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Visibility Assessment of a Historical School Building through Isovists and Visibility Graph Analysis

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Abstract

City image includes people's perceptions of the built and natural environments as well as the emotions and ideas the city arouses in them. In the city image, the preservation of the buildings, especially historical buildings, which carry the past cultures, meaning and structural features of the city to the present day, can be ensured by making these buildings visible and perceptible by the inhabitants. Historical buildings' visibility can facilitate the recognition and appreciation of their historical significance, thereby contributing to the preservation of the city's cultural heritage. This study aims to analyse the visibility of a historical building that holds a significant place in the urban memory and to suggest recommendations for enhancing its visibility. In this context, the viewpoints used to examine the İskenderun Beş Temmuz Primary School Historical Building's visibility were specified by space syntax visibility graph analysis (VGA). Subsequently, the building's visibility in three different historical periods was determined by the isovists technique, utilizing these viewpoints. Based on the same viewpoints, an observational field study and a survey applied to 47 people were conducted. Consequently, it was identified that the historical building could not be sufficiently seen due to the presence of surrounding service structures, perimeter walls, and high buildings. Furthermore, this study proposed the removal of additional structures that negatively affect historical building's visibility. Additionally, a design approach was developed for new buildings and landscaping to enhance the historical building's visibility, and the efficacy of the proposed design was evaluated through isovists and VGA analyses.

Keywords

visibility, isovists and visibility graph analysis (VGA), city image, new building design in historical environments, Iskenderun Beş Temmuz Primary School

1 Introduction

According to Lynch, one's mental image of a city is a generalized representation of the outside world, and a city's imaginability—that is, its comprehension, legibility, and visibility—makes it appear unique and well-organized (Lynch, 1960). The visibility of historical and qualifying buildings that give meaning to the city also enables the city to create a positive city image and reflect its social memory. This study examines the historical building of Beş Temmuz Primary School, an important image element for the city of İskenderun. Despite the school campus located in the city center and on a busy axis, this historical building cannot be perceived sufficiently because it cannot be seen much while walking on the axis. In this study, we determined the visibility level of this historical building through various analyses, and consequently developed a design proposal to increase the visibility of the building. The analyses used in this study are isovists and visibility graph analysis (VGA), observational fieldwork and surveys. It can be said that the results of these analyses increase the reliability of the study through mutual control. The present study is composed of five parts. The initial part provides an explanation of the concepts of city image, visibility within city image, visibility in the space syntax method and the relation between visibility and new building design in historical environment, supported by relevant literature studies. The second part of the study describes the historical building selected as a case study and its immediate surroundings, outlining the changes it has undergone from the early 1900s to the present day. The third part describes the methods and analyses employed to investigate the visibility of the historical building, while the fourth part presents the findings. The concluding

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part presents the results of this study. In conclusion, we observed that the visibility of the historical building is partially obstructed by various reasons detailed within the scope of this study. In order to enhance its prominence in the city image, a design approach has been developed.

1.1 Conceptual framework

For individuals to navigate the built environment with ease and accuracy, it is crucial that they can perceive and identify the surrounding buildings, spaces, landscape, urban equipment, and landmarks. Lynch (1960) argues that the environment is constructed and defined through visual sensations, such as color, form, movement, and polarity of light, as well as through stimuli such as smell, sound, touch, motion, gravity, magnetic field, and electricity. Sensory organs receive stimuli from the environment, and personal characteristics such as past experiences, perceptual structure, subjective qualities, desires, needs, etc. contribute to the formation of an environmental image in the individual. Rapoport states that environmental appraisal is a general emotional response, largely influenced by images and imaginations, rather than a detailed analysis of specific aspects. As an example of this situation, a study conducted in England on the definitions of urban place pointed out that most of the answers consisted of emotional words (Rapoport, 1990).

Lynch (1960) defines the environmental image, which he describes as the strategic link of the path-finding process, as a picture in which the external world is generalized in mind. This image is a product of both immediate emotions and past experiences and is used to direct movement in the environment (Lynch, 1960). A legible environmental image facilitates the identification of walking routes in the neighborhood and provides an idea of the available activities.

The environmental image can also affect the emotions, feelings, and thoughts of those residing within it. Rapoport states that people react to environments according to the meanings that environments carry for them (Rapoport, 1990). The meaning of the environment to us is closely linked to the values it provides and the emotions it evokes, as well as the activities that take place within it. According to Rapoport (1990), meaning cannot be separated from function when evaluating the environment, and he considers meaning to be the most significant aspect of function. Individuals remember the functions performed in a particular environment and associate these functions with that environment. For instance, certain countries are associated with specific dance genres, food styles, festivals, and races. Appleyard (1969) suggests a combination of four reasons why people remember a place or location: the uniqueness of its physical structure, its visibility while travelling in the city, its opportunity for personal activities, and its cultural value in society (Appleyard, 1969).

Architectural structures play a crucial role in shaping the physical environment. They are highly valued for their contribution to the overall aesthetic and functionality of the environment. According to Madran, architectural structures contribute to the formation of urban memory while providing insights into the status of the city in a certain period, the knowledge, skills and taste of the inhabitants, social, cultural, and economic relations, and the dominant mode of production (Madran, 2001).

Landmarks also play an important role in the formation of urban memory. Landmarks, which Lynch (1960) defines as one of the components of the city image, are unique elements that are point references for observers and easily remembered in context. Landmarks that stand out in the urban fabric thanks to their location, size, form, texture, meaning, etc. are the buildings that are more associated and remembered with the city. To maximize their visibility, Evans et al. (1982) recommend positioning land marks close to city crossroads. Easily visible structures that are physically different from their surroundings function as memorable landmarks. Abeynayake et al. (2022) emphasize in their study that there is a positive relationship between the level of visibility of landmarks within the city and people's perception. Therefore, it is essential to preserve landmarks, particularly historical ones that blend with and become an integral part of the environment. These buildings serve as a testament to the environment's past and present, contribute to the formation of the environment's image and identity, and hold a special place in the memories of its inhabitants. The visibility of these structures from various points in the neighborhood will help in their recall. Appleyard argues that visibility is an important component for remembering, stating that a building cannot project an image unless it is seen. He states that visibility is the visual equivalent of accessibility and a measurement that depends on the focus of the actions and vision of the inhabitants of the city (Appleyard, 1969).

Hillier and Hanson (1984) developed space syntax theory as well as a collection of analytical, quantitative, and descriptive techniques for analyzing space layout characteristics in a built environment. Visibility is a crucial concept in the space syntax methodology and is included in the graphic analysis of architectural and urban space

configurations. Visibility refers to the visual information provided to observers at any location. According to Al-Sayed et al. (2014), the built environment's visual information can aid in estimating the movement accessibility of spaces. Visibility is determined by the geometry of the space and the observer's movement. This concept is based on Benedikt's 'isovist' method, which describes space by considering the perception of the moving observer. Benedikt (1979) describes an isovist as "the set of all points visible from a given vantage point in space". The size and shape of an isovist may vary depending on its location (Benedict, 1979). Isovists can be defined for each viewpoint that forms an environment. The spatial combination of a given geometric feature defines a given isovist area, which is represented as a polygon (Batty, 2001). Various quantitative descriptors can be derived from these polygons, such as area, perimeter length, number of vertices, and length of open or closed edges. These descriptors reflect the physical properties of the relevant space (Franz et al., 2005).

