Research Article
Araştırma Makalesi

Bartın University International Journal of Natural and Applied Sciences
JONAS, 5(1): 47-56 e-ISSN: 2667-5048
31 Temmuz/July, 2022 DOI: 10.55930/jonas.1105478

BUILDING RESIDENCE AREA EXTRACTION PROCESS WITH POLYNOMIAL APPROACH IN FREE BUILDING IDENTITY ZONING PLOTS

Selim Taşkaya[1]*

[1] Artvin Vocational School, Department of Architecture and Urban Planning, ARTVİN
*Sorumlu Yazar: selim_taskaya@artvin.edu.tr

Abstract

The zoning islands in the identity of free buildings are one of the island types in the zoning plan. It has an aspect that distinguishes it from the zoning islands with certain definite features such as separate, block and adjacent. It is a building regulation in the identity of a zoning island, which is applicable in application zoning plans, especially in new development and settlement areas. On the islands with the identity of free construction, the building permit withdrawal dimensions are given on the basis of different precedents. As a method, it has been tried to be explained with examples on how to draw the parcels to the base according to certain rules with polynomial nesting. The polynomial is mathematically the process of constructing subsets or subsets from the universal set. In planning applications, it is the process of creating the right building stock by specifying the garden distances from the outside to the inside. Especially in the identity of free building, the most important part in these garden distances is to create the building sitting area by pulling the right side garden. In this way, an examination was made about how a different approach in the zoning plans will be given to the zoning islands with the identity of free buildings from general to specific.

Keywords: Free order, reconstruction island, polynomial approach

1. Introduction

The interest gained by the concept of the city has inevitably brought importance to concepts and fields such as urbanization, urbanization and urban planning. With the increase in the urban population and migration from rural to urban areas, the urbanization process has also gained momentum. Urbanization and the increase in the urban population, along with many other dimensions, have brought the organization of public services in the city and the planning of urban areas to a position that deserves special attention. Fixed or limited land supply as opposed to a growing urban population; The limited availability of land with infrastructure ready for development or with low disaster risk brings along various difficulties in the implementation of urbanization policy and zoning planning (Ulutaş, 2021). In accordance with Article 8 of the Zoning Law No. 3194, zoning plans consist of a master zoning plan and an implementation zoning plan. If there are regional plan and environmental plan decisions, the plans should be in accordance with them. In the zoning planning, regional distribution of duties and powers was made between municipalities and other institutions. Accordingly, within the boundaries of the municipality that is the subject of master and implementation development plans, the relevant plans will be made or made by the municipalities and will enter into force after being approved by the municipal councils (Ulutaş, 2021). If the area subject to the planning is outside the municipality and the adjacent area, it will be done or will be done by the governor's office or the relevant person. These plans, if deemed appropriate by the governorship, come into effect after being approved. Master and implementation zoning plans made or commissioned by municipalities are announced by the mayor as of the date they are approved by the municipal council, and master and implementation zoning plans for places other than the municipality and the adjacent area are announced by the governorship. During the announcement, these plans can be objected to by those concerned. Objections are examined and finalized within 15 days by the city council or the governorship, taking into account the institution authorized to plan (Ulutaş, 2021). In this context, in terms of zoning law, the country development plan, which also has a strong spatial discourse, design and dimensions, finds its application

***Sorumlu Yazar (Corresponding Author):** Selim TAŞKAYA; Artvin University, Artvin Vocational School, Department of Architecture and Urban Planning, Artvin-Turkey.

Geliş (Received) : 18.04.2022
Kabul (Accepted) : 19.07.2022
Basım (Published) : 31.07.2022

area theoretically by being at the top of the hierarchy of plans (Şanlı, 2009). The development plans, whose main purpose is to ensure the social and economic development and progress of the country, also reflect an urbanization policy in line with this purpose. The development of cities and solving problems related to urbanization are important in terms of development (Arslan, 2016; Ulutaş, 2021). It is possible to examine the mistakes made in zoning applications by dividing them into two parts. One of the sections is the problems experienced in the implementation of the zoning plans, while the other is the problems arising from the construction of the zoning plan (Yomralıoğlu, 1997; Akyol, 1997). In this respect, a study has been carried out that can be beneficial in the solution of zoning implementation problems in Turkey by examining the errors and separating the errors into two parts. In this study, the problem of unjust zoning plans has been addressed. Two different solutions have been proposed for this problem. The first of these is to implement the zoning application in accordance with Article 18 of the Zoning Law No. 3194, and the second is to expropriate the mass housing areas selected from the areas open to development of the cities, parceling them out in accordance with the law and putting them up for sale. For the first solution, the municipalities only have to cover the implementation costs, but in the second solution, the municipalities have to pay significant expropriation costs. Determining the developing regions of cities is an important detail for these solution proposals (Büyükaslan, 2021).

