

IMPACT OF CEMETERIES ON THE DEVELOPMENT OF URBAN SETTLEMENTS IN EGYPT: THE CASE OF MINIA AND KHARGA

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Master plans for urban settlements must allocate land for a variety of uses, including special land uses such as sewage treatment plants, garbage treatment areas, and cemeteries, which should be located outside the habitable settlement spaces. However, master plans often do not adequately account for these special land uses, which can result in unplanned developments that may hinder urban growth in both the short and long terms. This is clearly happening in Egypt, as evidenced in the cemetery of Ghafeer in Cairo, which became a part of the residential area over time, and in many small towns like Kharga, Beni Mazar, Minia, Assiut, and Qena. This paper presents a study examining the issue of land use for cemeteries in Egypt and their unplanned development. It explores the burial culture of Egyptians and the specifics of certain cemeteries from the perspective of urban planning. It also presents the findings of a survey carried out in the cities of Minia and Kharga that involved residents' general observations about their cemeteries and a structured questionnaire to ascertain the problems related to sprawling, unplanned cemeteries. The paper discusses the importance of planning cemeteries, which should take into account the moral, legal, and religious needs of the society. To conclude, the paper derives several principles and guidelines for cemetery site selection that could be used in the preparation of structural plans for urban settlements in Egypt.

INTRODUCTION

Allocating land for cemeteries has been a problem for a very long time, as noted by Lehrer (1974:181):

Cemeteries pose a special problem to the urban practitioner because of the traditionally favored position which land used for burials has held. Burial practices have largely been determined by superstition, religion and a regard for sanitation and health. Thus, from the pyramids of Egypt through the churchyards of Europe to the modern memorial parks, civilizations have given cemeteries special protection.

Cemeteries usually require large areas, which has been a challenge historically. A report by the U.S. Department of Housing and Urban Development (1970) claimed that cemeteries occupied nearly two million acres of land in the United States. However, the main problem is not just the amount of land but that this land is often valuable urban property. Urban planners face the dual problem of finding sufficient land to be permanently allocated for cemetery use while ensuring these sites will also meet the moral, legal, and religious needs of the society. In this struggle, planners must deal with both future and preexisting cemeteries in an urban area (Lehrer, 1974).

Using land close to residences for cemeteries is not preferred in Egypt and other Middle Eastern countries, where cemetery features and forms differ from those in Western countries in two main ways: first, cemeteries in the West are more like green parks because it is possible to irrigate cemetery lands without disturbing the bodies buried inside wooden coffins, unlike in Islamic cemeteries, where bodies are not buried in coffins (and therefore irrigation is not possible). Second, many cemeteries in Western countries include urban features (*e.g.*, green areas, sitting areas, religious buildings) because they are professionally planned, unlike cemeteries in Middle Eastern countries, which are planned by municipalities as part of their general duties (Middle Eastern municipalities do not keep professional planners on staff). These differences make it undesirable to locate cemeteries close to urban settlements in Middle Eastern countries. This problem has arisen in Egypt because many master plans prepared for urban settlements have neglected to allocate areas for special land uses, such as cemeteries, which should be located outside the main urban spaces. This has led people to choose inappropriate sites for cemeteries, often illegally. However, because cemeteries are important for communities, and master plans have not allocated specific areas for them, municipalities have not taken action against these people. The result of such ad-hoc land use is sprawling cemeteries that sometimes occupy areas planned for urban development. Thus, urban settlements are surrounded by cemeteries and vice versa, an undesirable situation. The cemeteries in Kharga, Egypt, which are surrounded by residential areas, are one such example (Figure 1).

Moreover, the shape and size of a cemetery site should be determined based on the burial methods being used, which differ in Egypt between the majority Muslim population and the minority Christian population. However, illegal practices make it difficult for proper burial methods to be appropriately directed through planned urban development. The wrong choices and burial practices can lead to abuses of the land in urban areas. Cemeteries may also hinder other land uses in both the short and long terms. For example, Figure 2 shows a large area of land located on the bank of the Nile River in Minia that is used as a cemetery. Land located along the bank of the Nile is considered extremely valuable; thus, using it as the location of a very large cemetery is a misuse of this valuable urban land. Moreover, its placement blocks the possibility of urban expansion by the villages and cities located beside it.

