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Communities and local sustainable development

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ACCESSIBILITY ANALYSIS FOR THE ELDERLY IN AN URBAN AREA FROM TURKEY

Aslı BOZDAĞ
Münevver Gizem GÜMÜŞ
Kutalmış GÜMÜŞ
Savaş DURDURAN

Abstract

An increasing population as a result of urbanization brings with it the need for an urban regeneration process. This process is particularly crucial to ensure that elderly people with limited mobility are able to meet their own needs as well as participate in the social dynamics of the city. Depending on their mobility, the accessibility capability of elderly people is one of the key dynamics of the urban planning process, and accessibility is particularly important for elderly people with regard to covering their needs.

The aim of this study was to examine the capability of elderly people, whose needs are typically neglected in the urban planning process, in accessing spatial services in Niğde, a city located in the Central Anatolian region of Turkey. The literature was reviewed to identify areas frequented by elderly users, as well as the level of accessibility of such areas. A survey was then conducted to determine the level of importance attached by the elderly to the accessibility of these spatial services. Based on the findings of the survey, a spatial analysis was conducted for the city using the Geographical Information System (GIS), and accessibility impact areas were identified. The inadequacies of urban areas in Niğde were identified, and various recommendations were proposed in order to resolve them.

Keywords: accessibility, age-friendly cities, geographical information system (GIS), spatial services, quality of life.

Aslı BOZDAĞ (Corresponding author)

Research Assistant, PhD

Department of Geomatic Engineering, Faculty of Engineering,
Niğde Omer Halisdemir University, Niğde, Turkey

Tel.: 0090-388-225.4023

E-mail: aslibozdag@ohu.edu.tr

Münevver Gizem GÜMÜŞ

Research Assistant

Department of Geomatic Engineering, Faculty of Engineering,
Niğde Omer Halisdemir University, Niğde, Turkey

E-mail: gizemkisaaga@ohu.edu.tr

Kutalmış GÜMÜŞ

Assistant professor

Department of Geomatic Engineering, Faculty of Engineering,
Niğde Omer Halisdemir University, Niğde, Turkey

E-mail: kgumus@ohu.edu.tr

Savaş DURDURAN

Professor

Department of Geomatic Engineering,
Faculty of Engineering and Architecture,
Necmettin Erbakan University, Konya, Turkey

E-mail: ssdurduran@konya.edu.tr

1. Introduction

Efforts to improve quality of life for the rapidly increasing elderly population have led to the emergence of the concepts of active aging (World Health Organization, 2002; Tatal and Üstün, 2009), the aim of which is to ensure the participation of the elderly in urban life, and an age-friendly city (Kalache, 2009; Plouffe and Kalache, 2010; Aslan, 2015; World Health Organization, 2007) that seeks to create environments conducive to active aging.

The World Health Organization defines the elderly population as people aged 65 and over (World Health Organization, 2007). In Turkey, this group made up 8% of the total population in 2014, increasing to 8.2% in 2015 (TUIK, 2016a). Together with the regeneration of urban centers, this increase necessitates the design of a spatial environment that bears in mind the needs of the elderly population. This is crucial for ensuring that elderly individuals can adapt to the process of urbanization, take part in social life and manage to meet their needs, while avoiding various physical, socio-economic or psychological problems (Köse and Erkan, 2014).

Although the topic has been discussed by many authors, the World Health Organization was the first to draw attention to the situation the elderly population occupies in the process of active aging in both currently populated and newly planned cities (Tatal and Üstün, 2009). Studies in the literature on the planning of urban areas for the elderly have focused on designing cities that support active aging (Beard and Petitot, 2010), while ensuring the active participation of the elderly in the planning process (Consiglio Federale, 2007), and establishing criteria for urban designs that take the needs of the elderly into account (Köse and Erkan, 2014). These studies proposed planning and urban design principles for age friendly cities and communities (Martinoni and Sartoris, 2009; Steels, 2015). These studies explained that the main problems faced by the elderly population are largely related to participation in social life and the ability to meet their own needs, and that these problems are principally due to their reduced mobility. In this context, they proposed criteria for urban planning that take accessibility to spatial services into account. The most important determinant in the use of spatial services by elderly people is their accessibility (Alun and Cloutier, 1991). Accessibility is also considered one of the main principles regarding quality of life (Morar *et al.*, 2014). Accessibility is one of the provisions proposed for the creation of age-friendly cities (Durdubaş, 2015).