Benedikt proposes that defining an environment through isovist fields allows for the prediction of trends, optima, and limits regarding possible spatial behaviors and perceptions. This description can be used to assess the fundamental spatial qualities of environments where conscious or unconscious perceptions can guide higher cognitions and behaviors. He also suggests that isovist field could serve as a foundation or contribute to a more comprehensive description of the environment (Benedikt, 1979). Turner et al. (2001) state that isovists are an intuitively appealing way of thinking about a spatial environment because they provide a description of space from the inside, from the perspective of individuals as they perceive, interact with and move through it. Franz et al. (2005) mention that there is the first empirical evidence that isovists capture environmental features of space related to spatial behavior and experience.

Isovists are basically polygons that define the area visible from a given observation point and capture the spatial properties of that area. To better describe the spatial characteristics of an environment as a whole, Turner et al. (2001) proposed the technique of visibility graph analysis (Franz et al., 2005). The researchers created an undirected graph linking all visible points on a human-scale grid. The product of this notation is a graph in which each point is noted as a node, and the visibility condition for connecting one node to another is the visibility between them (Al-Sayed et al., 2014). A visibility graph is a graph of mutually visible locations in a spatial layout, and visibility graph analysis investigates the properties of a visibility graph derived from a spatial environment (Turner et al., 2001).

According to Turner (2003), visibility analysis can be used to discuss the morphological characteristics of the built environment, how people can move and interact within the visible space, or to explore the significance of objects placed within that space (Turner, 2003). Batty states that questions such as what can be seen from different viewpoints and how much can be seen from different distances are important to the development of good design, and argues that the appropriate theory of space should answer these questions (Batty, 2001).

DepthMap, developed by Alasdair Turner (2003), is a single software platform for performing a range of spatial network analyses designed to understand social processes within the built environment (Turner, 2004). In visibility graph analysis, the program divides any plan into a grid, the size of which can be specified by the user, and enables the creation and examination of a visibility graph representing the visible connections between different point locations at the center of each grid. Visual relationships between different nodes in the system can be calculated using different local and global metrics in Depthmap (Al-Sayed et al., 2014). Visual integration is a global measure of the visual distance from all spaces to all others (Hillier, 1996). Visual integration represents the potential core area where most of the layout is visible and the person(s) can be easily seen. It can be assumed that people want to be in such areas if they want to perceive the whole settlement and communicate with others (Al-Sayed et al., 2014).

A significant part of the current Space Syntax literature focuses on modeling human behavior through the study of the spatial configuration of urban systems. Yunitsyna and Shtepani (2023) analyzed the spatial integration, connectivity and visual exposure of open spaces and roads in conjunction with land use patterns and revealed areas that facilitate social and commercial activities. The study results indicate a correlation between the type and location of activities and spatial and visual integration. Şahin Körmeçli (2022) analyzed the visibility of park design in a historical area and attempted to determine how well the visible area integrated with the design concept. Bartie et al. (2008) stated that a filter based on the visibility of features is an additional capability made possible by digital surface models and proposed a set of visibility criteria for ranking items according to meaningful priority using a historical landmark as a case study. Sarıhan (2021) proposed a methodology for guiding the design and planning

research of heritage sites by linking perceptual behavior with knowledge of the built environment. By modelling both the heritage environment and heritage items according to designated visibility criteria, the author aimed to evaluate the identification of items that should be preserved.

According to Sola-Morales Rubió, a new work of architecture not only establishes a physical and spatial relationship with the existing but also a visual one (1996). Providing a physical, spatial, functional as well as visually respectful association with the existing one should be one of the main principles of new construction (Bilgin Altınöz, 2010). Charter for the Conservation of Historic Towns and Urban Areas (ICOMOS, 1987) states that new construction in the historical environment should respect the context and that the use of contemporary elements in harmony with the surroundings can be an important tool for enriching the area. Avoiding approaches that will limit the visibility of historical buildings in terms of location, scale, contour, and height features in new constructions and landscaping will contribute both to the preservation of historical buildings and their identification as a city image element - a landmark. Eventually, this paper aims to make a modest contribution to the literature by using descriptive and syntactic concepts to address a framework for examining the visibility of a historical building and defining new building design proposals that improve its visibility.

1.2 Historical and architectural characteristics of the case study area

In this study Beş Temmuz Primary School in İskenderun district of Hatay province was selected as a case study. Among the reasons for selecting of this school are that the building is located on Namık Kemal Street, one of the main axes in the center of İskenderun city (Güngör and Harman Aslan, 2020), it is an important identity element for the city, and it contains a historical building. Although Beş Temmuz Primary School is a significant element of the city image and its location is known by the residents, it can be said that the visibility of the historical school building from the street is not at a sufficient level. Beş Temmuz Primary School, located in the center of İskenderun, is on Namık Kemal Street, which feeds the main arteries perpendicular to the sea in the 2nd Mıntıka district. On Namık Kemal Street there are important public buildings such as the Social Insurance Institution, Post Office Building and schools. In the vicinity of Beş Temmuz Primary School, there are prominent buildings in the city image, such as multi-storey car park, Orthodox Church, İskenderun High School (Fig. 1).

On the general cadastral map of Iskenderun prepared by the French in 1929 (Bibliothèque Nationale De France, 1929), there is an American Church and an American School in the area where the historical building of Beş Temmuz Primary School is located today. This

