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Spatiotemporal change of land use for deceased in Beijing since the mid-twentieth century

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Abstract: The land use for the deceased is not only for the dead but also for the living relatives. It competes with land use for living populations in urban areas through occupying a specific space of land. This article looks at this shared interest in humankind by mapping the land use for the deceased in the mid-twentieth century and modern Beijing and address the sustainability of future land use for dead in Beijing. Specifically, it clarifies the change of its area and location in the urban–regional structure and also considers the background factors. In the 1930s, the spatial distribution of cemeteries in the mid-twentieth century was mapped using the old topographic maps and also mainly using city government materials for modern times. A comparison of land use between the two periods shows that the spatial land use for the deceased continues to be the characteristics of traditional funeral values, *Feng Shui* philosophy, spatial separation of the dead, and the population, such as public cemeteries surrounding the built-up area. The city government reduced the pressure on land resources by encouraging land-saving burial such as undersea burial, which affects the value of funerals for citizens, resulting in an area of cemetery per urban population.

Keywords: topographic map, funeral culture, land resource, population growth, cemetery

1 Introduction

1.1 Implications of land use for deceased in urban areas

Humankind, in its history, has been mourning the dead. At the same time, the bodies buried to pay homage to the dead and to alleviate the pain of the deceased's family and relatives [1]. They have required funeral ceremonies and places for memorial services such as graves and cemeteries to mourn the dead. Land use for deceased such as graveyard and cemetery wherein the survivors occupy a specific area of land and bury the dead bodies themselves or cremate bones and ash. On the other hand, people install symbols such as land elevation and tombstones in their field, and they give the vitality of the bereaved. If a person who inherits the 'family' lives away from home, a grave plays a role as 'a device that connects home and people' [2,3]. It is also a device for realizing the mental safety of the survivors in their daily lives by establishing a physical location where the deceased exists. In this respect, the land use for the deceased is an important land use for humans living in modern cities (Figure 1).

Graves and cemeteries, a common form of land use, are important facilities not only for the deceased and their relatives but also for the general citizens of the city. Land use for deceased that matches their values serves as a place to confirm their identity for urban residents with diverse cultural backgrounds [4]. On the other hand, as a physical environment, many public cemeteries and sacred religious sites in the city are covered with vegetation, and they are evaluated for their valuable ecological environment, including animals in the urban environment [5–7]. Many urban residents use them as places for daily life, such as public parks where the history and cultural environment of the city are fused [8–11]. Citizens are also now focusing on tombstones and church architecture in cemeteries as new targets for geotourism in the city [12].

Thus, land use for the deceased in urban areas is a multifunctional and essential facility. However, it always

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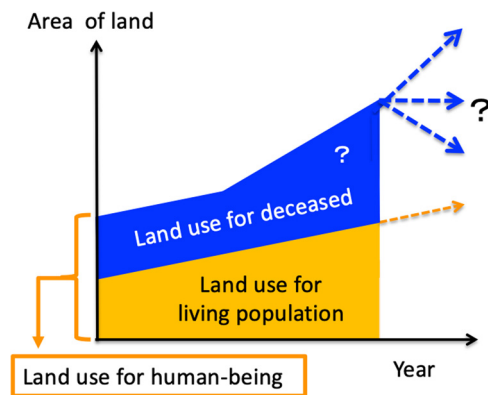


Figure 1: Framework of the research.

occupies a certain amount of land to bury the bodies and bone ash in the soil, and a graveyard or a cemetery for many dead needs many properties to set up. As a result, modern cities, which have a large population and a limited land area, are facing various challenges regarding land use for deceased. For example, the availability of citizens for a limited capacity to bury is not necessarily equal due to the economic and social status of people, and it is necessary to make it a public space that is well-balanced to social needs [13,14]. General issues are reported, such as crimes in the cemetery and the repulsion of residents to a new cemetery development plan with the surrounding land use [15–17]. The problem of maintaining and managing cemeteries has also been pointed out in advanced countries such as the aging population [18,19]. A concern prevails over the long-term effects on the surrounding groundwater and soil since the cemetery is also part of the urban ecological environment [20,21].

In China, which is the subject of this research, the urban population based on economic growth has continued to increase significantly since the introduction of the Reform and Opening Policy in 1978. Also, the number of large-scale public cemeteries is growing in response to the needs of economically wealthy citizens and overseas Chinese. Productive citizens are looking for a graveyard that suits their values. As a result, the overexploitation of graves and cemeteries on mountain slopes, also known as “whitening of green mountains,” has become a problem [22]. A problem that the local government does not properly manage the development of cemeteries has also been pointed out in the areas [23].