Accessibility is crucial for supporting the active aging of the elderly and their participation in daily life, to create livable cities, and to prevent inequality in terms of spatial access (Elmacı and Ergin, 2015; Tatal, 2015). In this context, spatial analyses have been conducted using GIS with the intention of measuring the accessibility of urban services for the elderly. There are studies in the literature using GIS to examine the accessibility of resting and care services for the elderly (Cheng *et al.*, 2012), the decisions taken in residential areas to improve the accessibility of basic services (Somehalli and Shipton, 2013), and the effect of changes in public services on accessibility for the elderly in rural and urban areas (Higgs and Langford, 2013). Unlike previous

studies in the literature, the present study uses GIS to examine the accessibility impact areas of spatial services preferred by elderly people in Niğde.

The aim of this study is to examine the capability of elderly people in accessing spatial services; an aspect usually neglected in the urban planning process in Niğde, Turkey. A review of the literature was first conducted to determine the spatial services frequently used by elderly people and their accessibility distances. A survey was then carried out in Niğde to examine the preferences of elderly people regarding the accessibility impact areas of these spatial services. As a final step, recommendations were proposed for spatial services in urban sites where, according to findings on accessibility impact areas, such facilities are required. This study is important in that it can help Niğde to have age-friendly city planning by creating spatial strategies for the elderly that will, in line with their demands, meet their needs in the city and allow them to actively participate in social life.

2. Materials and methods

The cooperation of the elderly as social actors is necessary to support active aging and protect social structure in urban planning (Popescu, 2007). The integration of the elderly in urban planning process is possible by means of developing urban planning strategies for an active aging process. The scope of these strategies can be generalized as follows:

- Collaborative work among local authorities, police, community organizations and elderly should be ensured (Steels, 2015).
- Employment of the elderly in suitable jobs, their encouragement to engage in social activities like educational and voluntary works should be ensured (Scharlach and Lehning, 2013).
- Qualitative and quantitative development of urban equipment areas (health, education, social, cultural, commercial) in line with universal design principles and standards should be ensured (Feyzioğlu and Sayan, 2015).
- Organization of transportation systems (walkways, road intersections, etc.) in an unobstructed way should be ensured.

These strategies are important to prevent social isolation of the elderly, enhance their participation in family and social life, and ensure their feeling of confidence, well-connectedness and self-awareness as a community.

Cities, where active aging processes are not taken into consideration in urban planning processes, will deviate from universal standards (Durdubaş, 2015). Furthermore, urban planning that takes active aging into account is very important for aging in place. Aging in place is the ability of a person to keep living in their home or community regardless of potential changes in his/her functions and health in the coming years (Lehning and Harmon, 2013). When aging in place is not ensured, service supply and nursing criteria need to be established, causing early institutionalization of the individual (Chapin and Dobbs-Kepper, 2001). Therefore, the creation of a sup-

portive and active environment by local administrations during the urban planning process is important for the elderly, so that they can cope with the difficulties of aging in an urban environment.

This study investigates the level of accessibility to spatial services by the elderly during the urban planning process, which are aimed at supporting active aging. This study analyzes urban areas frequently used by the elderly in Niğde in terms of accessibility, sufficiency and usability, and also spatial recommendations. Figure 1 shows the stages of the method used in the study.

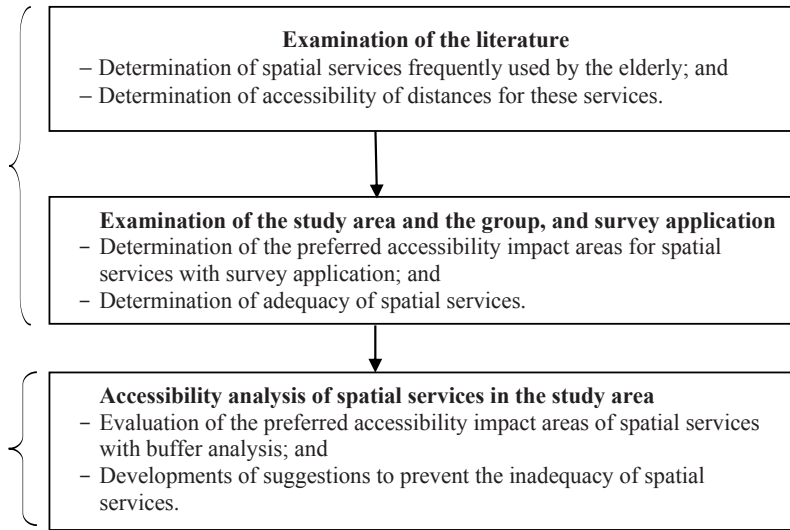


Figure 1: The methodology of the study

The study area was the city center of Niğde. Niğde is located in Cappadocia, in the southern part of the Central Anatolia region of Turkey (Figure 2). It is located at the intersection of the provinces of Aksaray, Kayseri, Konya and Adana.