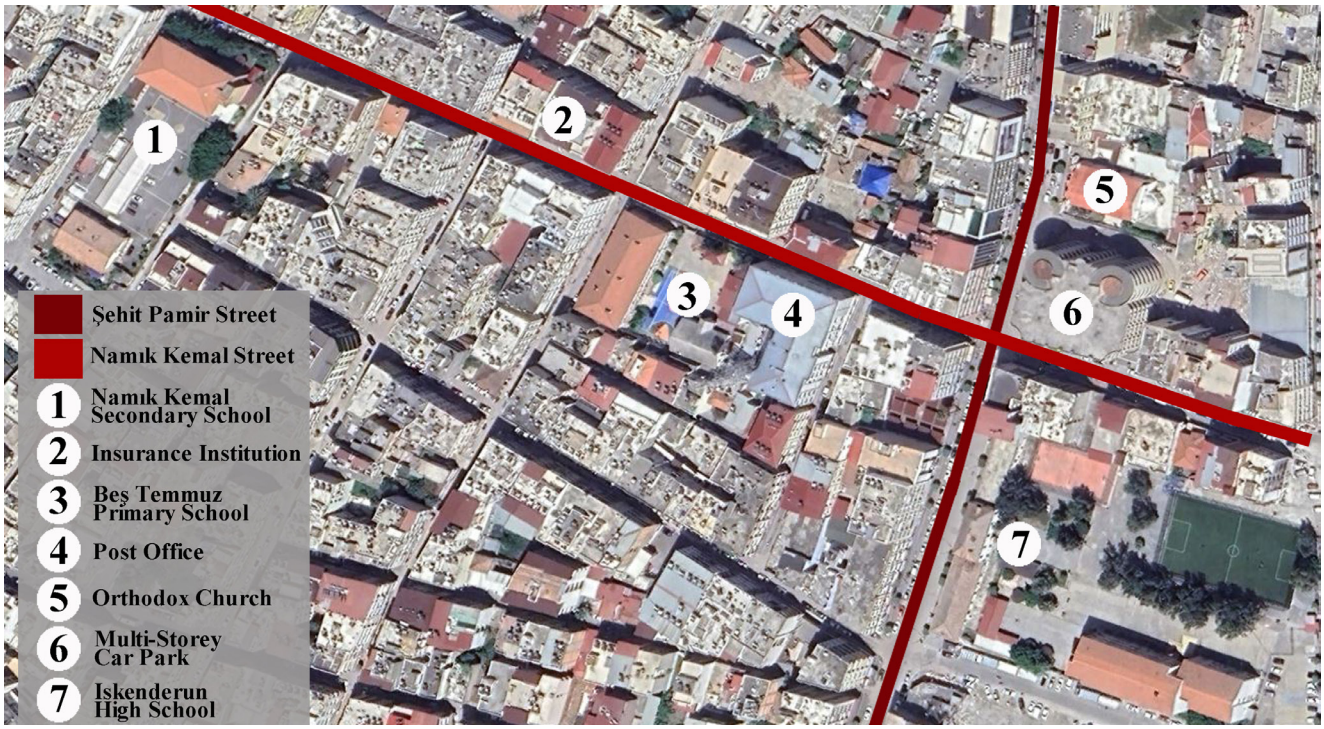

Fig. 1 The location of Beş Temmuz Primary School (Prepared by the authors using Google Earth map)

map shows that the historical building was used as a school. There were also buildings in the area where the new school building now stands (Fig. 2). It is believed that these buildings were wooden structures used for educational purposes prior to the existing multi-storey reinforced concrete structure when Beş Temmuz Primary School was first opened. In his study, Garbioğlu named Beş Temmuz Primary School as the İskenderun British School and stated that this historical building belonged to the British Society, citing the interviews he conducted (Garbioğlu, 2017).

According to the French map, the Post Office Building, which is now located next to the Beş Temmuz Primary School, was replaced by the İskenderun Primary School for Girls. Ürkmez (2012) states that this building, whose name is noted as 'Ecole De Letat' on the French map, was opened in 1901 (Fig. 2).

It is unclear for what purpose the historical building, which served as a Boys' Art School between 1940-1966, was used in the following years (Garbioğlu, 2017). It should be noted that the church, school and wooden buildings shown on the French cadastral map are preserved with minor additions, in the 1982 development plan. The inscription "Beş Temmuz Primary School" on the plot indicates that these buildings were used as a primary school at the time. There was also no multi-storey Post Office Building at the period (Fig. 3). According to Garbioğlu (2017), the new building of Beş Temmuz Primary School was constructed in 1986, as reported by the school administration.

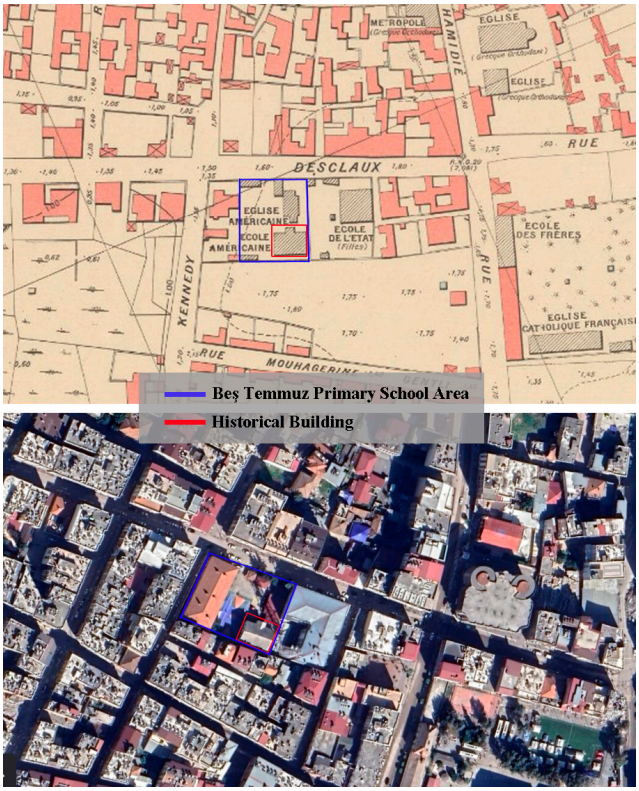

Fig. 2 On the top, the area where Beş Temmuz Primary School was located on the 1929 French cadastral map of Iskenderun (Source: Revised by the authors from the original 1929 French cadastral map at Bibliothèque Nationale De France); on the bottom, the area where Beş Temmuz Primary School is located today (Prepared by the authors using Google Earth Map)

Beş Temmuz Primary School is situated on an area of approximately 2700 m^2. The school comprises a reinforced concrete main building (modern) constructed in 1986 and a historical building. The historical building is used for various purposes such as education and storage, while education is primarily conducted in the reinforced concrete main building. The main building is three storeys high and has a hipped roof. In the north-eastern part of the historical building, there are single-storey service units, including a transformer, security and canteen (Fig. 4).

The Beş Temmuz Primary School Historical Building is a rectangular, two-storey masonry structure measuring approximately 12 × 18 meters. The entrance, which protrudes 5 × 2 meters, is located on the building's symmetry axis and faces northeast. The building features a gable roof sloping on both sides that intersects perpendicularly with a smaller roof over the entrance projection. Access to the ground floor is through the arched main entrance door located in the north-east. Rectangular windows are present on both the ground and upper floors of the building. From the school garden, one can see the north and west facades of the historical building. However, the east side of the main entrance façade (the north façade) is not visible due to an adjacent building on the ground floor level. Furthermore, the south and east facades are not visible due to the close proximity of neighboring buildings in other directions (Fig. 5). Following the earthquakes on 6 February 2023, no significant structural damage was found in or around the Beş Temmuz Primary School area.

The Beş Temmuz Primary School Historical Building was registered as a cultural asset by the board's decision numbered 3553 and dated 17.07.1987 (T.C. Hatay Valiliği, 2011).

2 Methodology

This study applied three different methods and conducted various analyses to determine the visibility level of the İskenderun Beş Temmuz Primary School Historical Building (Fig. 6). Firstly, using visibility graph analysis (VGA), we identified the viewpoints to be used to reveal the level of visibility of the historic building. Subsequently,

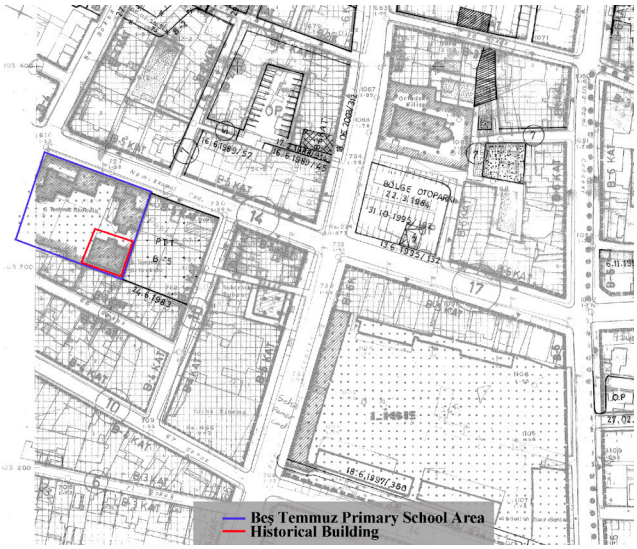

Fig. 3 Beş Temmuz Primary School in the development plan dated 1982 (Source: Revised by the authors from the original development plan dated 1982 at İskenderun Municipality Archive)

we determined the visibility levels belonging to different periods, which demonstrate the physical changes undergone by the building, using the space syntax isovists technique from the designated viewpoints. Thus, the changes in the visibility levels caused by the new buildings and environmental arrangements that developed around the historical building in the historical timeline were quantified. Again, we determine the visibility of the historical building from the designated viewpoints through both observational fieldwork and the surveys conducted with the participants living in İskenderun. By comparatively evaluating the results of these three different analyses, we have revealed the level of visibility of the historical building. As a result, we developed design approaches for additional new buildings and landscaping to improve the visibility of the historic building and its contribution to the city image. Finally, the efficacy of the proposed design in enhancing the visibility of the historical building was evaluated through isovists and VGA analyses.

