, on the inhabited area of the person; use and move freely, acquire, make changes and save [5-4]. The implementation of the zoning plan is the whole of the methods that ensure that the property texture, for which new usage decisions are made with the zoning plan, is adapted to the zoning plan and all kinds of urbanization activities are carried out. However, zoning practices are the basic implementation tools in terms of ensuring the formation of modern and livable healthy cities, and they are processes that are carried out based on the methods whose boundaries are specified in accordance with the laws and regulations [4].

Urban Transformation is conceptually defined as the demolition of unlicensed buildings that do not comply with the city's zoning plan, and the creation of collective settlement areas in accordance with the plans [6-4]. It has been defined as all the actions taken to create housing, trade, culture, tourism and social reinforcement areas, to take precautions against natural disaster risks, to renew and preserve the historical and cultural texture of the city and to use it by keeping it alive [7-4]. Zoning regulations have been established for the development of the constructed buildings within the framework of certain legal rules and plans. The zoning regulations and the hierarchy of plans related to it have directly or indirectly affected the zoning movements [8-9]. Although the concept of planning can be evaluated with different approaches, its general meaning is; It refers to a goal to be reached at the last stage and the process to be followed for this purpose [9]. Investment concerns in the construction and real estate sectors, which are in direct interaction with the economic structure of the country, are directly related to the spatial plans and the rent areas revealed by these plans. While determining investment areas in business development processes, each investor tries to develop land with some concerns such as how feasible the investment will be and how suitable the market is for this investment [10-9]. Plan revision and change both apply to plan types at all scales. Many planning works that should be handled within the scope of plan revision are implemented as plan changes [11-12]. According to the planning hierarchy, revisions and changes may come to the fore for the spatial strategy plan, environmental plan, master zoning plan and implementation zoning plans. The most frequent plan changes are on the implementation zoning plans. In the table, it has been determined that there are no big differences between the two regulations. However, it is noteworthy that the phrase "obligatory by the public interest" in the definitions section of the zoning plan change in the Regulation on the Principles of Plan Making has been changed to the phrase "for public benefit" in the Spatial Plans Construction Regulation. It can be said that this change of expression will cause an increase in the number of changes in the zoning plan [12].

When plan-making regulations and plan-making techniques are examined, the techniques, display languages, levels of detail, etc. used within the framework of comprehensive planning understanding while preparing the upper-scale plans and lower-scale plans prepared in our country. It is seen that they are made as physical plan documents that are identical with their features [13-14]. Pedestrianization applications have been made in big city centers. With the construction activities in the city centers, historical and cultural values were destroyed and as a result of the increase in density, green and social infrastructures were also insufficient. Buildings in housing areas have started to be built by cooperatives and have been realized. Social housing policies were developed, but the problems in fund transfers were not sufficient to meet the continuity and demand. As a solution, mass housing production has been included in development plans [15-16]. Despite the participation of the state (initiative), mass housing practices were generally carried out by private and local governments [17-16]. Zoning plans are the most important tools that organize urbanization. The functions determined by the zoning plans are to ensure that the citizens of the city have a more organized living space and to control the future growth and development of the city with a certain mechanism. According to the planning hierarchy, 1/100,000 scaled Environmental Plan, 1/5000 scale master plan and 1/1000 scale implementation development plans are made and decisions are made on how and for what purpose the lands will be used, and areas such as housing, commerce, industry, agriculture and forest are determined. The legal and constitutional basis of zoning plans is the concept of superior public interest. They are documents that balance individual interests with the general interests of the people, hence individual interests. It is a social consensus document that balances short-term common benefits and long-term goals, prevents injustices, foresees the problems that may arise, puts physical, geographical, cultural and economic orientations, prohibitions, and determines possibilities [18]. Urban planning, on the other hand, is a public service that prioritizes the

benefit of society in order to provide a safe and sustainable living space to the society it hosts, takes a role in the physical development of cities by considering all needs, is interested in directing the formation of the city, and seeks solutions to problems [19].

II. THEORETICAL FRAMEWORK AND SCOPE

Planning, with a general definition, includes producing the land use decisions made to determine the usage patterns, capacities and location choices of the functions in the space. Here, planning is defined as the preparation of systematic programs for the future in order to achieve the desired goals [20-21]. These are the applications made in order to ensure that the immovable properties of the immovable owners are made in accordance with the zoning plan without waiting for the actions to be taken by the relevant administrations in the event that the implementing administrations are late in making the lands of the immovable owners comply with the usage decisions specified in the zoning plan. However, in case of different usage decisions with the new zoning plan in the previous subdivision plans, or in cases where the immovables in the subdivision plan need to be divided into smaller pieces and the parcels in small pieces should be combined, applications are made upon the request of the immovable owners [4]. border correction; In case there is a border between two parcels that affects the use of the parcel, it is the correction process carried out with the consent of the parcel owners, provided that the parcel areas do not change. For example, in cases such as the presence of a parcel boundary that makes it difficult to place a building on a parcel with an unfavorable border, or the building appearing as encroaching on the application sketch, the parcel boundaries can be resolved by mutual agreement of the immovable owners. In parcels that need border correction, it is essential that the parcel areas do not change after the correction process [22-4]. The allotment process, after the real estate registered on a separate page of the land registry, is divided into two or more parts, upon the request of the relevant person, in accordance with Articles 15 and 16 of the Zoning Law No. recording it on a separate log page under a separate parcel number [23-4].