The city center has a population of 132,155 citizens of which 7,390 are elderly people residing in the same area (TUIK, 2016b). In 2015, the elderly made up 8.2% of the total population of Turkey. In Niğde, the share of the elderly population is 9.3%, which is higher than the national average (TUIK, 2016a). Niğde was selected for this study because:

- the proportion of the elderly population in the city is higher than the national average;
- the city is homogenous in terms of its cultural characteristics and social structure;
- a regeneration process for the city is underway; and
- there is a current need for a city plan that would enable Niğde to better compete with neighboring provinces in terms of socio-economic development.

The study consisted of two stages. In the first stage, the literature on elderly people's relations with the urban areas was reviewed, and areas frequently used by the

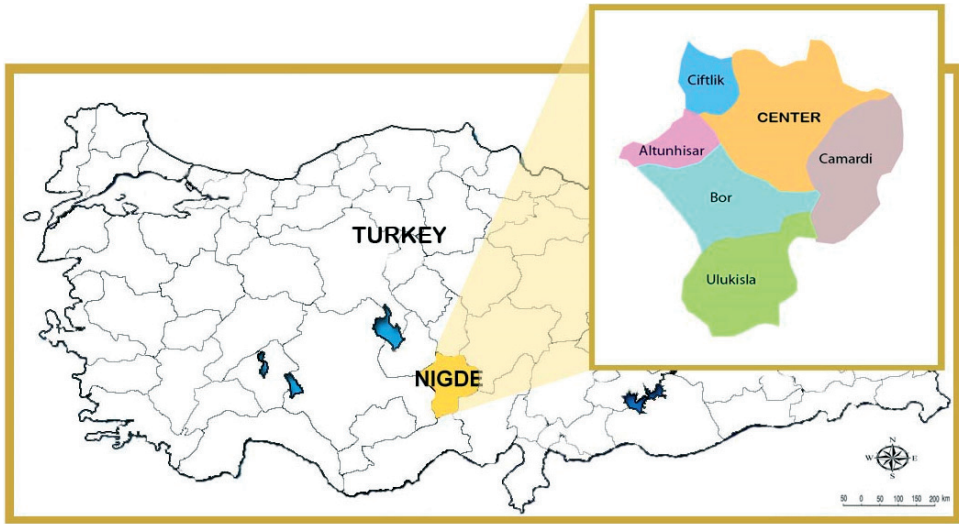


Figure 2: The location of Niğde

Source: Authors' contribution

elderly (health service, mosque, green areas, cafe and resting area, bakery, supermarket, bazaar, square, payment points, cash dispensers, public transport points, public toilet) were identified (Morris and Wigan, 1979; Tatal and Üstün, 2009; Somenahalli and Shipton, 2013; Köse and Erkan, 2014; Steels, 2015). In the second stage, a survey was conducted in order to identify the preferred distances and the accessibility of these areas. The aim of the survey is to ensure active participation of the elderly in the planning process, and to examine how their preferences would affect accessibility distance impact areas (Erol, 2015). Survey findings were analyzed in GIS, and spatial services were visualized on the maps in terms of their accessibility and usability.

The literature identifies 400 meters as a maximum distance threshold when defining pedestrian accessibility to bus stops (Bakan and Konuk, 1987; Untermann 1984; Hess, 2012; Southworth and Ben-Joseph 2003; Biba *et al.*, 2010). In addition, some authors identify 800 meters as the maximum distance threshold to access public transport facilities, such as subway and train stations and bus terminals (Condeço-Melhorado *et al.*, 2014; Kuby *et al.*, 2004; Zhao *et al.*, 2003). Given the limited mobility and health problems of elderly individuals, this study defines pedestrian accessibility distance as 0-400 meters, the distance to access public transport as 400-800 meters, and the distance that could be covered with a companion as 800-1,200 meters. For hospitals, which are one of the locations frequently used by the elderly, the accessibility impact area was defined as 0-1,500 meters, given the population of the city and the number of physicians per capita. In addition, pedestrian access distance was defined as 0-400 meters for neighborhood mosques, and 0-250 meters for smaller mosques based on the Regulation of Spatial Plans Construction, which is consistent with the Law on zoning no. 3194 from May 3, 1985 (Mevzuat Bilgi Sistemi, 2016).

The survey was conducted with participants aged 65 and over. The survey questionnaire included questions on the demographic characteristics of the participants, their level of satisfaction with the city-planning activities of the municipality, and the usability of and preferred accessibility distances to frequently used areas. For easy understanding by the elderly, a 3-point Likert scale (important, neutral, and not important) was used to evaluate the question regarding the preferred accessibility distances to frequently used areas.