Little previous literature or research has focused on cemeteries in Egypt or the Middle East. Thus, this paper aims to provide the Egyptian community with an appropriate solution for the problem of where to locate cemeteries. Moreover, it is hoped that this start may encourage further urban-planning research into cemetery land use. This paper discusses the issue of unplanned cemeteries in Egypt and its implications for urban planning. Though it is primarily written with a view to Islamic



FIGURE 1. The Muslim cemetery in Kharga and the residential areas that surround it.

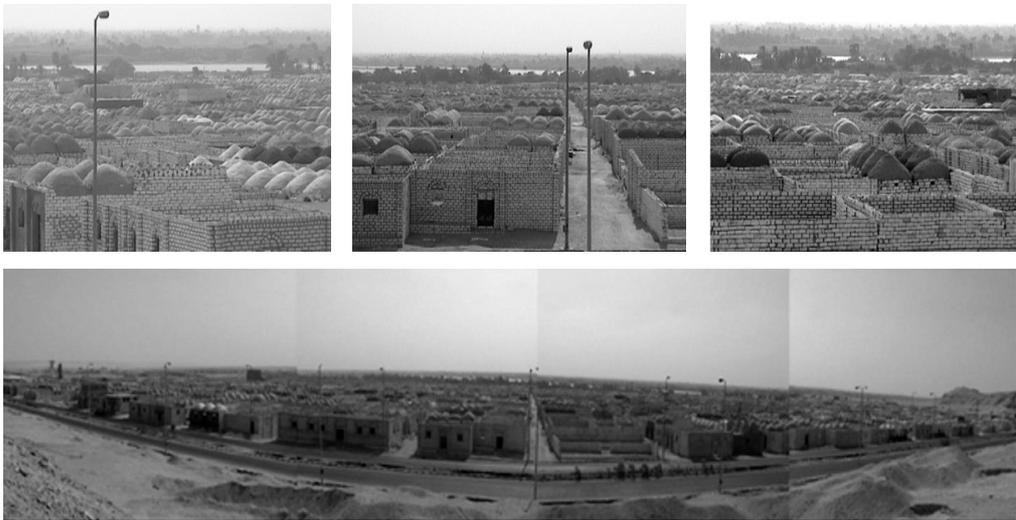


FIGURE 2. The huge area of Al-Kom Al-Ahmar Cemetery, which is located on the bank of the Nile River in Minia.

burial practices, it will also provide an overview of Christian burial practices to place the issue in context. The objectives of the paper are as follows:

- (1) To highlight the need for allocating well-planned areas for cemeteries within formal land-use plans. Cemeteries need large areas, so it is important for planners to consider such land uses when preparing master plans for urban settlements to discourage illegal practices.
- (2) To examine problems resulting from the inappropriate selection of sites for cemeteries in the Egyptian cities of Minia and Kharga.
- (3) To develop principles and guidelines for cemetery site selection that planners can apply in different cities and urban settlements in Egypt.

CEMETERIES: THE MOST ESSENTIAL AREAS OF SPECIAL LAND USE

As Goodman and Freund (1968) noted, cemeteries are areas that are generally used forever, and adequate space must be provided for their future expansion. Space allocated for a cemetery is rarely changed to another purpose later. In this sense, it is a very special land use. The amount of space allocated for a cemetery depends on the current and expected populations of an area, as well as the mortality rate. Perceptions of cemeteries and their relationship with local populations are couched in individuals' notions of death, burial, and the afterlife. Thus, the issues surrounding the planning of cemeteries are complex and myriad. Nevertheless, the place of cemeteries with regard to urban planning has received scant attention in planning research and literature.

Egyptian Cemeteries and Burial Culture

Ancient Egyptians took great care in preserving bodies after death. Corpses were buried in the ground or in tombs constructed from mud bricks or rock, and worldly goods, such as clothes and jewelry, were placed in the graves (Mark, 2013). Bodies were placed with the head to the east and the feet to the west, according to the belief that the dead would rise from their graves “facing west, a direction ancient Egyptians associated with death” (Maffly, 2010). The families of the deceased would visit the graves during feasts to give offerings, perfume the graves with incense, and perform major funerary banquets. The burial process in ancient Egypt was complex and evolved over time, though several aspects — the preparation of the body, the use of magic rituals, and the provision of grave goods — persisted (Mark, 2013).