Many of the existing studies mentioned above focus on various aspects of land use for deceased in cities with large populations and limited land and consider each research theme as an event derived from the problem of

limited land resources in urban areas. However, they do not ask how much the land use expanded in response to urban growth as a precondition of their research. The Chinese Folklore Association [24] estimates that the burial of the body consumes about 135 km² of land every year in China. If this trend continues, it will reach 1.1% of the national area 100 years later. The basis of this estimation is not clear, but it shows land use for deceased is recognized as a problem of land resource allocation in modern China.

Given the multifunctionality of cemeteries in urban areas, it is a critical issue that sustainability of land use for deceased is expected in the future as urban population increases and urban areas expand. The first issue to investigate is whether the land use has increased with the rise in urban population. It is also crucial for living citizens to know where it has been arranged and changed in the regional structure of the city. Besides, understanding the factors and background behind the changes, such as culture and policies, will help us to think about what is required to improve the quality of life of citizens living in the new urban areas. These findings will lead to the consideration of the land use for deceased in large cities such as developing regions where the population will continue to grow.

2 Research purpose and research method

2.1 Purpose of the research

The purpose of the study is as follows. First, the authors clarify the spatial characteristics of the location and their changes in land-use sites in the mid-twentieth century and modern times, regarding graveyards and cemeteries of urban citizens. Specifically, the authors analyze what kind of place and spatial characteristics are essential for the land use by comparing the spatial attributes of sites during two periods. Second, they will investigate whether increasing urban population leads to growing cemetery area by comparing their area per capita of the urban population over two periods. They also consider a factor and background of such land-use change such as urban population, economic development, the value of the funeral of citizens, and the funeral policy of the government. Finally, they would like to comment on the sustainability of land use for deceased in urban areas of China, where population and economic growth continue based on the above considerations.

2.2 Study area and reason for selection

China, which has the largest population in the world, has seen a rapid increase in population since its founding in 1949. The number of deaths in China remained low until around 1980 except for the Great Leap (1958–1961), but then it drastically increased with the population growth reaching 9.77 million in 2014 (Figure 2) [25,26]. The number of fatalities in urban areas had risen sharply since 1978 when economic growth accelerated in contrast to the declining number of deaths in rural areas in recent years.

Beijing, the capital of China, which is the study area of the research, provides an excellent example of land use for deceased. The number of deaths has been increasing in Beijing since the 1970s (Figure 3) [27]. The increase since 2000 is significant in particular, and it is now about 90,000 people per year. Beijing has vast administrative areas, including large rural areas. Similar to national trends, the number of deaths in rural areas has consistently declined since the 1970s. The number of the urban regions increased in contrast from about 30,000 in the 1970s to about 80,000. In this way, there may have been various changes in land use for deceased due to increased pressure on land resources by the increase in the number of deaths in Beijing as well as in China's urban areas.

2.3 Methodology

Land use for deceased, based on the history and culture of the region, occupies a certain amount of land and that information is drawn on the map at the time. The authors use GIS to map the graveyard and cemetery and measure their area both periods. In other words, the authors visually recognize the grave symbols on *Gaihozu* and record the locations that could be confirmed on the maps on GIS

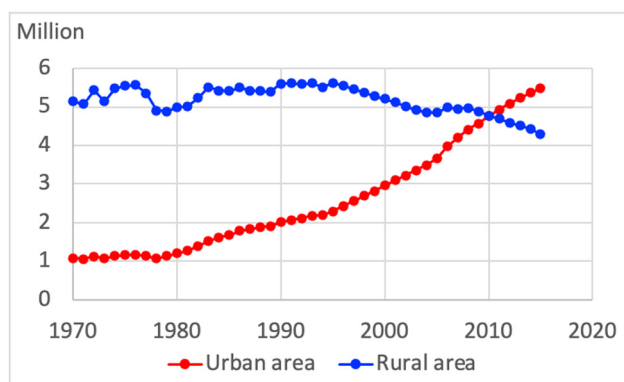


Figure 2: Number of death in China (Source: [25,26]).

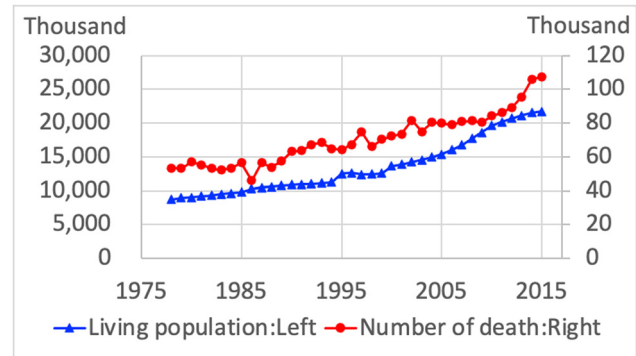


Figure 3: Population trend of Beijing (Source: [27]).

as point data and polygons in the mid-twentieth century. “*Gaihozu*” is a topographic map created by the Land Surveyor of the Japanese Army Staff Headquarters during the late nineteenth and early twentieth centuries, mainly in China, India, Indonesia, and other Asian countries on scales 1 in 25,000 to 1 in 5,00,000.