Fig. 4 Service units built around the historical building, new and historical school buildings (Prepared by the authors using Google Earth Map, Photos Source: Authors' Archive)

Fig. 5 North and west facades of the historical building visible from inside the school courtyard (Source: Authors' Archive)

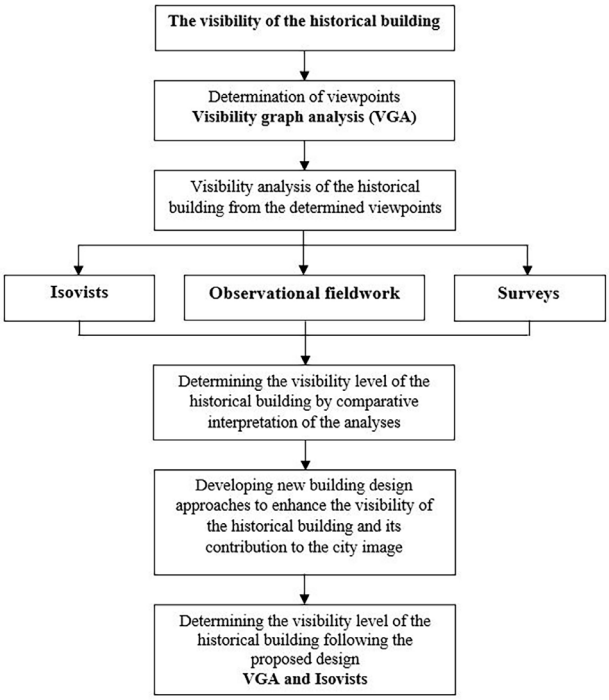

Fig. 6 Study framework

2.1 Space syntax isovists and Visibility Graph Analysis (VGA)

We conducted a syntactical analysis of the study area's visibility by applying an an isovist and a visibility graph analysis (VGA). Specifically, we used the UCL DepthmapX 0.8.0 software to represent and calculate syntactical values. We produced a visual integrity map of the Beş Temmuz Primary School and its surrounding as an output of the visibility graph analysis, to define the study area's visual characteristics and to specify the viewpoints. We then used the isovist technique to indicate the visible areas from the designated viewpoints.

2.2 Observational fieldwork

Appleyard argues that visibility is an important component for remembering, stating that a building cannot project an image unless it is seen. He states that visibility is the visual equivalent of accessibility and a measurement that depends on the focus of the actions and vision of the inhabitants of the city (Appleyard, 1969). In his study, Appleyard measured the visibility of each building using the characteristics of three components. The first is viewpoint density, which is an estimate of the number of people who can regularly see the building from the most frequently used viewpoint. The second is the importance of the building from the viewpoint, which refers to the building's location at important decision points or transit points on the city's circulation system. The third is the proximity of the building, which indicates its centrality in the line of sight (Appleyard, 1969). As Appleyard said in his study, this study aims to determine the level of visibility of the historical building by standing at the viewpoints from which it can be seen. In addition, fieldwork was undertaken to understand the level of visibility of the historical building from specific points. Groat and Wang define fieldwork as a methodology that concentrates on the examination of single or multiple phenomena in real-life contexts and explained in a cause-and-effect relationship. This method, which allows for the development and generalization of theory in design research, ought to provide confidence in a phenomenon that has numerous sources (Groat and Wang, 2013). In this article, we conducted a field study by documenting the buildings that can be seen when looking at the historical school building from certain viewpoints on Namık Kemal Street. The visibility of the historical building was assessed by stops at six specific locations along Namık Kemal Street. The six points selected are the locations where the historical building is partially visible (2, 3, 4), the nodes in the research area (1 and 6) and the points where the historical building is not visible at all (5 and 6). Furthermore, viewpoints A, B, C (Fig. 7) determined by the VGA analysis correspond to viewpoints 1, 3 and 6 in the observation analysis, respectively.

The observational fieldwork was completed before the February 6, 2023 earthquakes. Following the earthquakes on 6 February 2023, no significant structural damage was found in or around the Beş Temmuz Primary School area.

2.3 Survey method

One of the methods used in the study is the survey method. The purpose of this survey was to gather information regarding the image of Namık Kemal Street as well as the visibility of the Beş Temmuz Primary School Historical Building. The purpose of this survey is to get an idea about the visibility of the historical building examined from the participants passing through the region, except for isovist analysis and observational fieldwork. In addition, in the survey, the participants were asked to provide suggestions for both the improvement of the street where the historical building is located and the visibility of the historical building. As a result, a design approach was developed in accordance with these suggestions. In order to enhance the reliability of the study, the outcomes of the syntactic analyses were subjected to a comparative analysis with the results of the questionnaire analysis conducted on the users of the area.

The first ones on the survey concerned the participants' demographics, the buildings they were familiar with on Namık Kemal Street, and their reasons for using the street. After then, questions about the past and present condition of this street as well as proposals for improvement of street were asked to the participants. The participants were then asked about the buildings they saw when they stopped at the designated points on this street (Fig. 7), the historical building(s) they knew on the street and their suggestion how to make the known historical building more visible. In December 2022 and January 2023, a total of 47 people were given surveys. The data obtained from the questionnaires were analyzed using frequency and multiple frequency (since there was more than one answer option) analyses.

As a result, the results of the analyses obtained from the three different methods were combined and compared with each other in order to understand the visibility of the historical building of İskenderun Beş Temmuz Primary School and to develop suggestions for improving the visibility of this building.

3 Research findings

This part of the study presents the findings of isovist and visibility graph analysis (VGA), observational fieldwork and survey data analysis to understand the visibility of the historical building of İskenderun Beş Temmuz Primary School.

3.1 Findings of isovist and Visibility Graph Analysis (VGA)

To measure the visibility of the Beş Temmuz Primary School Historical Building, we used isovist and visibility graph analyses. During the initial stage of the analysis, a visibility graphic analysis (VGA) was conducted to identify the points from which the visibility of the historical building will be measured. In the second stage, we analyzed isovist areas using the determined viewpoints.

Upon analysis of the visibility graphic, it is evident that the visual integration values are high (indicated by the color red) at the intersection points of the main road axes. These points indicate potential core areas where many parts of the site are easily visible (Al-Sayed et al., 2014). For this reason, two viewpoints (points A and C) were determined at the intersection points of Namık Kemal Street, where Beş Temmuz Primary School is located, and Şehit Pamir and Şehit Oğuz Yener Streets, which cut it perpendicularly. Furthermore, the front of the school garden gate, which offers the best view of the historical building from Namık Kemal Street, has been identified as a third viewpoint (Point B) due to its high visual integration value (Fig. 8).