2.Theoretical Framework and Scope

It is noteworthy that the master zoning plan is a whole with the plan notes and the report. The report, which is an integral part of the plan, is a document describing the principles introduced in the plan. No matter how detailed the master plan is made due to its technical plan structure, it is not possible to show all the views of the planner regarding the implementation, the determinations at the planning stage and all the targets aimed with the plan. For this reason, the report, which includes the explanation, general principles, mandatory provisions, suggestions and advice regarding the plan, is seen as a complement to the plan and is made compulsory (Yıldız, 2016; Ulutaş, 2021). The application development plan is drawn on the existing map such as the master development plan and includes all the details such as the building blocks, roads, density order in the building blocks, implementation phases for the implementation of the plan. Again, the layout of the building, the number of floors and heights, the size of the parcels, the region is determined in the plan, and the details of the application relations with the infrastructure facilities are also included (Keleş, 2013; Ulutaş, 2021). As a matter of fact, the implementation development plan prepared without processing the cadastral situation may result in a shared ownership on the land, especially at the stage of land and land arrangement. However, whether or not the cadastral situation is written on the map, the boundaries of the real estate are not decisive for the plans (Kalabalık, 2017; Yıldız, 2016; Ulutaş, 2021). The zoning applications made within the scope of the purpose explained with article one in the Zoning Law are the practices carried out in the settlements. The realization of these applications is to make the land and lands as specified in the zoning plan (Büyükaslan, 2021). It should be carried out in a way that can meet the social needs as well as the basic needs of the society, with zoning practices, to increase the welfare in the cities and to have healthy environmental conditions. The Zoning Law covers all of the prohibitions and rules that must be followed within the scope of meeting these basic and social needs and the implementation of zoning plans (Büyükaslan, 2021). Planned Areas Zoning Regulation entered into force with the Official Gazette No. 30113 published on 03.07.2017. This regulation has been prepared based on the provisions of the Zoning Law No. 3194 dated 03.05.1985 and the Decree Law No. 644. Purpose; It is to determine the provisions regarding the construction and inspection of buildings in accordance with health, science, plan and sustainable environmental conditions (Planned Areas Zoning Regulation, 2017). The presentation of the construction, beautification and improvement activities that we use while explaining the concept of zoning within a plan and program revealed the zoning plans. The development plans, which provide a modeling for the future in line with a certain hierarchy from the smallest administrative unit to the whole of the country, allow the main objectives in economic, social and cultural dimensions to spread all over the country (Gelir, 2021;Utkucu and Çağlan, 2019). Although many public institutions and organizations on behalf of the central administration and local governments participate in the preparation process of the zoning plans, from the highest level to the lowest level plans, the coordination between them is extremely limited. Since the upper and lower scales of the plans must be compatible as a whole in order to achieve the aim desired to be achieved by planning, it is inevitable that there will be an interaction, priority of implementation and order between the wills embodied as a result of planning activities (Gelir, 2021; Çolak, 2014).

3. Material and Method

One of the methods of mathematically approximating the residential area of the building on the basis of parcels in free-range zoning blocks is the polynomial approach. Orthogonal polynomials are used in many areas of mathematics such as coding theory, number theory, harmonic analysis, numerical analysis, approximation theory; It has many applications in many other fields such as probability theory, stochastic processes, quantum mechanics, solid state physics, optics (Yıldırım, 2022).

Polynomial array {P(x)} (k=0,1,…..,) that is orthogonal to the weight function p(x) in a (a,b) interval

$\int P_k(x)\mathrm{Pl}(x)p(x)\,dx = 0$ (1 ≠k) (1) (Yıldırım, 2022).

Realizes the orthogonality relation. Examples of this polynomial sequence are continuous Laguerre, Jacobi and Hermite classical orthogonal polynomials (Rainville, 1960; Chihara, 1978; Szegö, 1975; Yıldırım, 2022).

a_1, b_1,c_1,d_1,$e_1$real parameters and r is a positive integer;

(a_1x^2+b_1x+c) y_r''(x)+(d_1x+e_1) y_r' (x)-r(d_1+(r-1)a_1) y_r^1(x)=0 (2) (Lekesiz, 2021).

$n\epsilon N$, k > 0 including;

$J_{k,n+2} = kjk, n + 2J_{k,n-1}; J_{k,0} = \begin{pmatrix} k & 2 \\ 1 & 0 \end{pmatrix}$ (3) (Taştan, 2021).

In the figure, k −Jacobsthal Lucas defined the matrix sequence with $\{Ck,n\}n\epsilon N$. $n\epsilon N$, k > 0 including;

$C_{k,n+2} = CJ_{k,n} + 2C_{k,\cap-1;C_{k,0}} = \begin{pmatrix} k^2+4 & 2k \\ k & 4 \end{pmatrix}$ (4) (Taştan, 2021).

is He has included some identities that give the relations between these two matrices. To define Gauss Fibonacci and Gauss Lucas polynomials, to investigate their relations with known polynomial families, to define Gauss k −Fibonacci polynomials, Gauss k −Lucas number sequences and polynomials given by recurrence relations, Gauss k −Jacobsthal and Gauss k −Jacobsthal-Jacobsthal number sequences and Lucas number sequences The main purpose of the study is to define the polynomials and to investigate the properties of these defined number sequences. The recurrence relations to be defined are to establish a connection between the Gaussian families known as new number sequences, and thus to establish a link between number theory and matrix theory. Thanks to the relationship to be established, while the properties of new number sequences are investigated, at the same time, information about the properties of derivatives of Gaussian number sequences polynomials is obtained (Taştan, 2021).

Matrix representation of the Jacobsthal-Lucas polynomial;

n≥1 and $Q = \begin{bmatrix} 1 & 2x \\ 1 & 0 \end{bmatrix}$ $and\ R = \begin{bmatrix} 1+4x & 1 \\ 1 & 2 \end{bmatrix}$ for; $QnR = \begin{bmatrix} 1 & 2x \\ 1 & 0 \end{bmatrix}^{\Pi} \begin{bmatrix} 1+4x & 1 \\ 1 & 2 \end{bmatrix}$
(Tereszkiewicz; Wawreniuk, 2015; Taştan, 2021).

ti (i=1,…,M) let Di be all the failures that occur at the time. Let Ri be the set of all units at risk just before time Ti. This set includes all units that failed after time ti and those that were stopped or failed at a later time than t_i. Ri members of the set r=1, ..., ni be in shape. Let X denote the explanatory variables. These variables are indexed by i,j,k. Td values of variables at failure time, x_{1d}, x_{2d}, …, x_{id} It is written as (Dinç, 2019).