For modern times, the authors recorded the location of the cemeteries as point data, also marked the extent of them as a polygon, and superimposed them on the same GIS file together with the elevation and land use by GlobalMap3.0 on the Google Earth image [28].

Using the GIS data created above, the authors measure the location and area of grave and cemetery of both periods and also determined the topographical features by calculating the height difference between the altitude at the center of the grave and the surrounding area. The authors also considered the locational characteristics in the urban–regional structure by calculating the distance from the grave and cemetery to downtown Beijing and the land use around them. They examined changes in the urban population, the number of fatalities, funeral value of citizens, and their relation to government policies as factors and backgrounds of these changes.

3 Land-use data of grave on the mid-twentieth century and modern cemetery

3.1 Grave information on the old topographic map

The old topographic map (*Gaihozu*) has information about a grave as a map symbol with reverse T character



Figure 4: Symbols of grave on *Gaihozu* of map sheet “Beiping.”

and the surrounding separate line (Figure 4, Table 1). In the GIS work, the authors recorded the symbols as point data and registered as a polygon having land-use boundaries or walls. The graves shown on the map are of five types according to the symbols, surrounding walls, and presence/absence of names (Table 2). Beijing is in a different situation than other Chinese cities, where many royal families, senior officials, and wealthy people lived there in the first half of the twentieth century. Types 3 and 5 were presumed to be burial grounds for royal and wealthy clans because of their family names. Its area is 4.1 km^2 , with an average of $25,000 \text{ m}^2$.

On the other hand, Types 1, 2, and 4 seem to be graves for ordinary people, most of which were presumed to be *Yiyuan* and *Yidi*. Name of “*Yiyuan*” and “*Yidi*” were mass graves for ordinary people, and *Huiguan* has established the former, which was an association of landman, and the local government maintained the latter. Among

Table 1: Old topographic maps (*Gaihozu*) used in the research

Sheet name	Scale	Issued date
Sanjia dian (三家店)	1/50,000	July 1937
Qinghe zhen (清河鎮)	1/50,000	July 1937
Zhangxin dian (長辛店)	1/50,000	July 1937
Beiping (北平)	1/50,000	July 1937
Genlian xian (良良縣)	1/50,000	July 1937

the ordinary people not even a few burials were without permission in the common graves.

3.2 Estimation of the urban burial area

The five used sheets of *Gaihozu* cover not only the built-up area of Beijing but also the surrounding rural areas (Figure 5). It is necessary to distinguish whether each symbol on the map belongs to an urban resident or a rural resident, but no practical way to achieve this. It was difficult for the ordinary citizens who were moving on foot to transport the bodies to a distance at that time. Therefore, it is highly probable that the body was buried in a place not far from the built-up area.

At that time, the castle wall (inner and outer walls) surrounded the built-up area of Beijing (erstwhile Beiping). The wall was demolished and renewed the Second Ring Road in the 1950s and 1960s. Because the eastern direction of the castle wall is missing in the *Gaihozu* used, the distribution of the graves on all sides of the castle wall cannot be confirmed. Figure 6 estimates

Table 2: Five types of identified graves and their area

Distance from Second Ring Road		Type 1	Type 2	Type 3	Type 4	Type 5	For citizens Type 1 + Type 2 + Type 4	For wealthy Type 3 + Type 5	Total
				+ Name		+ Name			
Within 15 km	Number	186	107	131	27	30	320	161	481
	Area (m^2)	58,404	12,02,492	31,69,139	5,99,180	9,67,591	18,60,076	41,36,730	59,96,806
	Average area (m^2)	314	11,238	24,192	22,192	32,253	5,813	25,694	12,467
More than 15 km	Number	67	91	64	10	2	168	66	234
	Area (m^2)	21,038	12,25,556	16,27,875	1,08,537	1,08,597	13,55,131	17,36,472	30,91,603
	Average area (m^2)	314	13,468	25,436	10,854	54,299	8,066	26,310	13,212
Total	Number	253	198	195	37	32	488	227	715
	Area (m^2)	79,442	24,28,048	47,97,014	7,07,718	10,76,188	32,15,208	58,73,202	90,88,409
	Average area (m^2)	314	12,263	24,600	19,128	33,631	6,589	25,873	12,711