There is some evidence that the Romans brought early Christian burial practices to Egypt as early as the second half of the first century A.D. Burials dating from that period have been discovered in which the bodies were placed with the head to the west (instead of the east), which could reflect the Christian belief that the Messiah would come from the east on Judgment Day (Maffly, 2010). The Coptic Christians (or Copts, the earliest Christian Egyptians) rose to prominence in Egypt in the fourth century, as Christianity began to find favor in the Roman Empire (*ibid.*), and Christian burial practices began to spread more widely at that time. The Bagawat Necropolis in the Kharga Oasis, one of the earliest and best preserved Christian cemeteries in Egypt, provides evidence of these early Christian burial practices (The Metropolitan Museum of Art, 2013).

At Bagawat, bodies were most commonly buried in pit graves surrounded by a low, rectangular brick wall and usually included a headstone (*ibid.*). The Christian burial process evolved to include placing the corpse inside a wooden box and burying the box under a building with a terraced pyramid (similar to a *ziggurat*) over the grave, as shown in Figure 3.

In the seventh century, at the beginning of the Islamic era, Muslims in Egypt began to use a different burial method that followed Islamic beliefs, which they called “legitimate burial.” This method, a form of “green burial,” involves burying the body wrapped in a shroud without a coffin. According to Islamic scholars (known as *mullahs*), the location of burial for a Muslim is considered an endowment from society until no part of his or her body remains in the grave, but when the body becomes dust, the place it was buried can be used again for burial, planting, construction, or any

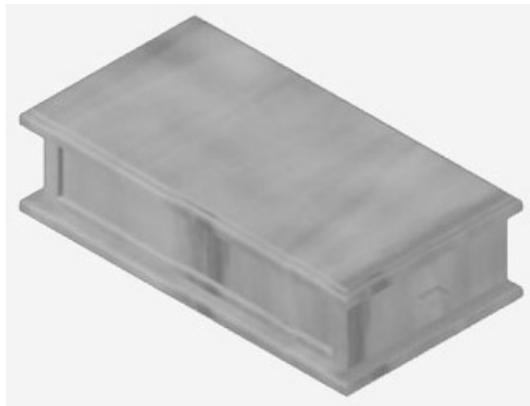


FIGURE 3. Examples of (top) Christian-style tombs and (bottom) coffins.



FIGURE 4. Aspects of the Islamic burial method: (left) the surface of the grave should be at ground level with only a small marker over the grave; (middle) the body is laid on the side of the grave and covered with stones; (right) a hole dug for burial.

other land use. If bones are found while digging a grave, the digging must be stopped. If the remains of bones are found after the digging is finished, the remains must be collected and put on the side of the grave, and the grave can be used again. A dead body cannot be moved from a grave except in three specific cases: if the body was buried without being washed, to correct the direction in which the body was buried, and if large amounts of water reach the grave (Sabeq, 1985). The Islamic burial process adheres to the words of the Prophet Muhammad. The body is laid on its side on the side of the grave and covered with stones so the earth is not placed directly on the body when the grave is filled (Siala, 1996). The surface of the grave cannot rise above ground level, although a marker can be placed over the grave, following the example of the Prophet Muhammad, who placed an inscribed stone over Othman Bin Mazoon's grave (Al-Jazaieri, 1978) (Figure 4). However, tombs and monuments cannot be constructed over graves. Nevertheless, in many urban settlements in Egypt, Muslims now construct tombs more like Christian tombs, a trend that began in the 20th century.

According to the practices of the Prophet Muhammad, Muslims are allowed to visit Muslim cemeteries in order to pray for the dead and ask God's mercy for them and to be reminded of death and the hereafter (Siala, 1996). Thus, one is allowed to visit a cemetery while going somewhere else, instead of making a special visit. However, the Prophet Muhammad recommended that followers not visit cemeteries frequently or during certain times like feasts.