The second stage involved an isovist analysis to reveal changes in the visibility of the historical building of Beş Temmuz Primary School over time. In this analysis, the visibility of the historical building was questioned from determined viewpoints A, B and C for three different periods

Fig. 7 The three viewpoints from which participants were asked to stand and name the buildings they could see during the survey (Revised by authors using Google Earth Map)

Fig. 8 Visibility graph analysis (VGA) of the immediate surroundings of Iskenderun Beş Temmuz Primary School

using the French cadastral map of 1929, the İskenderun development plan of 1982 and the updated basic plans. Based on the analysis conducted at point A, it was determined that the visibility of the historical building was low during all three periods due to the presence of other buildings in front of it and the surrounding walls (Fig. 9). From point B, assuming that the garden gate is open, it is understood that in the cadastral map of 1929 and the development plan of 1982, the western and partially northern façades of the building can be seen due to the church building in front; in the current situation, although there is no church, the historical building cannot be seen even from the gate due to the recently added service structures (Fig. 9). From point C, the historical building was not visible during three different periods due to obstruction by other buildings (Fig. 9).

Upon evaluation of the historical process, it is evident that the Beş Temmuz Primary School Historical Building is not easily visible due to the surrounding buildings and garden walls. The visibility of the historical building has gradually decreased over time. This is due to a church in the north, buildings in the west and east according to the 1929 cadastral maps; a church in the north and a building in the west according to the 1982 development plan; service buildings in the north, a new school building in the west, and a multi-storey Post Office Building in the east according to the basic map.

3.2 Findings of observational fieldwork

This study investigated the visibility of the Beş Temmuz Primary School Historical Building from some points stated in Fig. 10. In Fig. 10, when we stand at the first viewpoint and look towards Beş Temmuz Primary School, the historical building of the school is not visible, while the new school building, which is stated to have been built in the 1980s, is visible. Part of the roof eaves and the upper portion of the historical building are visible while observing the school building from the second viewpoint.

Looking towards the school from the third viewpoint in Fig. 10, the roof of the historical building and the rectangular windows on the upper floor can also be seen. Yet, the ground floor windows of the school's historical building are not visible when you stop at the third viewpoint. Nevertheless, the third viewpoint can be stated as the point where the historical building can be seen well.

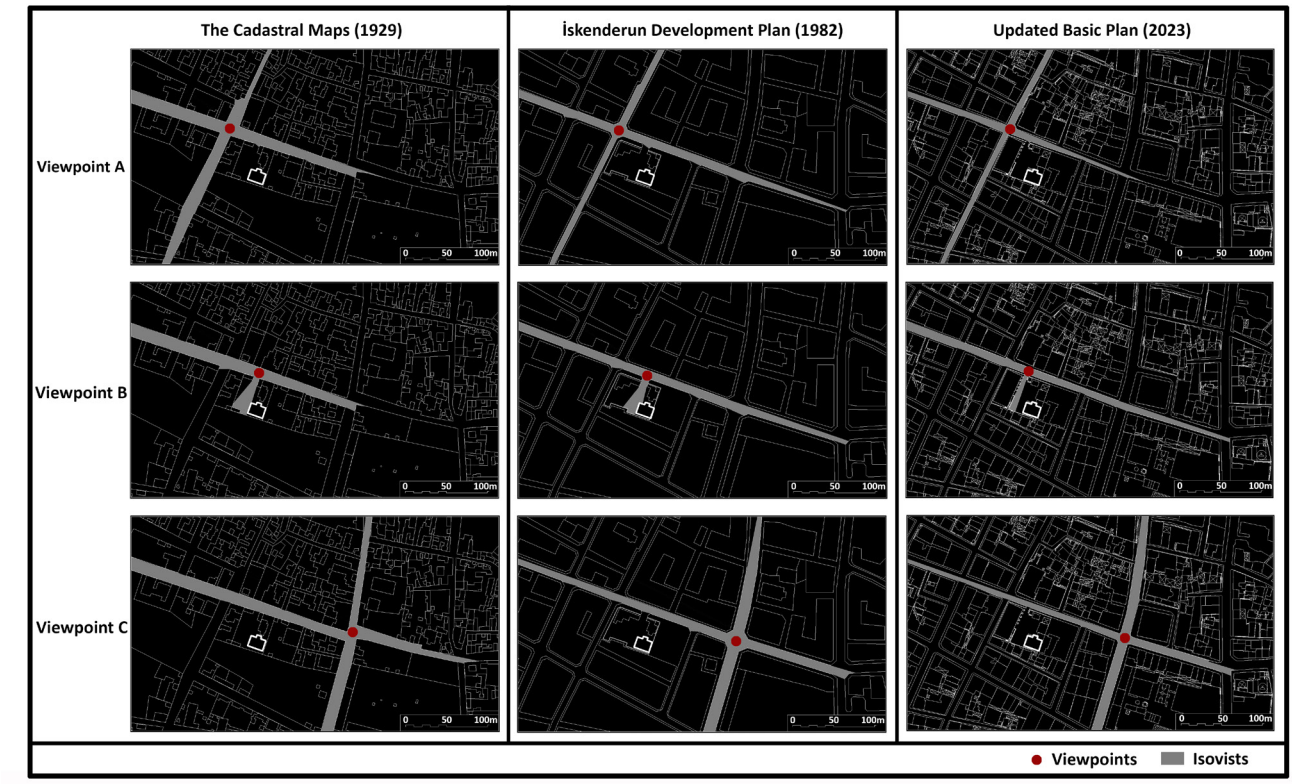

Fig. 9 Isovist analysis of the historical building from points A, B and C according to the French cadastral Map (1929), Iskenderun development plan (1982) and current situation

In addition, Namık Kemal Street, where Beş Temmuz Primary School is located, is a busy street in terms of traffic. The Beş Temmuz Primary School's garden wall, the single-storey service buildings adjacent to the wall, the high-rise buildings next to the historical building, and the traffic density on this street all make it harder to see the school's historical building. Due to the Beş Temmuz Primary School's garden wall and the advertising signs in front of the school, when standing at the fourth viewpoint in Fig. 10 and gazing at the historical structure, the only thing visible is the roof. When observing the historical building from the fourth viewpoint in Fig. 10, only the roof of the building can be seen due to the garden wall of Beş Temmuz Primary School and the billboard in front of the school. Viewing the historical building from the fifth viewpoint, it can be said that the historical building cannot be seen because the Post Office Building, which is about four floors high, is in the field of view. It is possible to say that both of the school's historical building and its new building are invisible when we stop at the sixth viewpoint.

Looking from Namık Kemal Street toward the historical building, one can see the four-storey Post Office Building, the four-storey new school building, and the five- and six-storey adjoining buildings. Looking at the street silhouette of the historical building in Fig. 11, the four storey Post Office Building, the four storey new school building, five and six storey neighboring buildings can be seen. Partially the upper floors and roof of the historical building can be seen in the street silhouette. The width of the road around the school is 7-8 meters for vehicles and approximately 2 meters for pedestrians (Fig. 11).