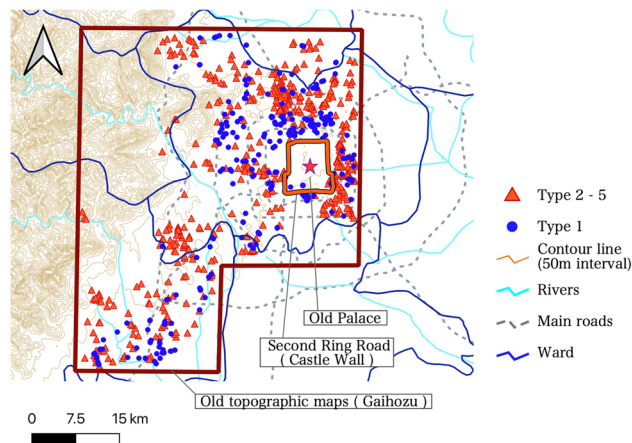


Figure 5: The extent of five map sheets and distribution of graves (contour line is of 50 m interval).

the spatial area where citizens were buried and shows graveyards concentrated in the area up to about 15 km from the castle wall, and that the number of graves is almost constant for about 15 km away. Citizens at the time tended to bury the dead bodies in the surrounding area of the castle wall till about 15 km from the walls.

3.3 Verification of data obtained from the maps

Spatial distribution of 715 graves confirmed in the maps shows Type 1 in a blue circle and Types 2–5 in a red triangle in Figure 5. According to “History of Beijing Funeral,” Zhou [29] mentions a survey by the Social Bureau of Beijing City, which says Beijing has 87,000 tombs [30]. Therefore, assuming that the study is accurate, about 8% of the graves can be read from *Gaihozu*. In other words, the graveyards listed on the *Gaihozu* are limited to those with large areas.

Among the Types 2–5 that can determine the area, the smallest space is 3,475 m² of Type 2 (Table 2). Assuming this is a circle, the radius is 33 m. Type 1 cannot specify the area on the map. Therefore, the authors believed the field of Type 1 to be one-tenth of the minimum area of Type 2 (radius 10 m and area 314 km²).

The map obtained and used for analysis does not cover 26% of the entire range of 15 km from the Second Ring Road. Therefore, it is considered that the graveyard that existed is larger than the values in Table 2. The area of the existing

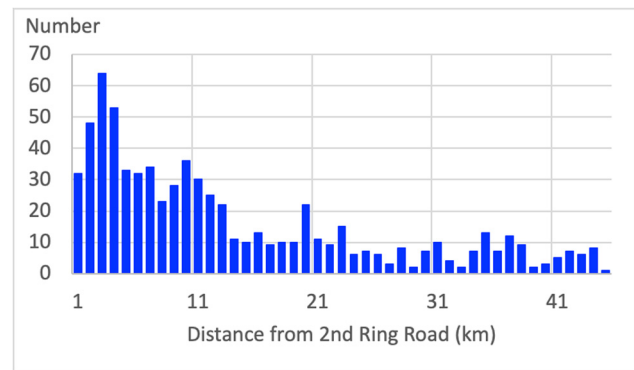


Figure 6: Number of graves by distance zone from the Second Ring Road.

graveyards should be 1.36 times larger, assuming that the graveyards are evenly distributed within 15 km. Based on this assumption, Type 1 is 0.08 km², Type 2 is 1.64 km², Type 4 is 0.81 km², and their total is 2.53 km². The survey mentioned above says the area of *Yiyuan* and *Yidi* for citizens is about 1.9 km². The area of the graveyard was probably more than 2 km², including a large number of burial graves not recorded in the survey. Although these two values do not match perfectly, it is reasonable to assume that the graveyard area at this time was about 2–2.5 km².

3.4 Distribution of modern cemeteries

The authors used the Beijing Civil Affairs Bureau [30] and private cemetery sales sites [31,32] to map all the modern cemeteries in Beijing City. The authors utilized the regular arrangement of tombstones and road shape expressed in Google Earth to record the spatial extent of the cemetery on GIS as a polygon.

Two types of modern public cemeteries in Beijing are an city cemetery and another. The former is a public cemetery approved by the city government; and in most cases, it is operated by a business operator under the control of the city. Other public cemeteries managed by the provincial government are, in principle, intended to provide cemeteries to residents, rather than to all citizens.

Very few cemeteries existed in stock during both the periods. The city government demolished most of the graveyards in the middle of the twentieth century after the independence of China to secure land for urban construction [33]. The cemetery currently served by citizens in Beijing has been newly constructed since then.

4 Discussion

4.1 Changes in locational characteristics of land use for deceased

Where do people want to be buried? Where do the dead want to hide? Whether such a desire will realize. These are essential perspectives in considering the sustainability of land use for the deceased. The authors consider two angles, the positional relationship between the graveyard and the built-up area, where the urban population lives, and the surrounding environment.