Expropriation is one of the tools used in the implementation of zoning plans [24-4]. Road, park, playground, school, hospital, etc. shown in the zoning plan. The ownership of the lands on which the public use or facilities to serve the public will be built may be in the hands of private individuals. In order to perform public services in these places, the ownership of these places must first be transferred to the relevant public institutions. The process of transferring the right of use of the property to the public without seeking the consent of the owners is called expropriation [25-4]. During the preparation of the plans, some ordinary or extraordinary factors such as unpredictable population movements, socio-economic changes, and increasing social needs may require changing the zoning plans [26-9]. The definition of the master zoning plan, the general principles of the regional plans, if any, and the environmental plans, if any, on the existing maps, again with the cadastral status of the plots, if any; It is a plan that is a whole with the plan provisions and the report, which is prepared to show the general usage patterns, the development, direction and size of the settlement areas, population densities and thresholds, transportation systems and to prepare the application development plans [2]. However, each city has its own economic and political history, in which it forms unique administrative arrangements among its political forces. It is an important mechanism of change in the city in the local governments involved in the implementation process, as well as the planning policies followed [27-28]. In the zoning plans, it is clearly stated how many floors the island and the parcel on the island are allowed to be built. Since the building permits have to be prepared in accordance with the zoning plans, the building should not exceed the number of floors in the zoning plan [29]. These interventions could not solve the structural problems in the spatial planning system. In this process, both the number of upper-scale plans and their relations were redefined. However, the interaction structure required by strategic approach, coordination, continuity and planning has not yet been established in planning practice at the current stage [30]. The preparation and creation of a real project data in distribution and parcellation problems in zoning applications is a very complex process that takes a very long time. It is very difficult to prepare the actual project data as the creation of cadastral islands, parcels and zoning islands, obtaining the location and area data of all the islands and parcels, and generating the land owner data are performed manually by an expert. Because all these data must be fully compatible in terms of area, location and owner. In addition, in a real project area, irregularly shaped islands and parcels can often be found, and cadastral and zoning islands can be in very different regions. In other words, cadastral and zoning areas generally do not overlap. In addition, the areas of the owners can often be very different from each other. While one owner can have a very small area, the other can have a very large area [31]. In urban renewal practices, unlike urban renewal, the participation of the public in the changes to be made in the city and the transformation of the urban space is considered, and it is planned to restructure the region in accordance with the lifestyle of the users living in the renewal region [32-33]. In the project-based system, plans are developed as a political but fair and non-binding public strategy. Plans determine some

framework rules in public and private project implementations in order to realize public and private projects that will contribute to government strategies [34-35]. The hierarchy principle, which is the basis of the regulatory planning system, is overcome by the horizontal and vertical appropriateness principle in the project-based system [36-35].

III. MATERIAL AND METHOD

Game Theory is a method of determining the most correct strategy against each other in the face of mutually conflicting possibilities by combining two or more opponents under certain rules [37-38]. Game theory is a technique that deals with the process of two or more players interacting with other players in a scarce resource environment. In this application, individuals are called decision makers and they aim to gain profit. The player must aim to gain a certain profit by considering the preferences of other individuals in the game. The determinant of earnings; are the decisions of other players with whom the player interacts. Decision makers are interdependent and either engage in conflict or cooperate to achieve the highest gains. In game theory, every decision made has a cost and every decision affects the opponent's decision, so every action in this process is interdependent [38-39]. Another important concept of game theory is strategy. Strategy is the set of decisions that specify the preferences of the players for all situations that may arise from the beginning to the end of the game. The aim in strategy is to obtain the most appropriate value gain. For this, passive and dominant strategic ways can be tried. The number of strategies in a game can be finite or infinite [40-38]. Game Theory assumptions; There are a finite number of players and their strategies, each player knows all possible strategies for both himself and his opponent, but the players do not know which of these strategies their opponent will use. Whatever strategy the players choose, each has a limited loss or gain. The gains or losses of the players depend on their own decisions as well as the decisions of their opponents. All possible actions or strategies to be played must be calculable in the same unit of measure. In addition, the most important assumption in game theory is that the individual behaves rationally and acts rationally for the most profitable situation [41-38]. Any social relationship is a game in game theory terminology. Each decision maker has partial control over the outcomes, i.e. the players decide under interdependence. The aim of mathematical game theory is to determine the strategy necessary to rationally protect the interests of the players through formal reasoning and to enable them to decide knowingly what outcome they will achieve when they do this [42].