$\log(B) = \sum_{t=1}^{M} \sum_{i=n}^{p} (x_{it} Bi) - \mathrm{In}\, \Sigma\, exp \sum_{i=n}^{p} x_{ir} B_i$ (5) (Dinç, 2019).

In the absence of simultaneous observation, the log-likelihood function is defined as above (Dinç, 2019; Kalbfleisch and Prentice, 1980).

4. Findings and Discussion

As a result of the zoning plans, ground gravity measurements can be given with different approaches for building settlement to the parcels that fall within the zoning islands created in a certain region. In the study, descriptions of how the measurements will be applied in the so-called free building blocks with their own indeterminate height, apart from the distinct, separate, block and adjacent orders of the zoning islands, are given by giving descriptions of the sample applications.

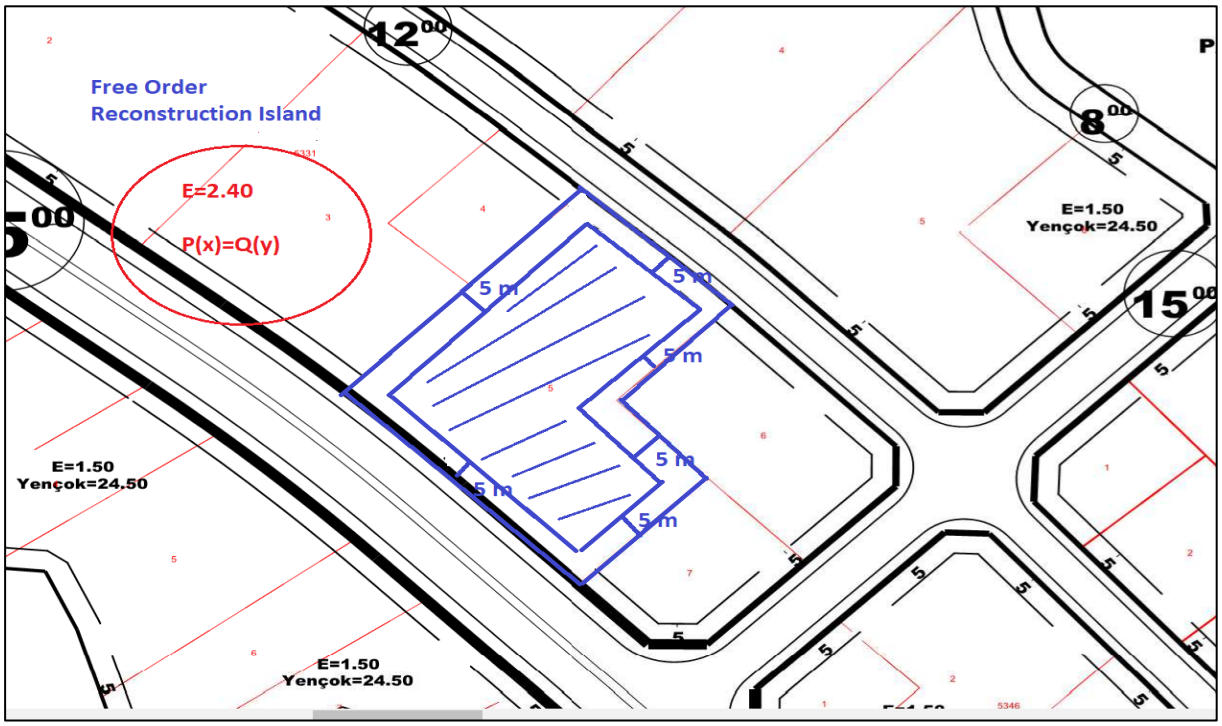

Fig. 1. Representation of the free building zoning island with a total construction area of 2.40

The most important feature of this type of building identity is that no information about the height is given. Since all parcels will have a frontage to at least one point, although there is no problem in towing operations on the islands where there is no construction from the front, problems may arise in the approaching borders of neighboring parcels. When looking for an answer to the question of how the building will be placed on the ground in free-standing building blocks, general procedures will be carried out only based on the precedent values, the phrase 0.30 coefficient should be taken on the average ground of the planned type zoning regulation. When the average coefficient of 0.30 is evaluated as each ground floor and upper floor, it is revealed that the building will be built normally from 2.40=0.30*8 to eight floors on average. According to the planned type zoning regulation, if it is not commercial in maximum residential areas, this equivalent value is deducted up to 0.40 on the ground. When the boundaries of the residential area on the ground were determined based on eight floors, it was emphasized that the approach limits should be determined by increasing the approach limit of the adjacent plots up to four floors by three meters, and by increasing half a meter per floor after four floors, according to the planned areas type zoning regulation. From this point of view, with the logic of P(x)=Q(x)=P((Q(x)))=y, the approach distance to the building where the building will sit is determined by pulling 5 meters from the neighboring parcel borders as a function from the nested cluster.