First, consider the first point. The built-up area of Beijing in the mid-twentieth century filled up the interior of ramparts and spread around the gates. Few graves are found inside the wall, but many graves were distributed outside of the castle wall. Figure 5 also shows some graveyards inside the walls. The castle wall at that time consisted of the inner wall of the northern part and the outer wall of the southern. The inner castle wall is an ancient castle wall in the fourteenth to fifteenth centuries. However, the outer wall was built in the late sixteenth century, and the urbanization within the wall delayed. Distribution contrast of graves indicates the castle wall acts as a barrier dividing the inside for the living population and the outside for deceased, in Beijing.

Figure 7 shows the spatial distribution of modern cemeteries [30]. The public cemeteries in Beijing were roughly divided into city and others. The city cemetery was operated by the Civil Affairs Bureau of the city, and others were established by a rural municipality with the permission of the local ward [34]. The figure shows that the cemetery widely distributed from the vicinity of the Fifth Ring Road toward the suburbs. The current built-up

area of Beijing City is in the process of passing the Fifth Ring Road and extending toward the Sixth Ring Road. The relationship between the distance to the Second Ring Road and the number of cemeteries changed around 1980 as a significant milestone in the maintenance of public cemeteries (Figure 8). In other words, few public cemeteries were established by the 1970s, within 20 km of the Second Ring Road. Some of them are private cemeteries such as *Wan'an* and *Fudian* cemetery established in the first half of the twentieth century and transferred later to the city government.

The city government established many public cemeteries relatively close to the Second Ring Road and also set up at a distance of 50 km to provide a funeral place for the public since the 1980s. The government has encouraged the city cemeteries to be accessed by all citizens. The other cemetery, on the other hand, is concentrated around 30–40 km. In this way, many cemeteries have been constructed in recent years at locations far from the built-up area.

Figure 9 shows the land-use ratio around the cemetery for each distance of the Second Ring Road. Land-use type was calculated based on the predominant land use. “Urban” stands out for built-up areas, “agriculture” stands for agricultural land use, and “Forest” stands for tree and forest. “Rurban” is a suburban area with a mix of urban and agricultural land, and “other” indicates land use that does not fit into any of them. The expanded built-up area surrounded the cemetery within 20 km, but farmland and forests surround the cemetery beyond. It indicates that the cemeteries developed in a few decades were separated from the urban area by interposing agricultural land and forests.

It is revealed that the built-up area and the graves and cemeteries were spatially separated in their location

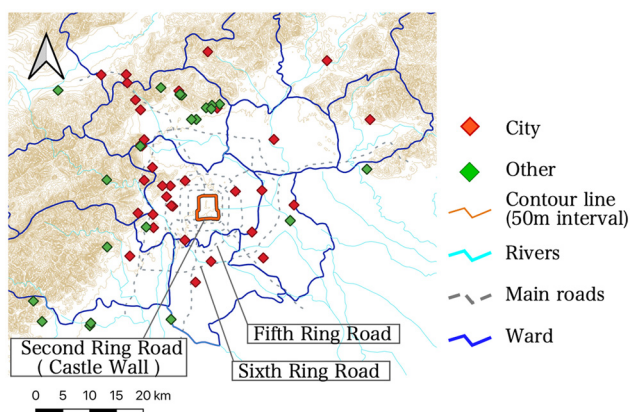


Figure 7: Distribution of public cemeteries (Source: [30]).

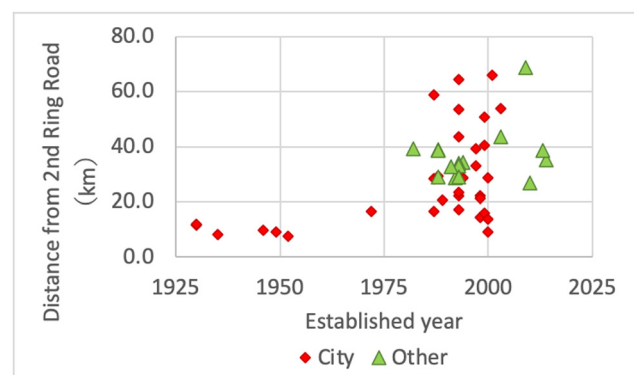


Figure 8: Established year and the distance from the Second Ring Road of public cemeteries.