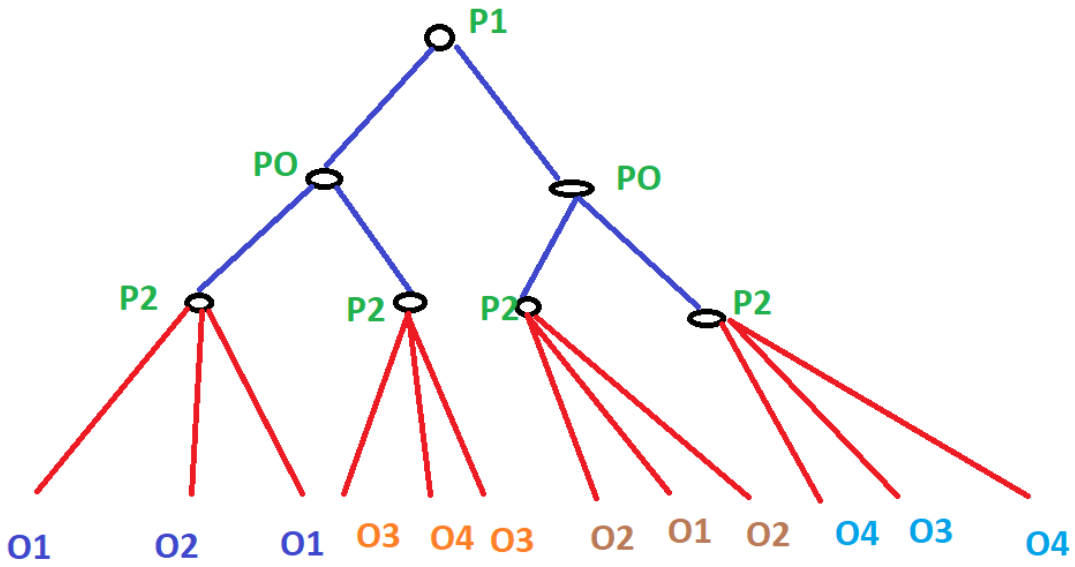

Figure 1. Game Tree Representation Under Uncertainty [43-42].

In strategic thinking it is important both to anticipate what other players will do and to know what other players know. Since the movements are simultaneous in static games, the players cannot obtain information by observing each other. But in ranked games, what they know is key. In dynamic games, unlike static games, the second player knows by observing how the first player moves before him [42].

N = {1, … , n} Let be the set of players and **2** N′ be the family of subsets of N′. If,

$\sum_{S\in 2^N} x(s)e^s = e^N$ **(1)**

If ⋋: 2 N\{∅} → ℝ+ transformation is called balanced transformation. Here, ***S*** is the characteristic vector for the coalition,

$e_i^s = \begin{cases} 1, i \in s \\ 0, i \in N \setminus s \end{cases}$ **(2)** olarak tanımlanır [44].

$M = \frac{M\max + s_{\text{Int}}^{0A}}{k_{ss} + s_{1nt}^{aA}}$ **(3)** [45].

A game theoretical model; players have four basic elements, which can be summarized as the options available, the consequences of those choices, and the benefit of each outcome to the player. The ability of the examined model to produce a specific solution to the question sought within the scope of the research depends on the complete and systematic consideration of these parameters in the model [46-47].