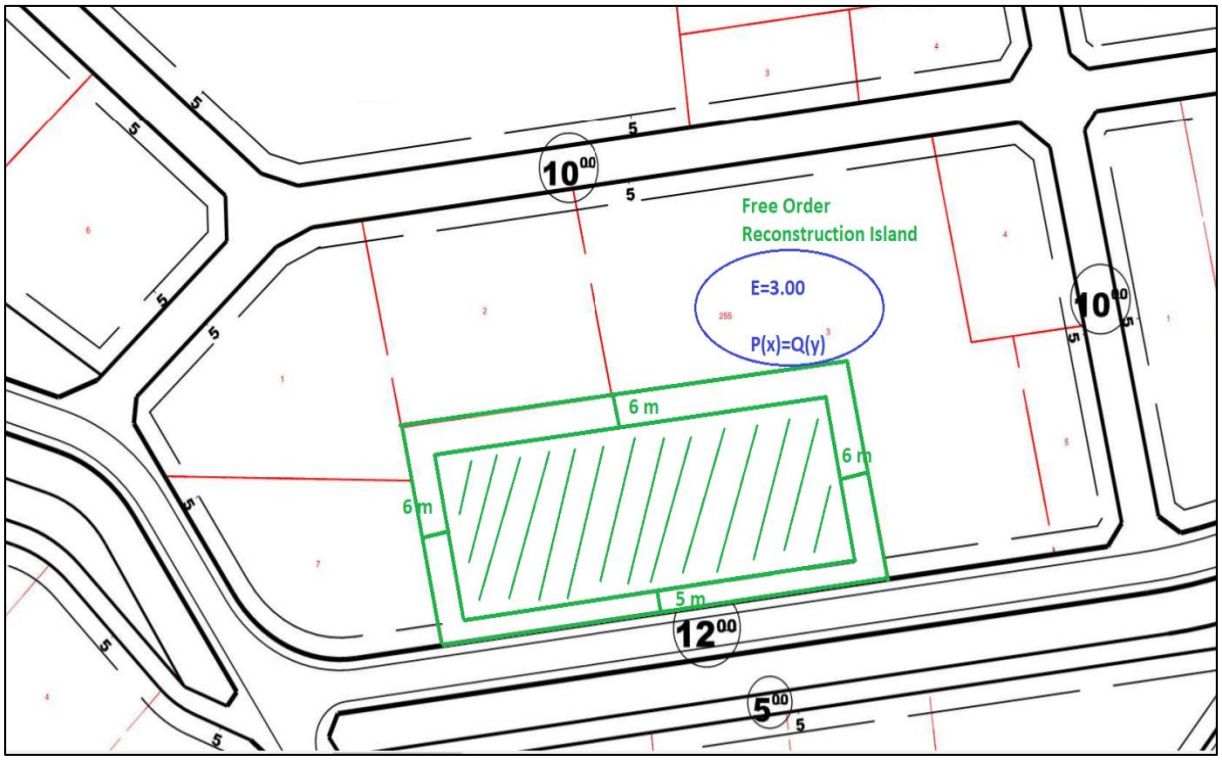

Fig. 2. Representation of the free building zoning island with a total construction area of 3.00

The most distinctive feature of the island with the free building identity shown in Figure 2 is that only the total construction area is given. The total construction area, on the other hand, defines the amount consisting of the multiplication of the title deed area of the relevant parcel with this precedent value, how many floors the parcel owner will build, the limit will be in that way. When we examine the building approach limit of a parcel on the south side of the island with only one side to the road, regardless of the precedent, the approach limit to the road will not exceed 5 meters. After 2017, in the planned type zoning regulation, since the neighboring parcels should be applied both on the sides of the parcel and on the back sides of the parcel, the average ground coefficient of 0.30 was taken at the base, and the building boundaries were formed to correspond to 10 floors. Therefore, by drawing 6 meters from the sides and the backyard, the sitting area of the building is determined as P(x)=Q(x)=P((Q(x)))=y with a polynomial approach.