Islam requires a unique method of carrying the dead to a cemetery. The earliest Islamic doctrine, which is still followed, requires that bodies be placed in a wooden container, called a *naash*, and carried on foot. The body should be carried by four men, who should walk for less than one minute, followed by additional groups of four men, who take over every minute. This method is followed for two reasons: (1) to inform people on the road that a body is being transported, so they can pray for the dead, and (2) because of the belief that God gives mercy and forgiveness to those carrying the dead. The dead can also be moved by vehicle in certain situations: if there are extreme weather conditions like intense sun, rain, or cold; if there is a shortage of people to carry the body (Ibn Taymiyyah, 1995); if there is a long distance to the cemetery; or if the dead body is large and heavy (Al-Rehebany and Al-Shti, 1961).

It is important to followers that their religious doctrines be followed, and neglecting cemetery land use during the planning process can create conflicts between religious doctrines and burial practices as they are applied.

Cemeteries from the Perspective of Urban Planning and Planners

Three main aspects must be considered when choosing a site for a cemetery: the location must be easily accessible, relatively permanent, and able to be regulated (Lehrer, 1974). Urban planners do

not recommend prohibiting cemeteries within city limits, reasoning that, because they are considered a cultural necessity, if they are banned within the city, they will instead be placed in areas just outside the city limits. Then, “as the city grows, those cemeteries which have been arbitrarily placed outside the city limits, devoid of municipal regulation, will impede future municipal growth” (*ibid.*:184-185). Moreover, “many of these cemeteries have been poorly maintained or abandoned. Poorly maintained and crowded cemeteries, like other neglected and crowded land uses, also depress the surrounding neighborhood” (Lehrer, 1974:189). Nevertheless, many U.S. courts “have held that a city may ... prohibit cemeteries within its boundaries if the city is densely populated. Furthermore, statutes prohibiting burials within short distances of a densely populated city’s boundaries have been held valid” (Lehrer, 1974:185-186).

In Egypt, modern planning practices have not dealt meaningfully with issues concerning cemeteries. For example, Egypt’s housing and construction law (Ministry of Housing, Utilities, and Urban Development, 2008) does not mention anything about the planning of cemeteries. The second article of the urban-planning law (with regard to physical planning) refers to the need for different land uses — residential, commercial, industrial, touristic, recreational, and “other” — to be compatible with both the circumstances of the city or village and the needs of the residents (Ministry of Housing, Utilities, and Urban Development, 1982), but it is only the reference to “other land uses” that is applicable to cemeteries. Nevertheless, as an “other land use,” the planning of cemeteries must reflect the needs of local residents.

This lack of planning has had a number of consequences in Egypt. Around the beginning of the 20th century, some families began to create private family cemeteries, building their own tomb-like houses with either vault roofs made of bricks or flat roofs made of reinforced concrete to house their family’s dead instead of using public cemeteries. People also claim areas within cemeteries and construct tombs to assert their ownership of the areas. Usually, these occupied areas are unplanned public areas. Some people use this illegal process to achieve financial benefits by occupying several areas and then selling them off as the cemetery fills up and demand for the land increases. The Egyptian government has generally failed to take action against such construction and claims (*e.g.*, El Deeb and Keath, 2013). Moreover, corruption within the government has led to problems at a number of Egyptian cemeteries, as some government officials have allocated plots to themselves using their children’s names; they then wait until the demand increases and sell the plots at a higher price. This process has created a false demand for cemetery plots and encouraged the extension of cemeteries without there being an actual need to do so.

According to the Egyptian planning administration system, each municipality or the local government unit is assigned two or more villages under its jurisdiction. Such villages are identified as dependent villages of that particular municipality, and smaller villages are also assigned to them. Generally, cemeteries are allocated to the municipality as a whole and are available to residents of the towns and villages therein. Due to the importance of cemeteries in society, site selection for new cemeteries or the expansion of existing ones must be approved by a committee representing the ministries of health, housing, and irrigation. The committee must contain members from the authorities of antiquities, railways, roads, mines, and quarries. Alam (1998) outlined the criteria for cemetery site selection in Egypt:

- the site must be located in the opposite direction of the prevailing winds;
- the site must be located at least 656 ft. (200 m) from any urban public space in a settlement;
- the site must be located at least 328 ft. (100 m) from main roads or separated by a minimum of 66 ft. (20 m) of green zone;
- the site must be located at least 328 ft. (100 m) from wells, rivers, and irrigation pathways such as canals;
- the site must be protected year-round from damage due to underground water;
- the burial level must be 4.9 ft. (1.5 m) higher than the underground water level at the site; and
- sites at higher elevations are usually preferred.