The sampling number was determined as 366 participants based on a 95% confidence level according to a standard table on acceptable sample sizes. These participants were selected as easily accessible participants for the survey area. The number of participants in the sample is sufficient to determine elderly population's characteristics in Niğde city center as statistical.

Locations commonly frequented by the study participants were selected as the places for administering the survey. The private urban areas (the Teachers' Park, the garden of the Teacherage, coffee houses, etc.) and the public urban areas (Şadırvan Park, the Mosque, the castle and its vicinity) where the elderly spend most the time were determined (Figure 3).



Figure 3: The area of survey application

Using current maps obtained from Niğde municipality, areas frequently used by the elderly people were digitized. Buffer analysis was performed in the GIS based

on the impact area distances obtained from survey results. Buffer analysis is a spatial analysis based on the examination of accessibility to spatial details around from geographical details (Karaş and Yeşil, 2011). Buffer analysis includes built zones with a certain linear distance to generate serviceable areas around facilities (Gupta *et al.*, 2016). In this study, the zones were drawn around the spatial services, depending on the impact area distances obtained from the survey results. The impact area and accessibility of spatial services were determined depending on these zones. The results of the analysis were used to make spatial recommendations for dealing with the shortcomings regarding the use of urban areas.

3. Spatial examination of the study area and participants, and application of the survey

Niğde, which comprises the study area, is surrounded by cities that are more developed, while receiving less investment compared with other provinces in the region. As a result, the city experiences a slower rate of social, demographic, environmental and economic change. During its gradual process of change, Niğde's urban pattern first started to develop around the historic city center; however, with new land usage, nowadays urban sprawl takes place in different directions (Figure 4). The focus of development has especially shifted due to the establishment of the Niğde Ömer Halisdemir University to the southwest of the city. In addition, the hospital has been moved from the city center to the west of the city, while the bus terminal has

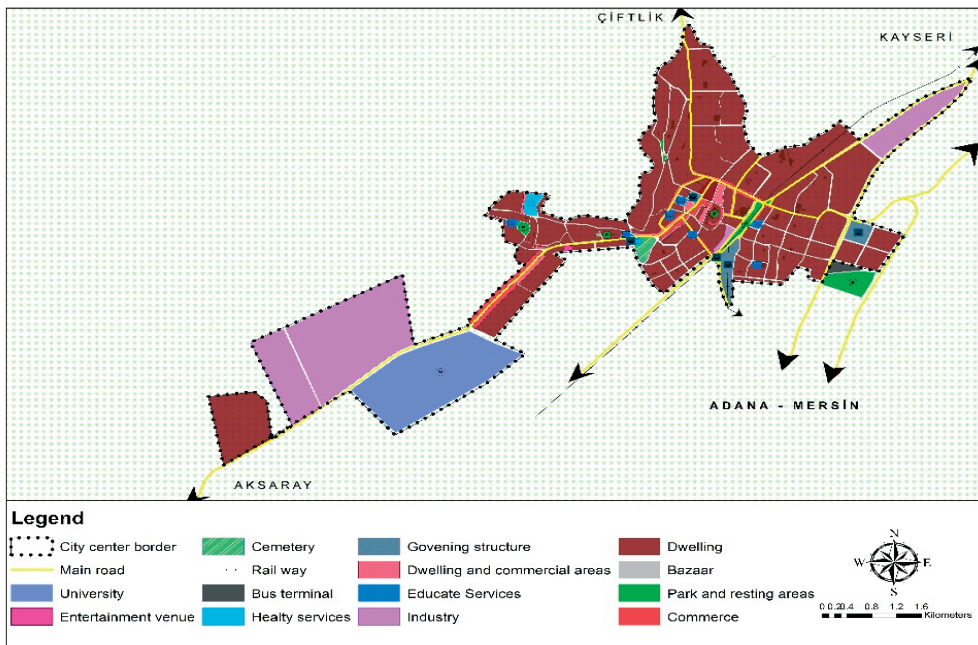


Figure 4: Land use plan of the city

been moved to the Adana-Kayseri highway, relieving congestion in the city center. Moreover, both the bus terminal and the hospital act as potential centers of attraction for residential development. The spread of the city as a result of these developments requires a revision in the city plans to meet the needs of city dwellers (elderly, women and children) with specific needs.

The aim of the present study is to identify elderly people’s problems and preferences with regard to the accessibility and usability of frequently used urban areas in Niğde – which has a higher proportion of elderly people compared to the national average – at a time when the city plans are being revised. A survey was conducted to determine these problems and preferences.

The survey findings showed that 70% of participants were male. Half of the participants were primary school graduates. None of the participants had completed graduate education (Figure 5). A majority of the participants (65%) was born in Niğde, and have lived in the city for their entire lives; conversely, the rest of the participants moved to the city for business or family reasons.