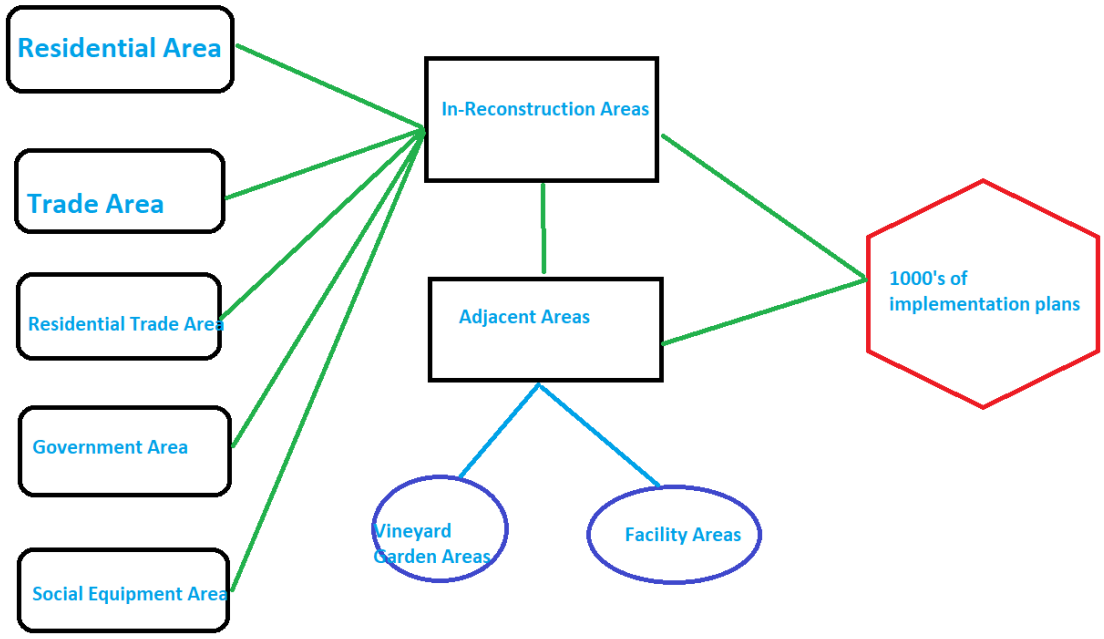

Figure 2. Game theory diagram of formation of 1000! development plan

Game theory provides a theoretical framework that includes a set of concepts and terminology to describe interaction. Within this structure are the players, the possible strategies of each player, the payoffs that result from the strategy combinations, and the sequence of actions. Second, game theory can predict the consequences of competitive situations and identify the most appropriate strategies [48-49]. Game theory and conflict management strategies involve the interaction of the parties from each other and the decisions they make dependent on each other. Therefore, the evaluations of the parties, both for themselves and for others, are important when interacting [49].

IV.THE CONNECTION BETWEEN IMPLEMENTATION ZONING PLAN AND GAME THEORY

The most important point in game theory is to have the stones, that is, the items that will provide you with the advantage of moves that will make you win the game or lead you to win, and to bring this power to the end that will end the game in your favor. When we consider the game theory logic as one of the best design methods to use in the design process according to the planning phase, the most important element in planning will be the population, population growth rate and the area-based ratio falling according to this speed will be our stones in establishing the game, which is called the most important cornerstone.

With the addition of a certain amount of fixed population to the population increase of at least 10 years or more in the current year, the person-based area area we have is taken as at least below the so-called minimum range, and then the maximum range in the area surface measurement rate that will fall on the population found with the fixed population amount in addition to the increasing population rate. When it is determined as a definite integral, an increase in urbanization rates will occur. This brings a different perspective to planning as a game.

With the long-term area-based rates to be released, the current total application zoning area surface measurement will be determined within the total zoning boundaries that will coincide with the best plan year.

(a, b) defined for the continuous f(x) function$\int_b^a f(x)dx = F(x) + c$ **(4)** as a result of the definite integral, a is taken as the amount in hectares equivalent to the population difference to be obtained from the population difference [50], b the lower limit will be the cornerstones of the game as the rate per current population, and the data in X is the amount of increase as a result of the ratios that will correspond to the data in the current used plan. it will give the new ratios of the implementation plan to be prepared and the total amount of surface measurement within the boundaries of the zoning plan to be increased.

V. FINDINGS AND DISCUSSION

While the 1/1000 application development plans, which show how areas such as housing development islands, commercial, educational, health, religious facilities, social cultural, green areas, and parks, which are the main parameters in city planning, are created on the basis of population projection, it is based on the basic relationship, that is, its correlation, with the area where the population will live. These numbers are tried to be calculated.