3.3 Findings of the survey method

Of the 47 survey participants, 28 were male and 19 were female, and 32 of the participants were married and 15 were single. Of the 47 respondents, 15 are aged 40-49, 10 are aged 30-39, 8 are aged 50-59, 6 are aged 18-29, 6 are aged 60-69 and 2 are aged 70-79. Regarding the educational level of the respondents, 21 are university graduates, 11 are high school graduates, 7 are PhD graduates, 3 are master's graduates, 2 are high school graduates, 2 are secondary school graduates and 1 is a primary school graduate. Regarding the occupations of the respondents, 20 people work as civil servants, 10 as tradesmen, 10 as professionals and 7 as workers. 24 of the 47 participants were from İskenderun, while 23 were from outside İskenderun. While 30 respondents have lived in İskenderun for more than 30 years, 6 respondents have lived in İskenderun for 24-29 years, 6 respondents for 0-5 years, 3 respondents for 12-17 years and 2 respondents for 6-11 years.

Fig. 10 The historical building's visibility and the view of the Beş Temmuz Primary School Historical Building from specific viewpoints (Source: Revised by the authors from the base map at İskenderun Municipality Archive, Photos: Authors' Archive)

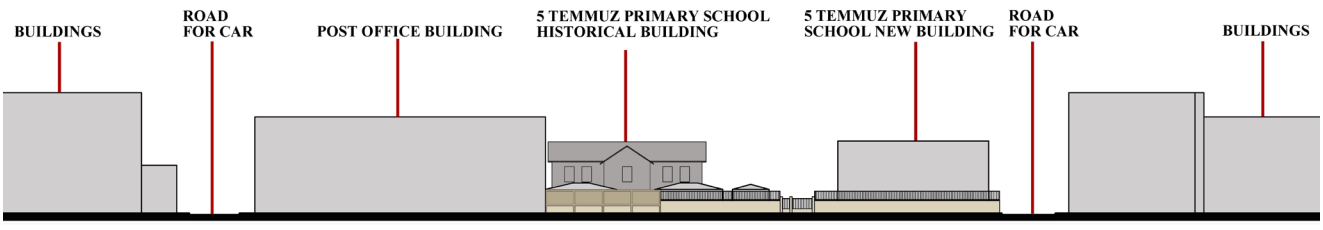

Fig. 11 The historic building of the Beş Temmuz Primary School in the silhouette of the street

The survey results show that people on Namık Kemal Street were mainly there to shop (22%), to go to official institutions such as post offices and social insurance institution (22%), and because they had a workplace in the area (22%). Of the participants, 16.9% indicated that they were on this street for transportation purposes, while 11.9% stated other reasons such as going the hairdresser. 5.1% of the participants indicated their purpose for coming to this street was to visit the shops on it. Participants were then asked questions about three well-known buildings on this street. The most known buildings were the Post Office Building with 27.80%, Beş Temmuz Primary School with 23.60% and Namık Kemal Secondary School with 14.60% (Table 1).

When asked to explain the oldest version of this street in three sentences, 17.10% of the participants admitted their lack of knowledge on the street's earlier form. Another 17.10% mentioned the presence of the Aslanlı Kiosk on the street, which has been demolished. 36.80% of the participants mentioned various factors such as highway directorate building, residential buildings, the Post Office Building, and busy streets. 13.20% of the participants reported no change in their surroundings, while an additional 13.20% reported that the area previously consisted of 1-2 storey buildings with gardens and tile roofs. 1.3% of the participants stated that the street had a narrow road width, while another 1.3% reported the presence of a wooden building instead of the current new school (Beş Temmuz Primary School).

When the participants were asked to sum up the present state of this street in three sentences, 27% of the respondents described it as "confused", "disorganized", "crowded", "ordinary", "chaotic" or similar terms. 22.30% of the participants reported that the traffic on this street is congested and busy. 10.80% reported the presence of tall buildings on the street, while another 10.80% reported that the street width is narrow (Table 2). Table 2 shows that 8.10% of the participants reported a lack of landscaping on the street, 6.10% reported a lack of parking facilities, and 6.10% reported that the buildings were not aesthetically pleasing.

When participants were queried about potential enhancements for this street, the prevailing response (17.80%) was "infrastructure-integrated planning-street widening". To enhance the street (Table 3), it is also recommended to resolve the traffic issue (17.20%), conduct landscaping arrangements (15.90%), solve the parking problem (8.90%), ensure the aesthetic appeal of nearby buildings (8.30%), and reduce the height of surrounding buildings (7.60%).

Subsequently, participants were questioned about their observations at the locations identified by the VGA analysis: on the street (viewpoints A, C) and across from the entrance gate of Beş Temmuz Primary School (viewpoint B). At viewpoint A in Fig. 6, 41.80% of the participants reported seeing Beş Temmuz Primary School (new building), while 23.60% observed residential buildings, tradesmen, and jewelry stores. Furthermore, 20% of the participants noticed the Post Office Building (Table 4).

At viewpoint B in Fig. 6, 39.50% of the participants reported seeing the new building of Beş Temmuz Primary School, while 31.10% reported seeing the historical building of Beş Temmuz Primary School and 14.30% reported seeing the Post Office Building. At viewpoint C in Fig. 6, 21% of the participants reported seeing the multi-storey car

Table 1 Survey findings regarding the known buildings located on Namık Kemal Street

Please provide the names of three buildings located on this street.	Percentage
Post Office Building	27.80%
Beş Temmuz Primary School	23.60%
Namık Kemal Secondary School	14.60%
Others (Private teaching institutions, stationery shop, office block, bakery, vb.)	11.10%
Social Insurance Institution	10.40%
Kaysar Dental Center	6.90%
Passage of Jewelers	2.10%
Türk Telekom Building	1.40%
Multi-storey Car Park	1.40%
Pharmacy	0.70%

Table 2 Survey findings describing the current state of Namık Kemal Street

Please describe the current state of this street in three sentences	Percentage
Others (Confused, disorganized, crowded, chaotic, ordinary, unaesthetic, depressing, etc.)	27.00%
Traffic is heavy and congested.	22.30%
There are tall buildings.	10.80%
The street is narrow.	10.80%
There is no landscape arrangement.	8.10%
There is no car parking space.	6.10%
The buildings are not aesthetic.	6.10%
There is a lot of noise.	3.40%
The pedestrian path/sidewalk is narrow.	2.00%
The street is unsafe in the evenings.	1.40%
Street lighting is insufficient.	1.40%
There is no place to rest.	0.70%

Table 3 Suggestions for the improvement of the street

What do you suggest for the improvement of this street?	Percentage
Other (holistic planning can be done, the street can be widened, building island spaces can be turned into gardens, there should not be parking on the street, signboards can be placed, infrastructure can be solved, bicycle path can be provided, schools can be moved to a wider area, Post Office Building should not be on this street, the street can be closed to traffic, etc.)	17.80%
The issue of traffic should be addressed with a focus on reducing congestion and finding solutions to alleviate the problem.	17.20%
Landscaping arrangements/parks should be created.	15.90%
The issue of car parking needs to be addressed by providing a designated parking area.	8.90%
The appearance of the surrounding buildings should be visually pleasing. Facade rehabilitation and coloring may be necessary to achieve this goal.	8.30%
The height of the surrounding buildings should be decreased.	7.60%
The pedestrian path should be arranged.	7.00%
Pedestrianisation should be implemented.	4.50%
Street lighting should be provided.	4.50%
Urban transformation should be carried out.	3.80%
Street rehabilitation should be done.	1.30%
The post office and school buildings should be moved from this street to another area.	1.30%
Official institutions should seek expert opinions to improve the street.	1.30%
Urban furniture should be placed in accordance with the identity of the city.	0.60%

park building, 19.30% noticed the İskenderun High School, 16.60% observed various buildings such as apartments, hairdressers, and commercial houses, 15.50% saw the Orthodox Church, and 13.30% saw the Post Office Building (Table 4).