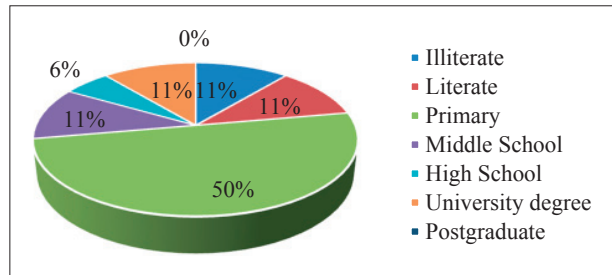


Figure 5: Participants' educational status

Most participants (61%) expressed satisfaction with the city planning activities of the municipality (Figure 6). In contrast, 39% of the participants said that they were dissatisfied with the city planning activities of the municipality because the cleaning of the streets was insufficient, the design of streets and avenues was not elderly-friendly, certain public services were available only in the city center, the city squares were not large enough, the static strength of buildings was insufficient, there was unplanned development, and that there was a lack of green areas (Figure 7).

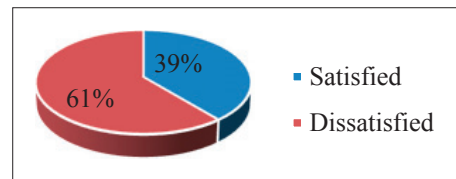


Figure 6: Level of satisfaction related to municipality's urbanization activities

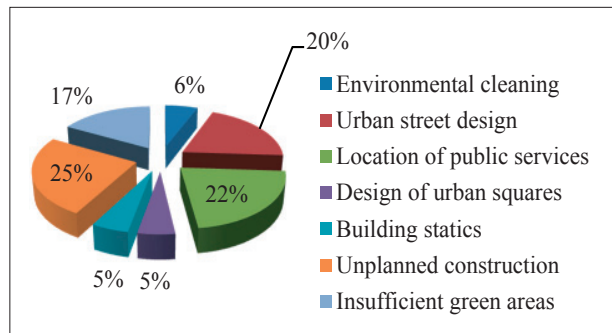


Figure 7: Level of dissatisfaction related to municipality's urbanization activities

Accessibility distances (0-400 m, 400-800 m, 800-1,200m) to areas frequently used by the elderly, which were identified through the survey and the literature, were examined with regard to the level of importance attached to them by elderly people (Table 1). The preferred level of accessibility was evaluated using a 3-point Likert scale (important, neutral, and not important). Based on recommendations in the literature, the impact area was defined as 0-400 meters for pedestrian accessibility to urban areas described as 'important' by elderly people. For urban areas described as 'neutral', the impact area was defined and accepted as 0-800 meters from public transport. For urban areas described as 'not important', the impact area was defined and accepted as 0-1,200 meters within the boundaries of Niğde city center.

Table 1: Determination of importance level for accessibility distances from impact area to spatial services frequently used by the elderly

Spatial areas frequently used by the elderly	Accessibility distances to spatial services according to the literature (an example of survey)		
	Pedestrian accessibility distance	The distance to public transportation points	The distance to spatial services with a companion
	(0-400m) Important	(400-800m) Neutral	(800-1200m) Not Important
Health services		√	
Mosques	√		
Green areas		√	√
Cafe and resting areas	√		
Bakeries			√
Supermarkets			√
Bazaar		√	
Squares	√		
Payment points		√	
Cash dispenser			√
Public transport	√		

It is observed that preferred accessibility distances to frequently used areas are intensified and varied for certain types of land uses (Figure 8). The preferred accessibility distances to health services, places of worship, green areas, bakeries, supermarkets, city squares and public toilets varied between 0 and 400 meters, whereas the preferred distances to cafés and resting areas, cash dispenser and public transport points varied between 400-800 meters.

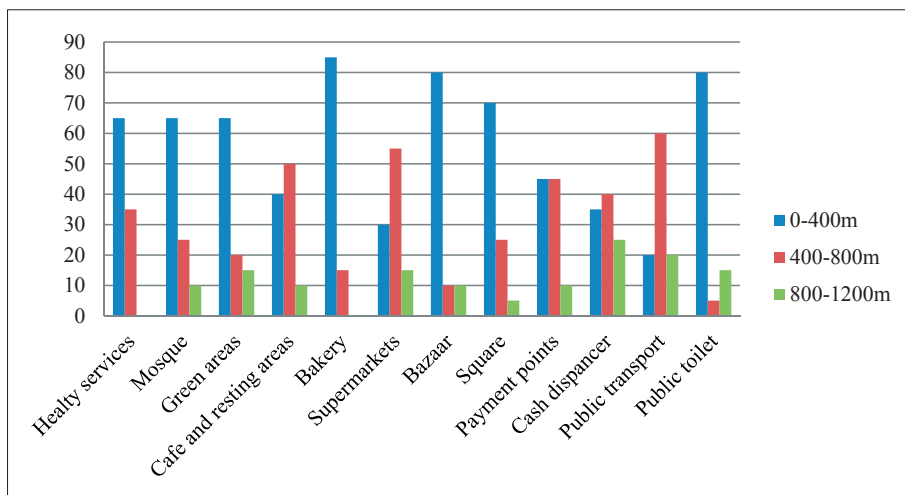


Figure 8: The preferred accessibility distances for spatial services frequently used by the elderly