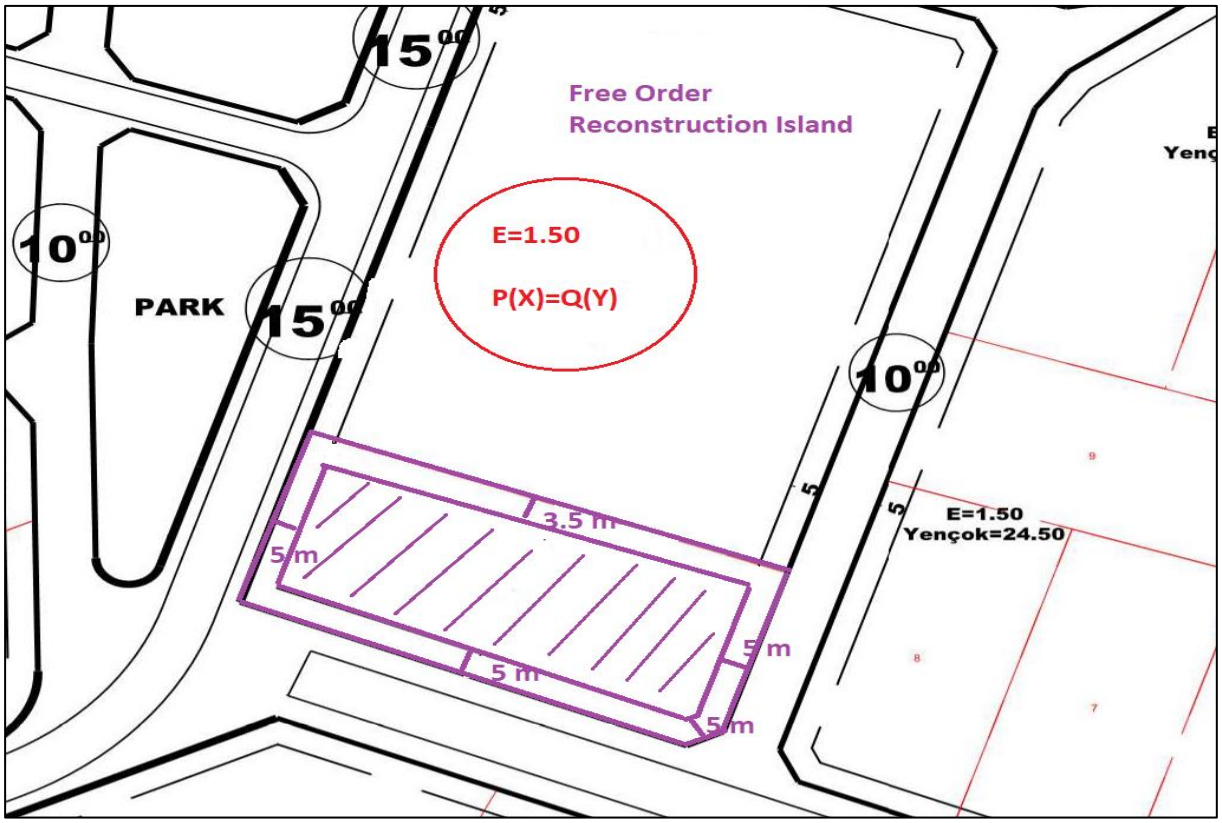

Fig. 3. Representation of the free building zoning island with a total construction area of 1.50

Especially in parcels with the identity of free buildings, it is to determine the adjacent and rear settlement building approach boundaries elastically according to the number of facades of the parcel and the maximum number of floors to be built. Here, too, 5 meters from the parts facing the road and 3.5 meters from the neighboring approach limit were taken, due to the possibility of building up to 5 floors on average, with a total construction area of 1.50. However, it should be stated in the project that if the amount of precedent on the ground is increased and the number of floors is reduced, then the adjacent parcel approach border will change.

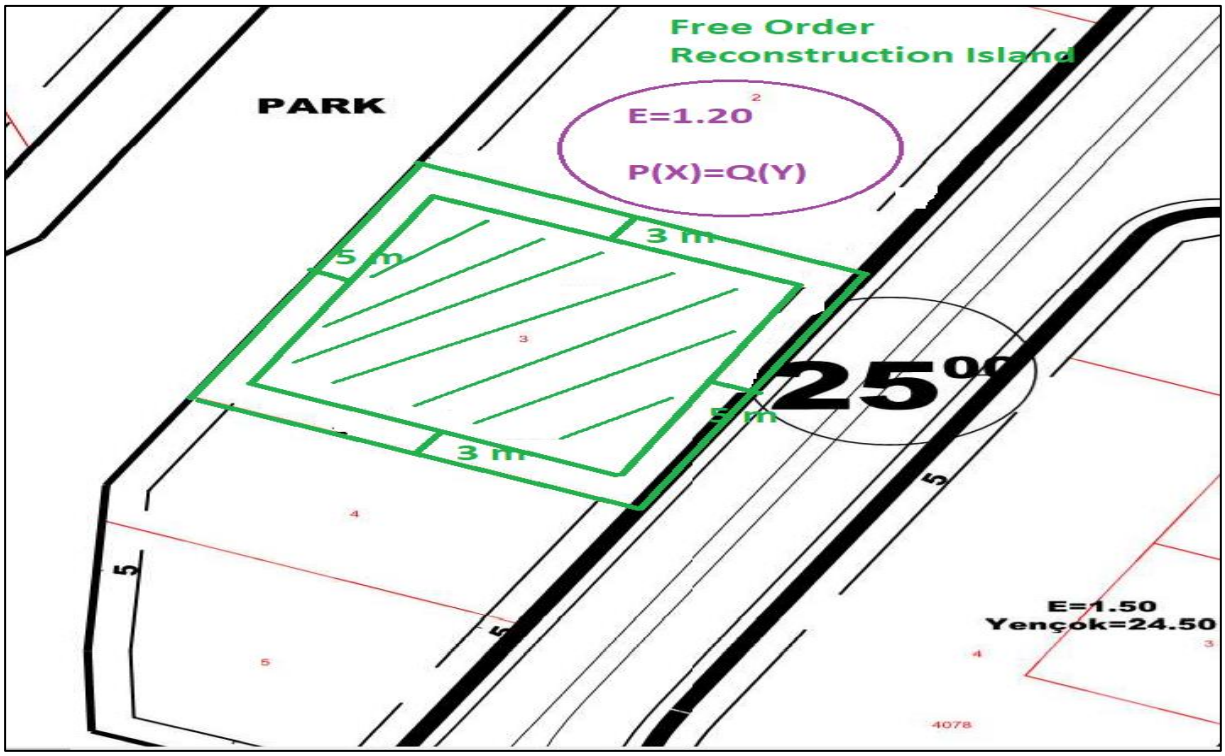

Fig. 4. Representation of the free building zoning island with a total construction area of 1.20

The building block with a coefficient of 1.20 in the total construction area and the building adjacent to a parcel in the identity of a free structure will be within 3 meters of the approach boundaries. It does not change as a result of increasing or decreasing the amount of coat. In the figure, the areas planned on a parcel in the west and east directions to the road are fixed to the type zoning regulation, 5 meters from their front sides, and the neighboring approach limit is 3 meters.