When the participants were asked about the presence of historical buildings on this street, 72.3% of participants confirmed their existence, while 27.7% denied it. Subsequently, participants who acknowledged the presence of historical buildings on this street were asked to specify which ones. Of those who responded, 44.6% identified Beş Temmuz Primary School, 39.3% identified Kaysar Dental Center, 10.7% identified Namık Kemal Secondary School, and 5.4% identified other buildings such as mansions and houses as historical buildings on this street.

When asked about how to enhance the visibility of historical buildings on this street, the most popular solution (28.80%) was to maintain their historical fabric and install suitable lighting. These recommendations continue with the removal of the additional structures at the entrance of Beş Temmuz Primary School (19.20%) and the lowering/removal of the garden wall of Beş Temmuz Primary School (15.10%). Subsequently, the participants proposed numerous proposals, including the renovation of the surrounding buildings (12.30%), the restoration of the historical building at Beş Temmuz Primary School (5.50%). Additional recommendations included making the walls surrounding Beş Temmuz Primary School transparent (4.10%) and removing the billboards in nearby areas of the school (4.10%) (Table 5).

4 Evaluation and recommendations

The study employed three methodologies and analyses: isovists and visibility graph analysis, observational fieldwork, and data analysis using frequency and multiple frequency analysis. The results of all three analyses support each other. To assess the visibility of the historical building of Iskenderun Beş Temmuz Primary School, we conducted

Table 4 Buildings seen from viewpoints A, B and C on Namık Kemal Street

Viewpoint A	Percent	Viewpoint B	Percent	Viewpoint C	Percent
Beş Temmuz Primary School (new building)	41.80%	Beş Temmuz Primary School (new building)	39.50%	Multi-storey car park	21.00%
Others (shops, apartment buildings, jewelers, etc.)	23.60%	Beş Temmuz Primary School (historical building)	31.10%	İskenderun High School	19.30%
Post Office Building	20.00%	Post Office Building	14.30%	Others (apartment buildings-private teaching institutions-nut shops-hairdressers-office blocks, ect.)	16.60%
Social Insurance Institution	8.20%	Others (shops, apartment buildings, jeweler's shops, etc.)	11.80%	Orthodox Church	15.50%
Pharmacy	6.40%	Social Insurance Institution	1.70%	Post Office Building	13.30%
				Passage of Jewelers	12.70%
				Beş Temmuz Primary School	1.70%

Table 5 Suggestions for improving the view of historical buildings on this street

If there is a historical building on this street, what improvements would you suggest to enhance its appearance?	Percentage
Other factors (to consider include lighting, preservation of historical fabric, variations in flooring or track, presence of signage, departure of service vehicles, and school gates may differ.)	28.80%
Service buildings/structures at the entrance of Beş Temmuz Primary School should be removed.	19.20%
The walls surrounding the Beş Temmuz Primary School garden should be lowered or removed.	15.10%
The buildings on the street should be restored and re-functionalized.	12.30%
The historical building of Beş Temmuz Primary School should be restored.	5.50%
The walls surrounding Beş Temmuz Primary School should be transparent.	4.10%
The billboards around Beş Temmuz Primary School should be removed.	4.10%
The new school building located on the Beş Temmuz Primary School campus should be removed.	4.10%
Kaysar Dental Centre has been restored / is visible.	2.70%
Beş Temmuz Primary School should be re-functionalized.	2.70%
Building heights in the neighborhood should be reduced.	1.40%

a syntactical analysis of the study area using isovist and visibility graph analysis (VGA). With the help of visibility graph analysis, viewpoints A, B and C were determined. Then, the visibility of the historical building from these points was questioned by isovist analysis for three different periods using the cadastral map of 1929, the zoning plan of 1982 and the updated basic maps. The visibility of the historical building has decreased over time due to surrounding structures. According to the 1929 cadastral maps, there were buildings to the west and east, and a church to the north. The 1982 development plan showed a church to the north and a building to the west. The basic map revealed service buildings to the north, a new school building to the west, and a multi-storey Post Office Building to the east. Consequently, the historical building has been inadequately visible throughout its history due to the existence of nearby buildings and surrounding garden walls.

Based on observational research, it was found that when viewing the school from a location near the opposite side of Beş Temmuz Primary School's gate, only the upper floor facades and roof of the historical building are visible. Apart from this, the historical building cannot be seen while walking on Namık Kemal Street as a result of service units, garden walls and high-rise constructions around the historical building. The billboards' height obstructs the view of the historical building, which is located in front of the school garden wall. While walking on Namık Kemal Street, the upper floor facades and roof of the historical building are partially visible. However, the upper floor facade and roof of the historical building are more visible in the street silhouette.

Based on the data analysis findings, Beş Temmuz Primary School is the second most recognized building on Namık Kemal Street. This street is mainly used for shopping and transportation to official institutions. According to Fig. 6, the school's historical building is not visible from points A and C, however it can be seen from point B by approximately 31.10% of the participants. Although it is mentioned that the historical structure can be partially seen from point B, the visibility is limited.

According to the survey findings, 72.3% of the respondents were aware of a historical building on Namık Kemal Street. Additionally, 44.6% of the participants stated that this historical building was located in the Beş Temmuz Primary School area. Therefore, it can be said that the historical building of Beş Temmuz Primary School is the most well-known historical building on the street by the participants. Furthermore, the participants provided the following recommendations to enhance the visibility of this significant historical building.

- Lowering the height and removing the walls around the school garden
- Removal of additional service buildings situated near the school's entrance
- Restoration
- Opening the area around the historical building in the school campus
- Making the school garden walls transparent
- Removal of billboards around the school
- Re-functioning of the historical building

The participants have described the current state of this street, apart from the historical building, as 'confused', 'disorganized', 'crowded', 'ordinary', 'unaesthetic', and 'chaotic'. The participants highlighted the most unsatisfactory aspects of the street, including heavy traffic, tall buildings, and narrow streets, when discussing the current state of the street. Furthermore, the survey findings indicate that

there used to be low-rise buildings with garden on this street in the past and there was a low-rise wooden building in the place of the new school building.

To improve this street, the participants proposed enhancing traffic flow, resolving parking issues, enacting urban design and landscaping improvements, enhancing the aesthetic appeal of surrounding buildings, widening the street, and reducing the heights of nearby buildings.

The analysis findings in this study are mutually supportive. The space syntax analysis indicates that the historical building of Beş Temmuz Primary School is not adequately visible due to the presence of surrounding buildings and garden walls. Additionally, the observational fieldwork indicates that the historical building is partially visible from point B, but not fully perceptible. Similarly, the survey results indicate that the participants are aware of the historical building, although only one-third of them have visual access to it.