Responses to the questions on the usability of frequently used areas indicate that there was insufficient use of green areas (Figure 9), although the level of usability of other areas was generally adequate.

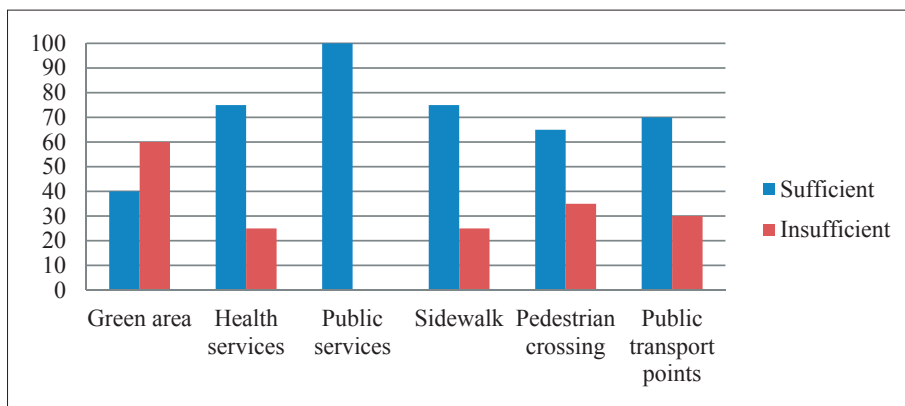


Figure 9: Sufficiency of spatial services frequently used by elderly

With regards to urban furniture in frequently used areas, the shortcomings were identified with regards to seating and furnishings at bus stops, the seating, landscaping, design and lighting of green areas, the lack of concern for people with disabilities when designing sidewalks, with the sidewalks being too high or occupied by vehicles, and the time allocated for pedestrian crossings being too short (Figure 10).



Figure 10: Inadequacy of some spatial services

4. Analysis of accessibility to spatial services in the study area

Survey results on elderly people's preferred accessibility distances to frequently used areas are presented using percentages (Figure 8). For example, 65% of elderly people preferred a maximum accessibility distance of 400 meters, while 20% preferred 800 meters, and 15% preferred 1,200 meters. Preferred accessibility distances for each frequently used area was ranked as 1st, 2nd and 3rd most common preferences, and a buffer analysis was conducted (Figures 11 and 12).

Figures 11 and Figure 12 indicate that preference rankings based on percentages vary for some frequently used areas. For example, the preferred accessibility distance to health services, places of worship, green areas, bakeries, bazaar, city squares and public toilets are within the proximity of maximum 400 meters. On the other hand, the preferred accessibility distance to cafés and resting areas, supermarkets, bill payment points, cash dispensers and public transport point facilities are within the proximity of the maximum of 800 meters. For bill payment points, equal numbers of participants selected 400 meters and 800 meters as their 1st preference for accessibility distance. For this reason, the larger one of these figures, 800 meters, was accepted as the maximum accessibility distance.

Using the results of the buffer analysis, and taking land use analysis and 1st preferences for accessibility distances into account, shortcomings were identified for some spatial services (Figures 11 and 12).