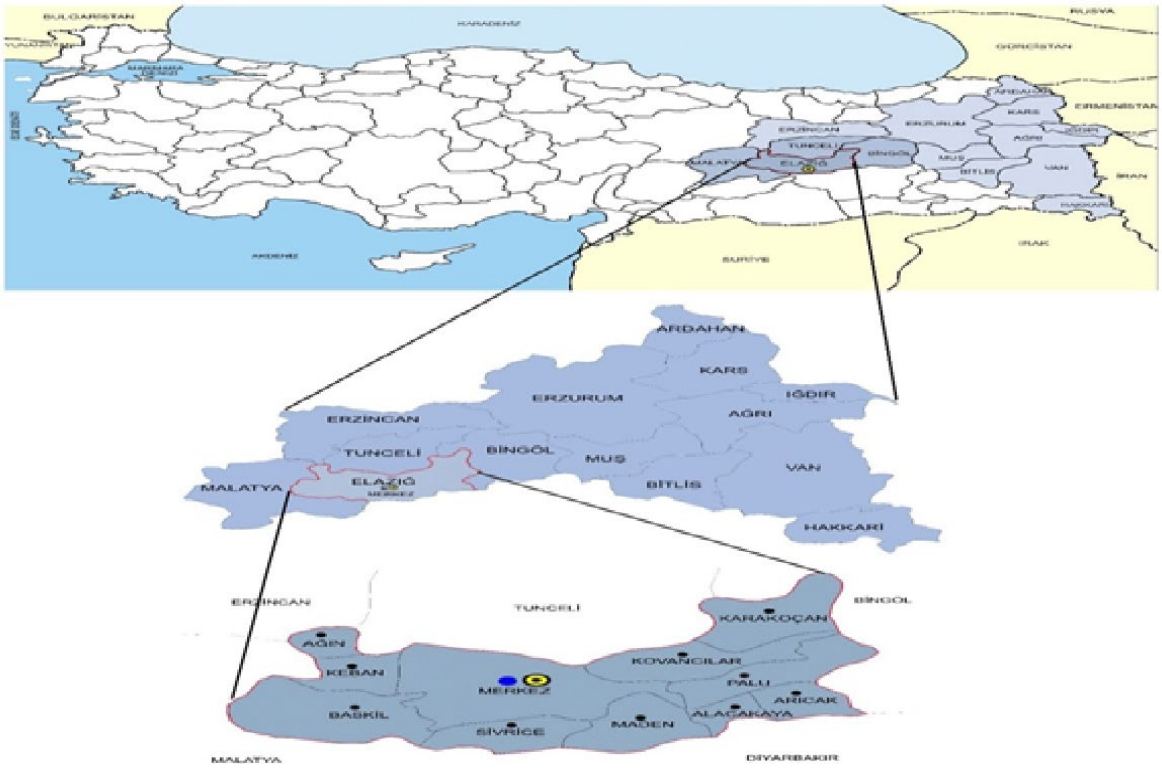

Figure 3. Location of Elazig City in Turkey [51].

In Figure 3., after explaining in the upper paragraph how a zoning plan should be made with game theory, the current zoning plan of Elazığ Province, which is one of the 81 cities in our country, and an average implementation zoning plan that will meet the need between 25-30 years can be given as an example. This is the representation of the game theory and plan making over the city and where it is as a location.

Table 1. Population Change in Elazığ City [51].

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Türkiye	75.627.384	76.667.864	77.695.904	78.841.871	79.814.871	80.810.525	82.003.882	83.1549.77	83.614.362
Elazığ	562.703	568.239	568.753	574.304	578.789	585.256	595.638	591.098	587.960
Centre district	406.300	398.108	412.220	424.870	431.294	437.951	421.726	439.687	440.513

In Table 1, the population amounts determined from the address-based registration system from 2012 to 2020 of the city of Elazig, which is considered as a pilot city, are shown. When looked at, it turns out that the 9-year population increase until 2020 is around 7 thousand on average. This 7 thousand population growth rate will be calculated on a yearly basis with the addition of 25 thousand to a city with an average capacity of this capacity, in the part expressed as a fixed amount of c [50], in the indefinite integrals, according to situations such as migration to the city or an unexpected increase in the population in the event of a disaster in the surrounding provinces. The proportions of all zoning island parameters according to the population in the zoning plan will be formed in this context.

Table 2. Projected population in current 2014 and 2040

Available (2014)			**2040**			
Population (Person)	Area (ha)	Density (person/ha)	Population (Person)	Total settlement area (ha)	Density (person/ha)	Development area
351.504	3.9	90	1.000.000	9.726	102	5.826

In Table 2, it is seen that the current zoning plan corresponds to 351.504 people and a 3.9 hectare usage area, with 25 thousand constant additions depending on the average population increase of 7 thousand, 26 years after the current zoning plan in force, the population will correspond to 1 million people compared to 2040. It is seen that it will cover an area of 9,726 hectares by calculating an increase of 600 thousand people, and the increased surface area will correspond to an area of 5,826 hectares. The per capita rate will increase by 12 bands.