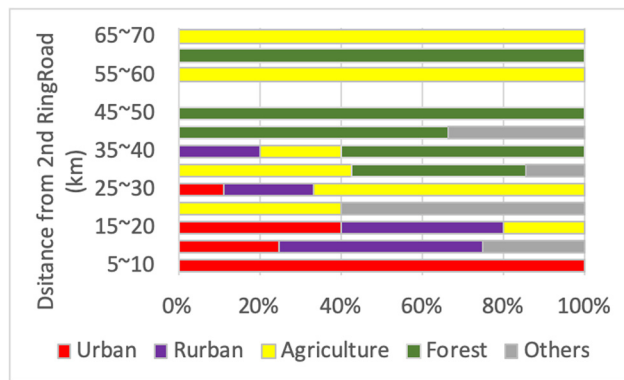


Figure 9: Land use of surrounding area of cemetery by distance (Source: [28]).

during both the periods. There are several reasons for the spatial arrangement features. It has the difficulty of securing the land for the maintenance of the graveyard in the built-up area in its vast territory. A problem in land-use planning is that it is difficult to switch to another land use for a long time once a land becomes a burial ground, and historically there are hygiene concerns such as epidemics [35,36]. The city officials of Beijing recognized a lot of graves distributed outside the castle walls as a sanitary problem in the middle of the 20th-century [37].

Traditionally people in the living world in China must not come into contact with the next world in their daily lives. So it is necessary for the real world, and the world after a death must be spatially separated. The features of the spatial distribution of the graves and cemeteries identified for two periods are universal and fit the traditional values of China.

4.2 Environmental characteristics of the grave and cemetery in two periods

Regarding the environment in which the graveyard is placed, which is the second purpose of the research, the authors considered the slope of the terrain around them. The topography of the northern region of the North China Plain, including the urban area of Beijing, is a very gentle slope descending from the northwest to the southeast, and the plain connects the mountains in the north and west. The Great Wall, built on the ridge of the mountainous region, has divided the plains and the northern plateau, in its history.

The elevation of the castle wall, which corresponds to the Second Ring Road, is about 40–50 m. The graves that are placed around the walls concentrated at an altitude of

35–70 m. The authors obtained the elevation difference around the graveyard with the highest and the lowest height in a 1-km buffer from the location. The height difference of the graves around the Second Ring Road is about 10–20 m, indicating that they are on a flat surface with little undulations. On the other hand, there are many graves with 30–50 m difference and within 100 m above the northwestern direction of the castle wall. These graves have a mountain on their back and in the distant view of the mountain slope.

In the area, there is the *Yuanminyuan* Garden, which was used as a summer resort for the Emperor of the Qing Dynasty, and the sloped terrain was suitable for *Feng Shui* thought. It is a traditional way of thinking of Chinese citizens and is desirable to return to the place where the “Qi” or “soul” of a person flowed out. Surrounded by mountains and the terrain behind the exit of the valley is a desirable location for *Feng Shui*. It has traditionally been used not only in cemeteries but also in various aspects related to life, such as the arrangement of houses in China [38].

In this area, for the ordinary people it is Types 1, 2, and 4; but for royal families, it is Types 3 and 5. Many cemeteries were located on flat land near the city walls easy to access, but a suitable place for *Feng Shui* attracted those who set up graves in the middle of the twentieth century.

Looking at modern cemeteries, Figure 10 shows that cemeteries located at higher altitudes tend to have more towering terrain slopes. In other words, cemeteries with a height of 100 m or more have an altitude difference of 100 m or more, and many cemeteries have an altitude difference of more than 200 m. These indicate that many modern cemeteries were developed with a slope behind them. Modern public cemeteries use large areas of plains for open access. Nevertheless, the *Feng Shui* thought tends to grow in an area suitable for *Feng Shui*, which is the right

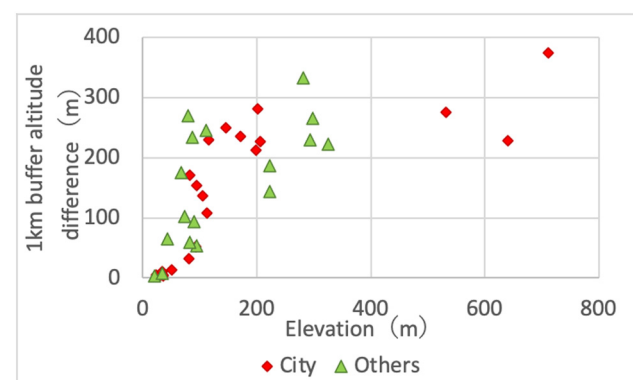


Figure 10: Elevation and slope of public cemeteries (Source: [28]).

place for people's souls to return (Figure 11). Some of the public cemeteries have posted a guideline on their online sales site saying, "Mountains surround three sides, one side faces the water. The environment is clean and quiet, and the scenery is graceful." Such advertisements show that the development side recognizes that the suitable site for *Feng Shui* is an essential factor for citizens' choice of cemeteries.