The authors propose a minimum intervention approach to increase the visibility of the historical building of Beş Temmuz Primary School, due to its ease of implementation and low cost. The suggestions in this context are as follows:

- Although the existing new building in the school area harms the visibility of the historic building to some extent, we decided to leave it as it is in the proposed design as the location of the new building is appropriate, and its height does not exceed the height of the historic building in terms of visibility.
- Relocating the current security building at Beş Temmuz Primary School towards the east in order to preserve the unobstructed view of the historical building.
- The entry door of the school should be relocated and expanded towards the southeast direction to ensure visibility of the historical building while crossing the street.
- The removal of service facilities and billboards located outside the school garden wall that obstruct the clear view of the historical building.
- Lowering the school's garden wall to 90 centimeters and installing a transparent railing on the wall to increase the visibility of the school's historical building.
- Removal of the adjacent unqualified additions located to the north (front) and south of the historical school building,
- The trees blocking the visibility of the historical building from the road should be relocated and aligned with the western wall of the adjacent Post Office Building that fronts the school garden.
- These proposed alterations will enhance the visibility of the historical building in the street silhouette of Namık Kemal Street, compared to its current state. Fig. 12 shows that the proposed design has made the ground floor façade of the school's historical building significantly more visible than before.

Visibility graph analysis was used to evaluate the proposed design, considering the transparency of the garden wall and the connection of the building facades with Namik Kemal Street. Based on this analysis, it can be inferred that the visual integration value of the facades of the historic building seen from the street increases (Fig. 13).

The application of isovist analysis to the proposed layout plan from viewpoints A, B, and C indicates that there is no change in visibility from points A and C compared to the current situation. However, visibility of the historical building significantly increases from point B, which is positioned according to the modified main entrance gate (Fig. 14).

5 Conclusion

Beş Temmuz Primary School is a significant educational building in İskenderun, contributing to the city's image and urban memory. According to the survey results, it is the second most well-known school on Namık Kemal Street. Moreover, the participants identified the historical building of Beş Temmuz Primary School as the most significant among the historical buildings located on this street. Although there is a historically significant building with an educational purpose in the school area, it may not be easily noticeable from the street and therefore may not be perceived by some city residents.

Based on the analysis conducted in this study, it was concluded that the visibility of this historical building is obstructed by several factors such as the high garden walls around it, nearby high-rise buildings, service units, and billboards. Furthermore, it could be argued that the historical building's visibility has decreased due to traffic and parking issues on the street, as well as the street's disorderly and mixed character. Based on the findings and conclusions of this study, certain criteria have been determined to enhance the prominence of the historical building, and a design proposal was produced. Thus, the visibility of a historical building that holds significance in the collective consciousness of İskenderun has been increased within the city's overall image. The design proposal aims to increase the visibility of the historical building, contributing to the continuity of urban and social memory formed throughout history.

Fig. 12 The layout and silhouette of the historical building as a result of the proposed design. The historical building's visibility and the view of the Beş Temmuz Primary School Historical Building from specific viewpoints (Source: Revised by the authors from the base map at İskenderun Municipality Archive)

Fig. 13 Visibility graph analysis (VGA) of the proposed design

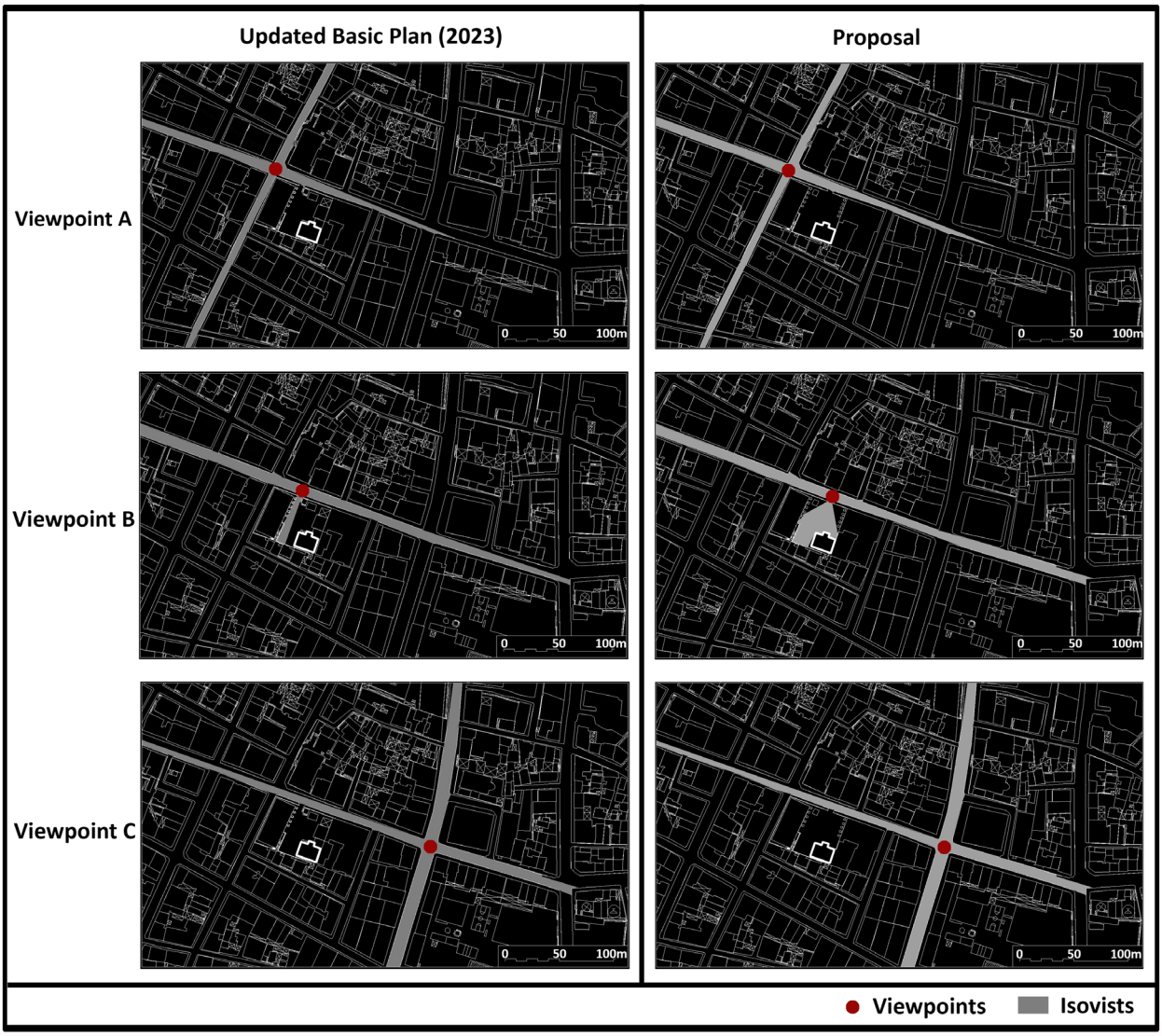

Fig. 14 Isovist analysis of the updated basic plan compared to the design proposal

In this study, a methodology based on isovists and visibility graph analysis, observational fieldwork analysis and survey method is proposed to understand the visibility of a building in the city image. This methodological framework, which includes a range of methods and techniques, can be used as a model for enhancing the visibility of historical buildings and for defining new building design approaches in historical environments. Besides, it is proposed that this methodological framework can be applied not only at the scale of individual buildings, but also to all buildings that contribute to the city's image. Furthermore, this study is expected to enhance the city's image by increasing the visibility, perceptibility, and preservation possibility of historical buildings. Additionally, it will provide insights into other studies within the context of a methodological framework, thereby contributing to the existing literature on this subject.

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