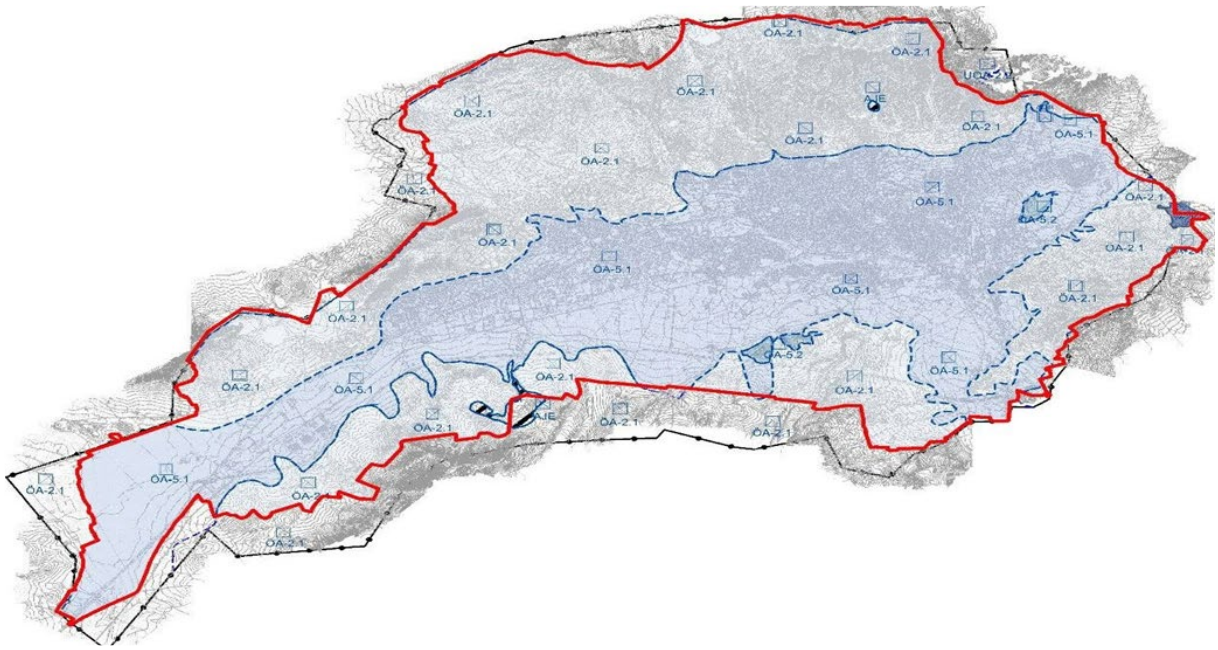

Figure 4. Map of Suitability for Settlement [51].

38 1/5000 scale K42-D- 10-A, K42-D-13-A, K42-D-15-A, K42-C-01-D, K42-D-03-C, K42 covering the borders -D-08-C, K42-D-10-B, K42-D-13-B, K42-D-15-B, K42-C-06-A, K42-D-04-C, K42-D -08-D, K42-D-10-C, K42-D- 13-C, K42-D-15-C, K42-C-06-B, K42-D-04-D, K42-D-09 -A, K42-D-10-D, K42-D-13-D, K42-D-15-D, K42-C-06-C, K42-D-05-C, K42-D-09-B , K42-D-12-A, K42-D-12-B, K42-D-14-A, K42-D-17-A, K42-C-06-D, K42-D-05-D, K42 -D-09-C, K42-D-12-C, K42-D-12-D, K42-D-14-B, K42-D-17-B, K42-C-11-A, K42-D It is a geological/geotechnical study based on the 1/5000 and 1/1000 scaled zoning plan of the area with an area of approximately 13 365 ha, which is on the border of the 416 1/1000 scaled maps with the number -08-B, K42-D-09-D, It has been prepared for the purpose of obtaining the geological and geotechnical data of the studied area and evaluating the suitability for settlement in the light of these data. In the mapping of the city, when the area is large, it is shown that all objects on the land will be processed according to the layout system and how many and which layouts this area will correspond to.

Table 3. Distribution and rates of uses in the planning area according to areas [51].

Elazığ (Center) Implementation zoning plan area use distribution		
Domain name	**Area (ha)**	**Ratio (%)**
Housing areas		
Housing area (0.30 precautions)	511.86	4.65
Housing area (0.60 precautions)	279.61	2.54
Housing area (0.80 precautions)	41.15	0.38
Housing area (0.90 precautions)	25.80	0.23
Housing area (1.00 precautions)	11.63	0.11
Housing area (1.20 precautions)	317.30	2.89
Housing area (1.30 precautions)	28.20	0.26
Housing area (1.50 precautions)	1777.35	16.01
Housing area (1.60 precautions)	6.98	0.06
Housing area (1.75 precautions)	1.31	0.01
Housing area (1.80 precautions)	5.04	0.05
Housing area (1.85 precautions)	0.99	0.01
Housing area (2.00 precautions)	20.03	0.19
Housing area (2.15 precautions)	0.78	0.01
Housing area (2.34 precautions)	1.09	0.01
Housing area (2.35 precautions)	1.43	0.02
Housing area (2.40 precautions)	158.45	1.45
Housing area (2.50 precautions)	0.83	0.01
Housing area (2.65 precautions)	0.42	0.01
Housing area (2.70 precautions)	2.23	0.02
Housing area (2.80 precautions)	0.39	0.01
Housing area (3.00 precautions)	1.06	0.01
Housing area (3.20 precautions)	52.18	0.49
Housing area (4.00 precautions)	46.53	0.43
Housing area (4.80 precautions)	34.07	0.32
Urban work areas		
Tick area (2.40 precedent)	74.89	0.69
Tick area (2.00 precedent)	98.27	0.90
Tick area (1.50 precedent)	188.39	1.73
Tick area (1.85 precedent)	29.11	0.28
Tick (other)	28.32	0.27
Tick area (block 12 floor)	47,47	0.55
Tick area (block 10 floor)	41.20	0.41
Tick area (block 8 floor)	6.90	0.06
Tick area (adjust 8 floor)	41.08	0.37
Trading area	1.80	0.02
Trade-1 area	5.36	0.06
Trade -2 area	50.12	0.47
Trade -3 area	100.80	0.93
Collective workplaces	5.00	0.05
Wholesale trading area	8.23	0.07
Municipal service area	43.28	0.40
Official institutional area	316.16	2.88
Fuel and service station area	13.12	0.12