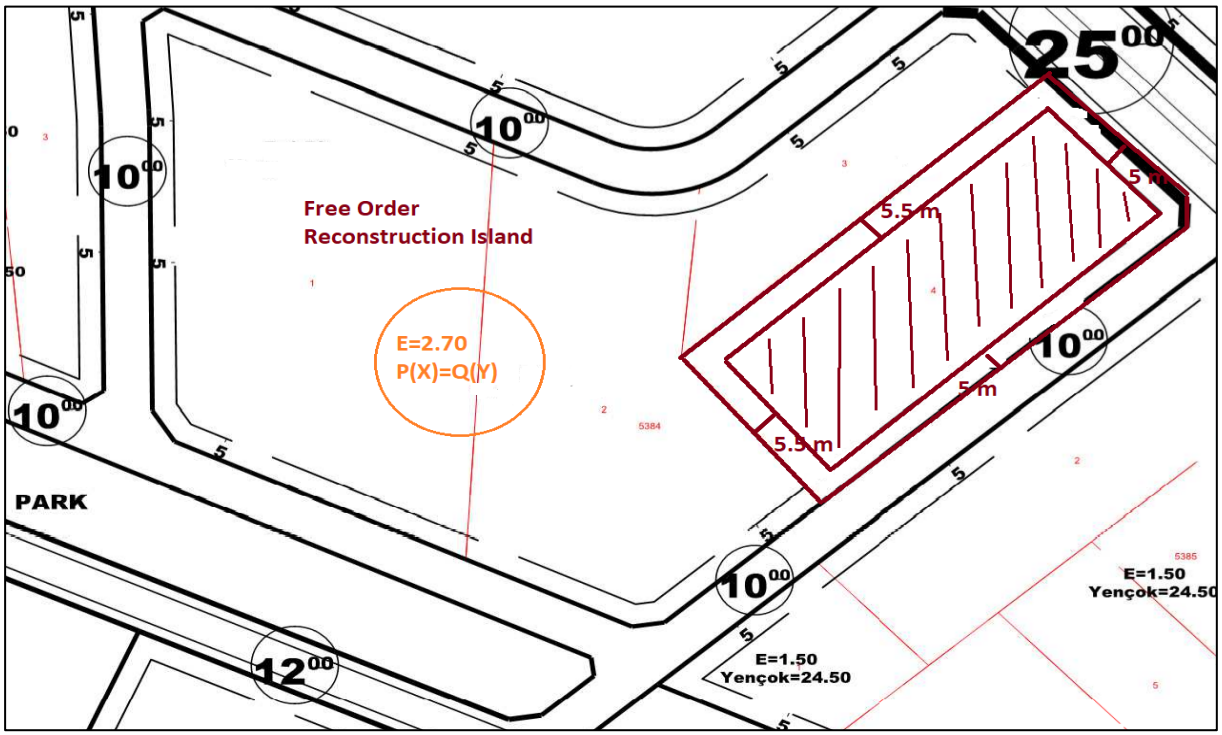

Fig. 5. Representation of the free building zoning island with a total construction area of 2.70

Since the total construction area has a coefficient of 2.70 in the display area of the parcel on the free identity zoning island, which has a geometrically convex structure, the double-fronted zoning parcel, which is considered as a corner parcel, is assumed to be 0.30 on the ground, and the approximation amount of the adjacent parcel is 5.5, assuming that it corresponds to 9 floors. meters will be. As we mentioned in the previous example, this amount will definitely increase or decrease in case of a decrease or increase in the floor in the project. P(x)=P(x+1)+……..+P(x+n) and Q(x)= Q(x+1)+……..+Q(x+n) to P((Q(x))) will be expressed mathematically.