The spatial characteristics of the urban grave and cemetery locations are not fundamentally different between the mid-twentieth century and today, based on those considerations. In other words, the built-up area and cemetery were spatially separated by the castle walls in the mid-twentieth century, and they are mainly separated by farmland in modern times. Also, such places are a suitable location for *Feng Shui* thought. In the mid-twentieth century, many graveyards faced the northwestern direction of the castle wall, and they are located at the foot of the northern or western mountains at present. Despite nearly 80 years of population and economic growth in Beijing, no fundamental difference was observed in the spatial characteristics of land use for the funeral value of the deceased Chinese.

4.3 Land area for deceased of two periods

The grave area for general public estimated 2 to 2.5 km² and the per unit area is 0.01 km² for Type 2 and 0.02 km² for Type 4 in the previous chapter based on Table 2. On the other hand, the total size of a modern public cemetery is 9.54 km², with an average of 0.19 km² in modern Beijing. The entire area and a per unit area of the modern

cemetery are relatively large compared to the mid-twentieth century.

A large amount of cemetery is set up responding to the increasing urban population and consequently the death. To examine the graveyard area increased in response to the population increase, the authors calculated the area per million people. Beijing's population in the mid-twentieth century was approximately 1.55 million [39]. Therefore, the graveyard area per 1 million people is 1.33–1.67 km², and the modern cemetery has 1.3 km² of land per million people (2015). It indicates that the per capita area of contemporary time is almost the same or has decreased a little compared to the mid-twentieth century. In other words, in Beijing, the cemetery area expanded in response to the increase in urban population over the last half-century, and it has restrained against the rise in population.

Based on Figure 12 showing the yearly area changes in the established year, the cemetery area was 2.24 km², and the urban population was 1.19 million, and the cemetery area per 1 million was 1.17 km² in 1980. However, a new cemetery developed between 1980 and 2000 has 2.23 km² of land per million people in response to the rapid increase in urban population. The city government has promoted the development since around 1980, in contrast to what had been kept low until before. Still the area expansion rapidly slowed since the beginning of the twenty-first century.

There was a period when the cemetery area expanded over population growth, but it has slowed down from the mid-twentieth century to the present as a whole in Beijing. The burial of modern cemetery was once a land-fill, and the grave of a single body required 3–4 m² of land in the 1950s and 1960s. If such forms of burial had



Figure 11: Cemetery on the foot of slope at Longquan Public Cemetery (Changping Ward, September 4, 2018).

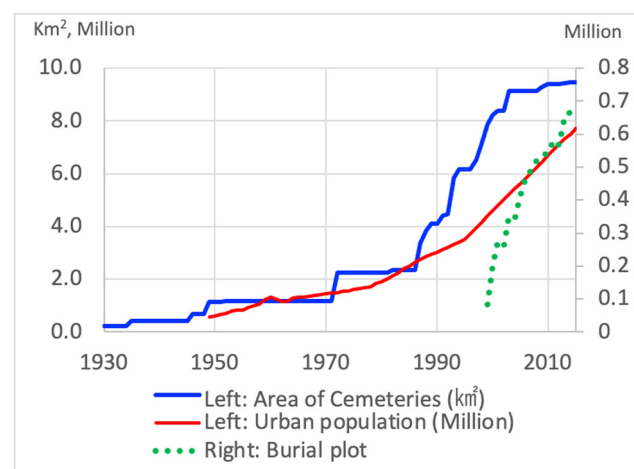


Figure 12: Area of cemeteries and burial plot of Beijing (Source: [26,27]).

continued to the present, a relatively larger area of agricultural and forest land had converted. Since the 1960s, the city government has actively promoted cremation to bury the bone ash in a smaller space. At the same time, the remains of a tomb in the burial site are repaired and the burial site is now within about 1 m² (Figure 13). At present, the cremation rate reached 100% in Beijing, and it pushes forward land saving to store such bone ash in a smaller area and vertically by introducing formats such as tree funerals and bone ash walls (Figure 14). The sharp increase in the number of burial plots shown in Figure 12 indicates the outcome of such city government policies. Also, ash scattering into the sea is an effective way to reduce the land for a funeral. Currently, the government is subsidizing this method, with about 1,000 cases per year. These funeral policies of the city government have restrained the expansion of the graveyard area.

5 Conclusion

In Beijing, the characteristic changes in the location and its area of the graves and cemetery in the mid-twentieth century and the present highlight the meaning of social, cultural, and political changes for the land use for deceased in contemporary urban China.

Regarding the location of them during both the periods, which was the first research purpose, it was common in that the built-up area for the living population and the cemetery for land use for deceased were spatially separated. Castle walls in the middle of the twentieth century, and farmlands and forests in the



Figure 13: Reburial for land saving at Fudian Public Cemetery (Haidian Ward, March 1, 2017. Personal names on the grave post are masked for privacy reason).