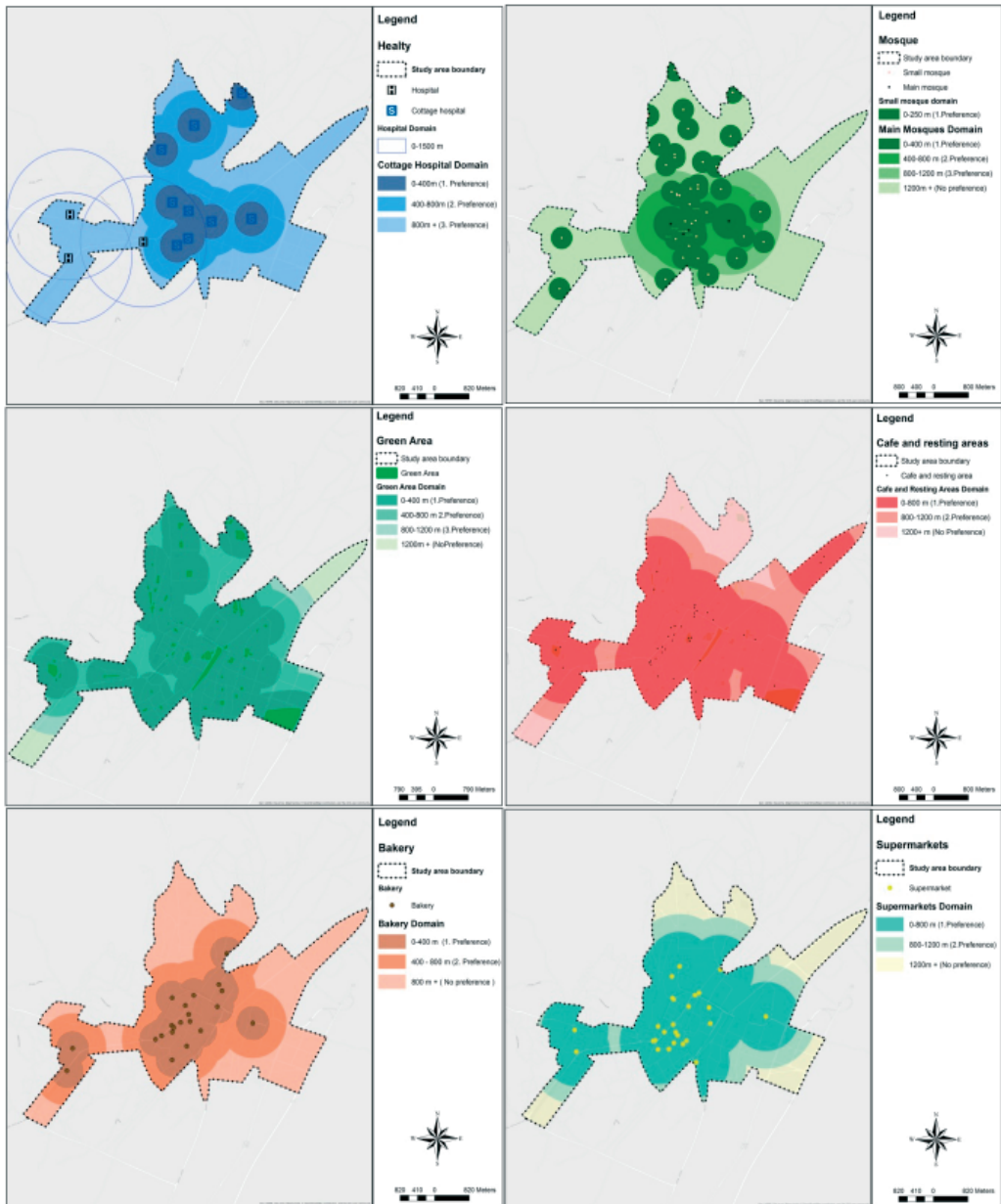


Figure 11: Accessibility analysis for elderly people in Niğde city

In the new development area to the southwest of the city, near the university campus, services were identified as being inadequate with regards to the availability/accessibility of mosques and green areas (Figure 11), and also of marketplaces and public toilets (Figure 12).

In the new development areas to the north of the city, services were found to be inadequate with regard to the availability/accessibility of health services, the place of