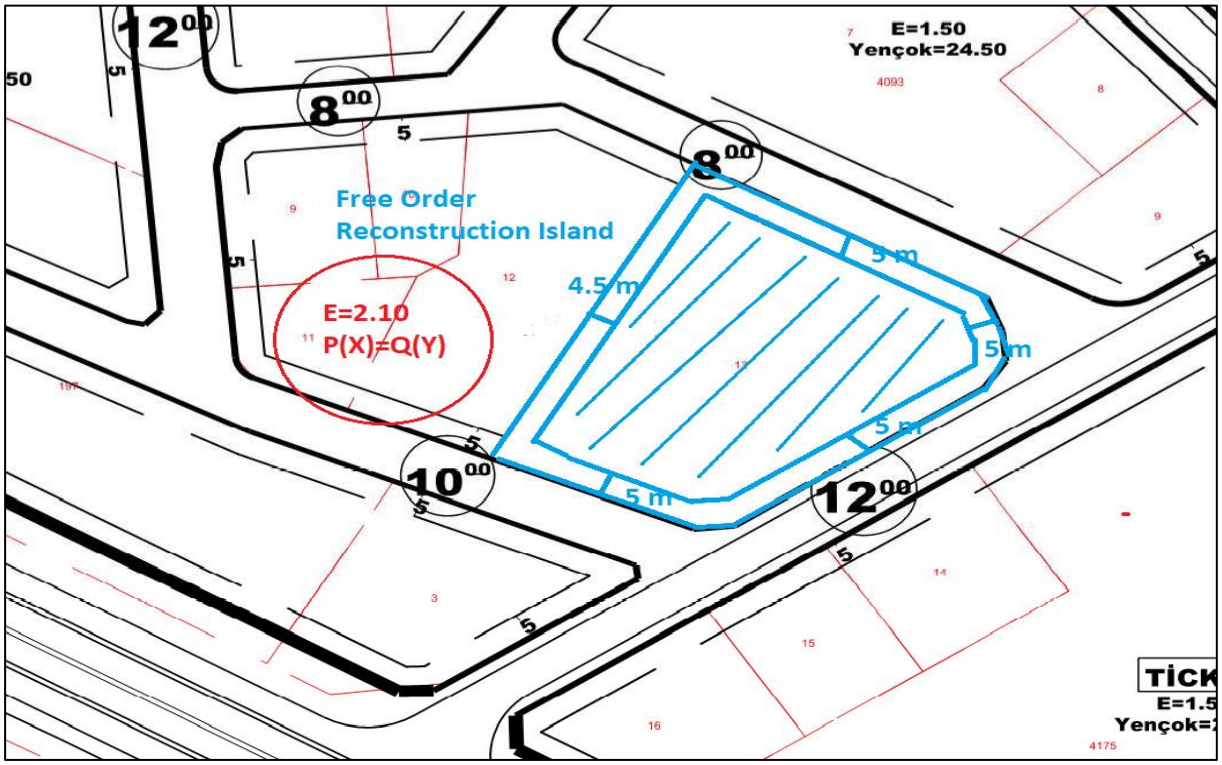

Fig. 6. Representation of the free building zoning island with a total construction area of 2.10

Considering the building residence area of the parcel with a total construction area of 2.10 in Figure 6, this part is important since the most important part will be the approach to the neighboring parcel. From here, we will evaluate the approximation part of the residential building on the ground of the parcel, which is 7 floors above the average, as 4.5 meters. We will argue that whatever P(x)+ Q(x) or P(x)-Q(x) is, it should be provided in a single equality and approached with the logic of the outside-in.

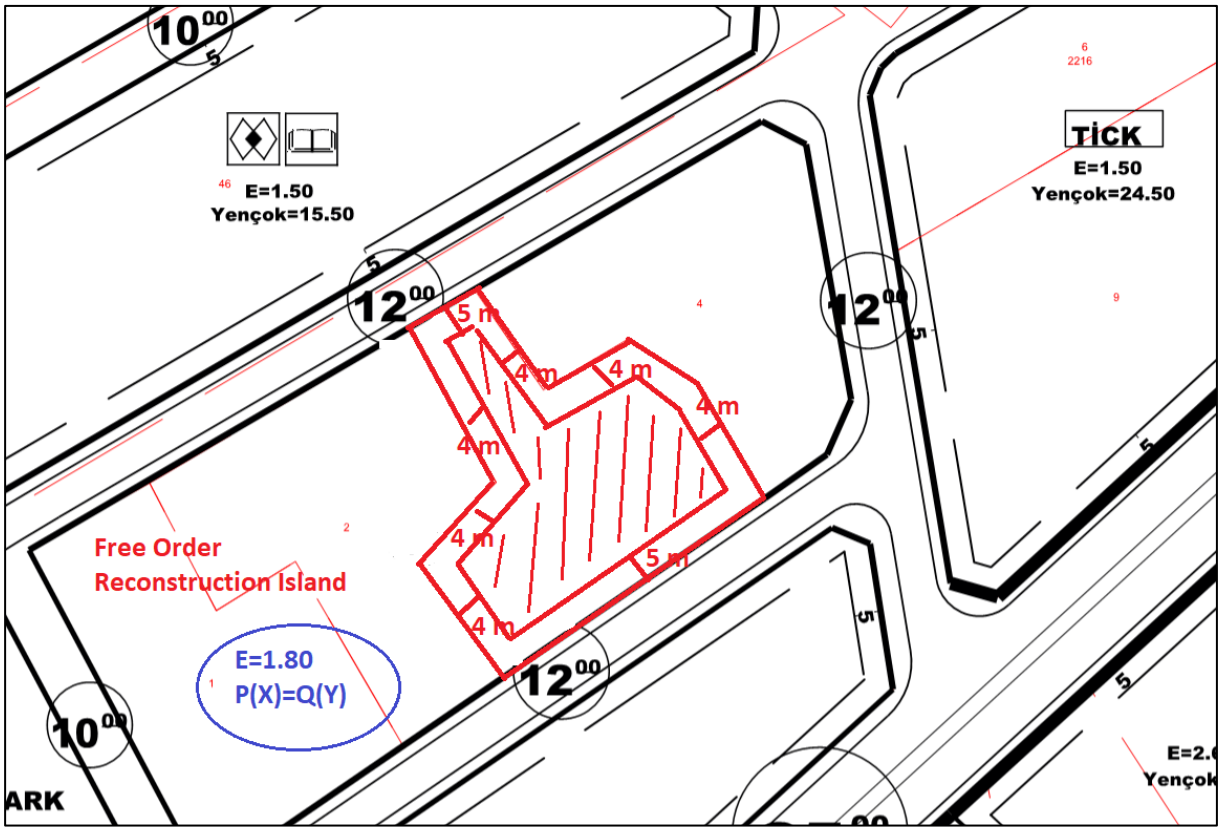

Fig. 7. Representation of the free building zoning island with a total construction area of 1.80

In Figure 7., when it is asked how to make an inference according to the identity of the building residence area, especially on a parcel that looks like a mixed shape, it is necessary to draw 4 meters as a side-by-side approach to the parcel with a free building identity, corresponding to 6 floors, in the same way as on the back side. The draw distance to be given to the relevant area will be evaluated in this way and the seating area will be determined with the same measure.