Logistics facility area	77.50	0.71
Industrial facility area	14.41	0.14
Small Industrial area	38.48	0.36
Storage area	15.51	0.14
Marketplace	11.80	0.11
Military area	295.02	2.69
Conserved areas that will continue to continue today's land use		
Forest area	398.7	3.62
Agricultural areas	75.05	0.69
Tourism areas		
Hotel area	10.21	0.09
Educational facilities areas		
Kındergarten areas	6.98	0.06
Primary school	114.30	1.05
Middle school area	92.53	0.81
High school area	9.31	0.08
Special education fields	3.76	0.03
Public education center	22.60	0.21
Vocational and technical training facility areas	1.66	0.02
Higher education facility areas	971.23	8,85
Health facilities area		
Health facility area	89.01	0.82
Social and cultural facilities areas		
Indoor sports facility area	56.58	0.52
Cultural facility area	66.08	0.62
Worship areas		
Mosque	50.78	0.48
Open and green areas		
Garden	831.13	7.58
Fairground	2.50	0.02
Square	3.89	0.03
Property place	30.98	0.28
Recreation areas	75.47	0.70
Areas to be forested	855.35	7.79
Cemetery areas	78.67	0.72
Technical infrastructure areas		
Transformer area	1.20	0.01
Technical infrastructure area	1.35	0.01
Water, wastewater and waste systems		
Water surface	51.46	0.47
Waste water plant	8.11	0.07
Transportation		
Roads	2142.21	19.19
Car park	1.18	0.01
Intermediate station	55.54	0.51
Terminal	18.34	0.18
Total	11000.00	100

In Table 3., the area and proportions of all the legends of the implementation zoning plans included in the currently used zoning plan of the city of Elazığ are shown.

1.000.000- 400.000=600.000 **(5),** when the population increase amount and the 3.9 hectare zoning area are expressed as the area that can respond to the population that will be expanded by the 9.72 hectares of zoning;

All values in Table 4 will be determined by calculating within the scope of the basic binary stone of the game, area and ratio.

The first zoning parameter in Table 3., the rate of housing area with a precedent of 0.30, $\int_{3.9}^{9.72}(4.65)x12$ **(6),** it will be seen that the determination of other residential areas from this formula will correspond to an area ratio of 20.12 in the form of a total expression.
It will be calculated that the total housing area in 2040 will be 2269.78 hectares as a result of 20.12 ratio total housing development area found according to 2040, subtracting from the total housing area in 2014 and adding the amount obtained as a result of multiplying 11000 hectares in 2014 to the total old housing area.

Let's show the game theory analysis over the health field from the data in Table 3.
$\int_{3.9}^{9.72}(0.82)x12$ **(7)** from here, 0.80 is the ratio of health facility areas in the current zoning plan in 2014, 9.72 is the ratio to be formed according to 1 million population in 2040, 3.9 is the ratio used today and the ratio of 3.9 people to 351 thousand population will be 90, the ratio of 9.72 people according to 1 million people. If it is calculated that it corresponds to 102, when the dx value from 102 -90=12 **(7)** is taken into account, the value of 1.75, which is the new health facility area ratio in 2040, will be found.

In other words, in two demonstrations, it is shown how the game elements will be processed with a mathematical approach and used as a move in the formation of a new application development plan area. Generally,
$\int_{B}^{A} f(x)dx$ **(8)** from, the values of all zoning parameters are found.

Table 4. Elazığ City 1000 usage area and distribution

Elazığ(Center) 1/1000 scale application zoning plan area use				Correlation between 2014 and 2040
Domain name	**Area (m²)**	**Area (ha)**	**Ratio (%)**	
Housing areas				
Residential area	12231135.87	1223.11	10.84	$\int_{3.9}^{9.7}(4.65)x12$
Development Housing areas	22697764.11	2269.78	20.12	$\int_{b}^{a} f(2014x) * dx$
Urban works area				
Trading area	1890492.27	189.05	1.68	$\int_{b}^{a} f(2014x) * dx$
Commerce- Housing areas (Tick)	6098006.19	609.80	5.41	$\int_{b}^{a} f(2014x) * dx$
Trade-Tourism area (Tict)	13524.05	1.35	0.01	$\int_{b}^{a} f(2014x) * dx$
Wholesale trading area	4313.80	0.43	0.004	$\int_{b}^{a} f(2014x) * dx$
Municipal service area	491699.53	49.17	0.44	$\int_{b}^{a} f(2014x) * dx$
Official institutional area	2996392.45	299.64	2.66	$\int_{b}^{a} f(2014x) * dx$
Storage area	54182.72	5.42	0.05	$\int_{b}^{a} f(2014x) * dx$