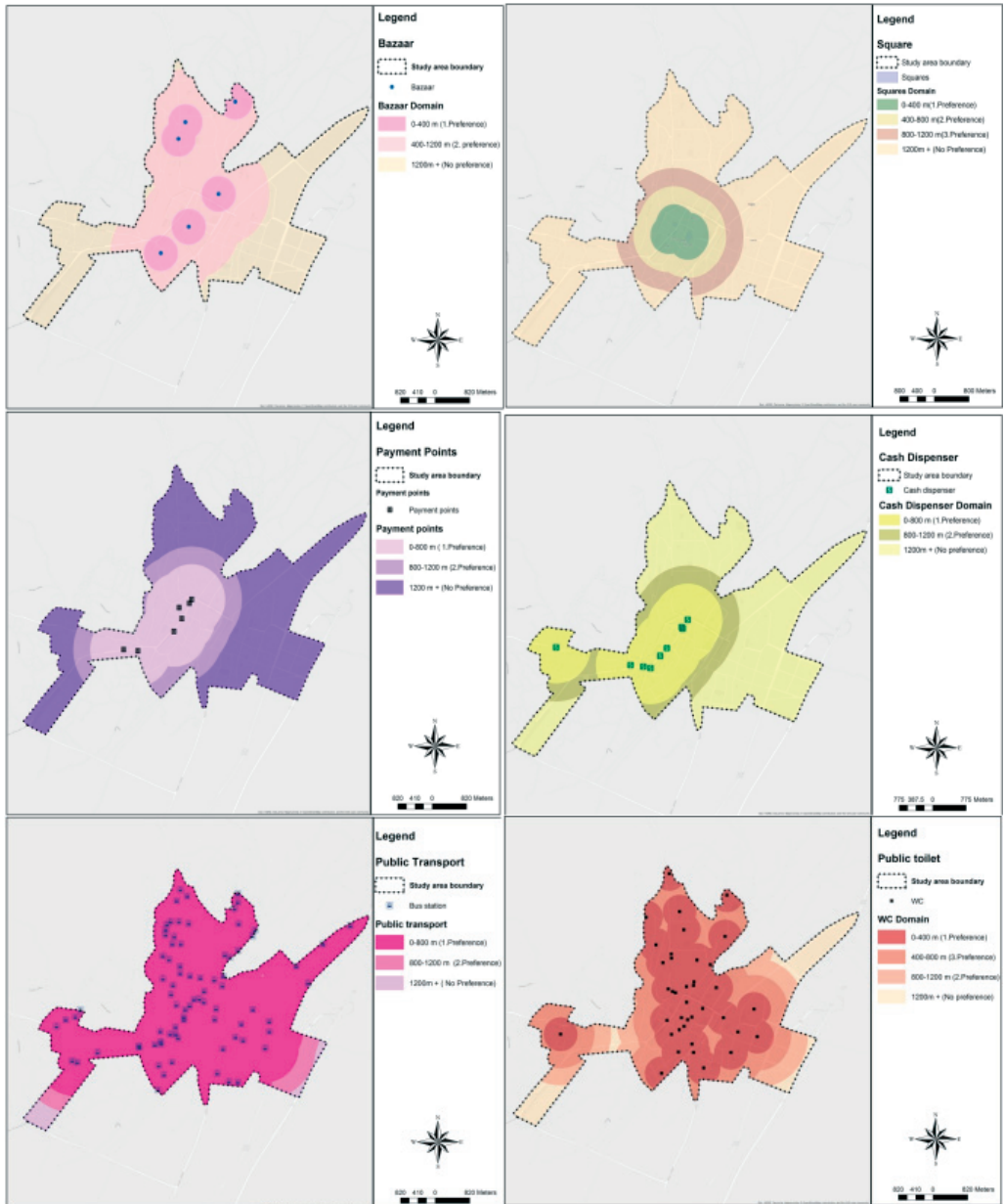


Figure 12: Accessibility analysis for elderly people in Niğde city

worship, cafés and resting areas, bakeries and supermarkets (Figure 11), and also of bill payment points and cash dispenser points (Figure 12).

Overall, the preferred accessibility distances of elderly people showed that there are certain inadequacies in urban spatial services with regards to health care centers, bazaar, city squares, and payment and cash dispenser points.

5. Conclusion

A planning approach that emphasizes equality and fairness for all social segments in a city is required for sustainable development and society. Taking health, safety, participation and accessibility issues into account in the planning process is particularly important for creating age-friendly cities for the active aging of elderly people.

This study used GIS to analyze the preferences of elderly people in Niğde regarding accessibility distances to frequently used urban areas. Accessibility impact area distances were defined with the participation of elderly people, and the shortcomings of urban areas were identified on this basis. In addition, shortcomings with regards to usability were also identified.

Improving accessibility and removing the relevant shortcomings would help improve participation in social life, not only for the elderly but also for women, children and people with disabilities. Accessibility is also related to the usability and user satisfaction with these areas. Within this framework, the following recommendations can be made for the city of Niğde:

- Urban services found lacking in terms of accessibility should be increased in the areas where they are required. In addition, navigation devices should be made available in the frequently used areas of cities for the use of elderly people.
- Measures should be taken to remove the shortcomings identified in seating elements, furnishings, landscape design, lighting, designs for the disabled, and the urban crossings and connections.
- Steps should be taken for stakeholders to assume responsibility and actively participate in the city planning activities. In this way, it might be possible to replace feelings of loneliness and social isolation with a sense of satisfaction with life.
- Pedestrian-oriented projects should be developed to integrate public areas, squares, and recreational and entertainment areas with green areas.
- GIS applications and analysis methods should be used to improve decision-making capacity regarding the regeneration process in the city.

Considering that everyone will eventually become a member of this demographic group, it is imperative to make the life of the elderly more livable and satisfying. In this context, local administrations, civil society organizations and academics should focus on developing social and physical policies in line with the World Health Organization's 'Global Age-Friendly Cities: A Guide' (World Health Organization, 2007).

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