Figure 14: Land-saving funeral (Cinerary wall) at Changqingyuan Public Cemetery (Chaoyang Ward, November 4, 2016. Personal names on the grave marker are masked for privacy reason).

present play a role in separating the built-up areas from land use for deceased. Also, in the mid-twentieth century, in the northwest direction of the city walls, the trend to aim for a suitable place for *Feng Shui* thought is a common feature of two periods by utilizing the slope that changes from plains to mountains in modern times. These commonalities of location related to such cemeteries show that the values of citizens' funerals are deeply rooted in culture and are not easily changed. Traditional values such as *Feng Shui* thought were excluded as old ideas by the Communist Party after the founding of China. However, many citizens seek the advice of *Feng Shui* masters when selecting a graveyard now that the economy has become affluent.

On the other hand, regarding the change in the grave and cemetery area, which was the second research objective, space itself increased significantly. Still the area per population had decreased slightly. The city government, mostly since the 1980s, has responded to the increase in deaths by opening many cemeteries. In the process, the government has promoted land-saving-type burial by inducing burial of bone ash after cremation. Recently, it has developed methods for more effective use of land, such as the burial of trees and promotion of bone ash walls [40]. Besides, the city government is also working to promote the use of ash scattering in the sea, which does not utilize the land itself. The promotion of these land-saving funerals alleviates the pressure on land resources from funerals and helps Beijing's land use for deceased sustainability. Some efforts are taken to reduce the area of the graveyard outside China, and Beijing leads other countries in saving land in its methods and scale [41].

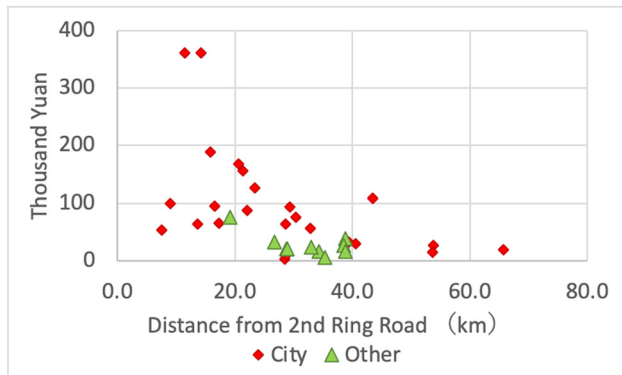


Figure 15: Lowest price of plot and the distance of public cemeteries (Source: [31,32]).

China is a multiethnic state, and so is Beijing. In 2012, the majority of Beijing city was Han Chinese, accounting for 95.9%. Many of the minorities, which make up 4.1% of the city's population, are Muslims [42]. Currently, the city government, in principle, requires burial of post-cremation ashes after death, and it has exceptionally permitted burial for ethnic minorities who have traditionally performed burial and has a public cemetery for such Muslims in the southwestern suburb of Beijing. The funeral policy in China requires consideration of such differences in funeral culture between ethnic groups from the viewpoint of land resource sustainability [43].

Modern cemetery locates on an excellent *Feng Shui* condition, with a mountain slope behind them, and such cemeteries are attractive to citizens. However, public cemeteries near the built-up area are expensive based on Figure 15, which shows the relationship between the lowest price and the distance from the Second Ring Road based on the commercial Internet sales site [31,32]. When citizens purchase burial plot of a public cemetery far from the city center according to their economic level, it is difficult to visit their cemeteries by public transportation, except for private cars. Chinese people traditionally visit graves during the Qing Ming Festival in spring. During the time, many people crowd into the cemetery, and many vehicles cause traffic congestion around the suburban cemetery. It is difficult to make a little public cemetery into an open space that is well-balanced to diverse social needs [44].

In Beijing, the increasing number of users of ash scattering in the sea, which can be used free of charge, is now helping to ease pressure on land resources. Such land-saving burials are not desirable given their values of underground burial. However, the acceptance of such land-saving graves by citizens indicates that funeral values of citizens are gradually changing. In Beijing, the pressure on land resources from land use for the

deceased is expected to increase to accommodate the increasing number of deaths. For the land use to be sustainable in Beijing, it is necessary to spread land-saving burials and foster the values of citizens who accept such burials.

After the Chinese Civil War following the end of World War II, the country's founding in 1949 introduced a political economy system led by the Chinese Communist Party to China. As a result, it may be a unique case in the world in that society's way of life, including the form of funeral, has changed drastically. It is necessary to proceed with research on East Asia, which has a relatively similar culture, and countries such as Europe and the United States, which achieved economic development and demographic transition at an early stage. Further studies will contribute to the land-use plans of developing countries in which the population is expected to rapidly increase in the future.

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