Military area	2950371.27	295.04	2.62	$\int_b^a f(2014x) * dx$
Marketplace area	115700.73	11.57	0.10	$\int_b^a f(2014x) * dx$
Industrial area	346390.70	34.64	0.31	$\int_b^a f(2014x) * dx$
Small Industrial area	333229.22	33.32	0.30	$\int_b^a f(2014x) * dx$
Logistics facility area	775003.26	77.50	0.69	$\int_b^a f(2014x) * dx$
Fuel delivery service station area	151009.64	15.10	0.13	$\int_b^a f(2014x) * dx$
Areas to be protected by continuing today's land use				
Agricultural areas	2115252.97	211.53	1.87	$\int_{3.9}^{9.7} (0.69)x12$
Forest area	1901351.21	190.14	1.69	$\int_{3.9}^{9.7} (3.62)x12$
Areas to be protected				
1st grade archaeological site	31154.33	3.12	0.03	$\int_b^a f(2014x) * dx$
Health protection tape	35882.87	3.59	0.03	$\int_b^a f(2014x) * dx$
Tourism areas				
Hotel area	8419.01	0.84	0.01	$\int_b^a f(2014x) * dx$
Education facilities areas				
Kindergarten areas	178753.76	17.88	0.16	$\int_b^a f(2014x) * dx$
Primary school	1424871.12	142.49	1.26	
Middle school area	1246426.77	124.64	1.10	
High school area	505747.01	50.57	0.45	
Public education center	426008.69	42.60	0.38	
Special education fields	59087.00	5.91	0.05	
Field of education areas	8840571.74	884.06	7.84	
Vocational and technical training facility area	103030.21	10.30	0.09	
Health facilities area				
Health facility area	1979569.32	197.96	1.75	$\int_b^a f(2014x) * dx$
Family health center	5399.17	0.54	0.005	
Worship areas				
Mosque	814630.77	81.46	0.72	$\int_b^a f(2014x) * dx$

Social and Cultural facility area				
Social-Cultural facility area	1049056.06	104.91	0.93	$\int_b^a f(2014x) * dx$
Nursery, day house	14812.74	1.48	0.01	
Indoor sports facility area	271779.56	27.18	0.24	
Open sports facility area	325684.12	32.57	0.29	
Open and green areas				
Garden	9299790.31	929.98	8.24	$\int_b^a f(2014x) * dx$
Passive green area	2567.44	0.26	0.002	
Kids garden and playground	6663.84	0.67	0.01	
Property place	309833.72	30.98	0.27	
Area to be aforered	4761194.96	476.12	4.22	
Recreation area	860892.32	86.09	0.76	
Fair, Fair and festival area	62916.74	6.29	0.06	
Cemetery area	810731.61	81.07	0.72	
National garden	216813.23	21.68	0.19	
Square	45641.98	4.56	0.04	
Disaster dangerous areas				
Building prohibited area	2646.45	0.26	0.002	$\int_b^a f(2014x) * dx$
Water, waste water and waste plants				
Water surface	547531.27	54.75	0.49	$\int_b^a f(2014x) * dx$
Wastewater surface areas	81050.70	8.11	0.07	
Technical infrastructure areas	108194.08	10.82	0.10	
Transportation				
General parking area	7605.38	0.76	0.01	$\int_b^a f(2014x) * dx$
Terminal (master gar)	187060.71	18.71	0.17	
Intermediate station	554973.75	55.50	0.49	
Roads	22440427.16	2244.04	19.89	
Energy generation, distribution and storage				
Transformer	23957.44	2.40	0.02	$\int_b^a f(2014x) * dx$
Total	112817197.33	11281.72	100.00	

In Table 4., the amount of new land that will correspond to the population during the planning construction process as an integral part of the area and ratio pair as an instrument used as a result of the ratio values of all implementation zoning parameters in 2014, is shown.

VI. CONCLUSION AND RECOMMENDATION

Implementation zoning plans are the product of the planning process to be prepared according to certain criteria, which are created in a way to meet the needs of the people and creatures living on that area at certain intervals in both cities or districts. As it can be done with various approaches, when the best approach is taken as a criterion, plans should be produced as a goal that will continue for many years at a level that will meet all needs. In the planning process, calculations can be made to correspond to different projection approaches. In the study, calculations were made based on game theory, which can be applied in studies different from artificial intelligence.

It was based on a ratio to the departure axis of the population, and as a result of taking the planning process at 25-30 years as a long-term basis, the population projection for 2040 was taken as a basis, and the increase of the city in a pilot region of 600 thousand was handled on the 26 year axis.

- Based on the number of people who will go from 400 thousand to 1 million,
- The area/person ratio was calculated to increase from 90 to 102 according to the population base equivalent,
- Considering the basic equation of definite integral game theory, the plan was produced by calculating that the area of 11000 hectares addressing the total population in 2014 would correspond to an area of 11281 hectares at the end of 26 years.

It has been shown in the study how the main planning axis at the 1/1000 level should be calculated on the basis of population projection with game theory and how it can be used in the field of city and planning. Our suggestion is stated how area-based planning can be calculated without complexity to meet the needs with this method.

Author Contributions
The authors contributed equally to the article. The authors have read and approved the final version of the article.

Conflict of Interest
The authors of the article declare that there is no conflict of interest between them.

ACKNOWLEDGMENT

I would like to thank Elazığ Municipality Map Service for their unwavering support in this study.

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