Table 1. Session area limit representation

Total equivalent P(x)	Front approach Q(x) m	Side approach Q(x) m	Rear approach Q(x) m
0.30	5	3	3
0.60	5	3	3
0.90	5	3	3
1.20	5	3	3
1.50	5	3.5	3.5
1.80	5	4	4
2.10	5	4.5	4.5
2.40	5	5	5
2.70	5	5.5	5.5
3.00	5	6	6
3.30	5	6.5	6.5

In the table, especially when the P(x) polynomial is expressed as peers, the Q(x) polynomial structure approximation limits of the zoning parcels on the islands with free structure identity are expressed.

5. Conclusion and Recommendation

It is extremely important that the zoning plans are made properly and that they are functional. In particular, while creating the island with special identities, except for the islands with the basic split, block and adjacent building identity, some parameters should be created by gaining certainty. The precedent value, which is one of these important factors in the identity of the free building, should be included in the plan. From the total construction areas to the relevant parcel, how the settlement chart will be formed on the ground should be applied based on this parameter. The number of floors should be determined in a certain amount and the adjacent and rear distances should be determined according to this number. Our suggestion is to eliminate the relative part of the residential area by giving the height coefficient along with the total construction area in these types of islands in the plans, so that the height of the building becomes certain.

Acknowledgment

He would like to thank Semih TAŞKAYA, MSc Metallurgical and Materials Engineer, for his contributions to the mathematical approach in the article.

Kaynaklar

1. **Arslan, C. (2016).** *Evaluation of Urbanization Policies in Development Plans in Turkey*, (Unpublished Master's Thesis), Ardahan University, Institute of Social Sciences, Ardahan.
2. **Akyol, N. (1997).** Problems Encountered in Zoning Practices, Trabzon.
3. **Büyükaslan, S. (2021).** *Problems Encountered in Zoning Practices and Solution Suggestions*, Çanakkale Onsekiz Mart University, Graduate Education Institute, Department of Geographical Information Technologies, Master's Thesis, Çanakkale.
4. **Chihara, T.S. (1978).** *An Introduction to Orthogonal Polynomials (1st Edition),* Gordon and Breach, New York.
5. **Çolak, N. I. (2014).** Zoning Law, Twelve Plates, Istanbul.
6. **Dinç, H. (2019*).*** *Life Models with Fractional Polynomials, Hacettepe University Graduate School of Education*, Department of Statistics, Master Thesis, Ankara.
7. **Gelir, M. (2021).** *Centralization Tendency in Zoning Plans, Yeditepe University Institute of Social Sciences,* Department of Law, Master's Thesis, Istanbul.
8. **Kalabalık, H. (2017).** *Zoning Law Courses, Updated, Enlarged Eighth Edition*, Seçkin Publishing House, Ankara.
9. **Kalbfleisch, J.;Prentice, R. L. (1980).** *The Statistical Analysis of Failure Time Data, Second Edition*, John Wiley & Sons, Inc, New York, Chapter 4.
10. **Keleş, R. (2013).** *Urbanization Policy*, 13th Edition, Imge Bookstore, Ankara.
11. **Lekesiz, E.G. (2021).** *Bivariate Finite Orthogonal Polynomial Families and Some Properties*, Ankara University, Institute of Science, Department of Mathematics, PhD Thesis, Ankara.
12. **Planned Areas Zoning Regulation. (2017).** *Official Gazette* (No: 30113, Date: 03/07/2017).
13. **Rainville, E.D. (1960).** *Special Functions. 1st ed., The Macmillan Company*, New York.
14. **Szego, G. (1975).** *Orthogonal Polynomials. American Mathematical Society Colloquium Publications,* 23, 4th ed. American Mathematical Society, Providence, Rhode Island.
15. **Sanli, D. (2009).** "Analysis of Planning Authority", Journal of Ankara Bar Association, 3, p. 47-58.
16. **Taştan, M. (2021).** *Gaussian Number Sequences and Polynomials*, Erzincan Binali Yıldırım University, Institute of Science and Technology, Department of Mathematics, PhD Thesis, Erzincan.
17. **Tereszkiewicz, A., Wawreniuk, I. (2015).** *Generalized Jacobsthal polynomials and special points for them, Applied Mathematics and Computation*, 268, 806–814. DOI:10.1016/j.amc.2015.07.002.
18. **Ulutas, T. B. (2021).** *Public Interest Criteria in Judicial Supervision of Zoning Plans,* Pamukkale University Institute of Social Sciences, Department of Political Science and Public Administration, PhD Thesis, Denizli.
19. **Utkucu, T.;Çağlan, E. (2019).** *Rant İmar İtibar*, Twelve Plates, Istanbul.
20. **Yıldırım, S.M. (2022).** *Discrete Bivariate Orthogonal Polynomials*, Ankara University, Institute of Science and Technology, Department of Mathematics, Master's Thesis, Ankara.
21. **Yıldız, F. (2016).** *Zoning Information. Planning, Implementation*, Legislation, Nobel Yayın Dağıtım, Ankara.
22. **Yomralıoğlu, T. (1997).** *Development Plan Implementation Techniques in Urban Area Arrangements,* Trabzon. 32- 39.