TABLE 1. Comparison of the case-study cities (Data sources: CAPMAS, 2007; EGSA, 1960).

Category	Kharga	Minia	Location
Region	Middle Upper	North Upper	
Governorate	New Valley	Minia	
Coordinates	25°26'56"N, 30°32'24"E	28°07'10"N, 30°44'40"E	
Elevation	105 ft. (32 m)	154 ft. (47 m)	
Form of urban settlement	City developed in desert oasis (detached)	Main city surrounded by satellite towns (semi-attached)	
Ratio of Christians to Muslims	1:99	1:4.5	
Water source	Underground water	Nile River	
Climate	Hot desert	Hot desert	

Previously Proposed Solutions

Numerous innovative solutions have been proposed to solve the problem of reconciling the need for open spaces in high-density urban areas with the need for more land to be used for cemeteries and the desire to make them more attractive. For example, in 1919, the city of Basel, Switzerland, set aside 125 acres of land for future burials. The city maintained the existing cemeteries until 1952 and then converted the land to other uses. Graves in the new plot are maintained by the city for 20 years, after which they are reused for new burials unless the family pays a high fee to keep them. The city of San Francisco, California, enacted legislation in the early 20th century to move all of its cemeteries to the nearby city of Colma, which remains a city largely dedicated to cemeteries (Lehrer, 1974). Others have suggested that bodies could be stored above ground “in multi-story mausoleums which could hold as many as 20,000 bodies in a fraction of the space used in a conventional cemetery” (*ibid.*:196-197).

To avoid wasting valuable “urban land, planners have also developed innovative ideas to make existing cemeteries a more useful part of the urban environment. Consequently, some cities have ... made efforts to convert cemeteries into useful open spaces” (Lehrer, 1974:197). For example, one cemetery in Cambridge, Massachusetts, also functions as a botanical garden. Forest Lawn Memorial Parks Cemetery in California contains copies of classic sculptures and fountains instead of traditional monuments and is a popular setting for weddings. The city of Pulaski, Tennessee, converted one of its dilapidated cemeteries into a park (Lehrer, 1974).

Another solution that has gained increasing favor in recent years is so-called “green” or “natural” burials, which seek to move death back into the cycle of life. The concept of green burials developed in reaction to the practices of embalming and casket burial that are common in the U.S. and Europe (Hammond and Playle Architects, LLP, 2005). Green burials seek to “ensure the burial site remains as natural as possible in all respects. Interment of the bodies is done in a bio-degradable casket, shroud, or a favorite blanket,” without the use of embalming fluid or concrete vaults (GreenBurials.org, 2008). Afla and Reza (2012) discussed the concept of sustainability in relation to cemeteries and Muslim burial spaces around the Kuala Lumpur metropolitan region. Steps to improve the sustainability of cemeteries, such as reusing old burial sites for new burials, can be taken in accordance with Islamic doctrines.

CASE STUDIES

Many cemetery sites in Egypt have been located in inappropriate sites. Such practices have numerous implications for urban settlements, but these issues have not been examined sufficiently in the literature. Thus, the author recently carried out a study involving cemeteries in two Egyptian cities, Minia and Kharga, in order to ascertain the planning implications of these practices. Table 1

TABLE 2. Distances between cemeteries and settlements in Minia (km).

Settlements	Cemeteries					
	Sawada Cemetery	Al-Faham Cemetery	Al-Kom Al-Ahmar Cemetery	Aljadidah Cemetery	Almtahirh Alsharkeya Cemetery	Alnuerat Cemetery
Madinat Al-Minia	4.1	7.8	11.2	22.3	15.4	17.0
New Minia	8.8	12.5	7.5	12.8	13.4	15.0
Nazlat Husayn Ali (village)	5.3	9.2	12.4	18.0	16.6	18.2
Sawada (village)	.1	3.8	7.2	21.7	11.3	12.9
Zawiyat Sultan (village)	3.7	0	3.4	25.3	7.6	8.8

Note. Distances were measured using the global positioning system in the Google Maps smartphone application.

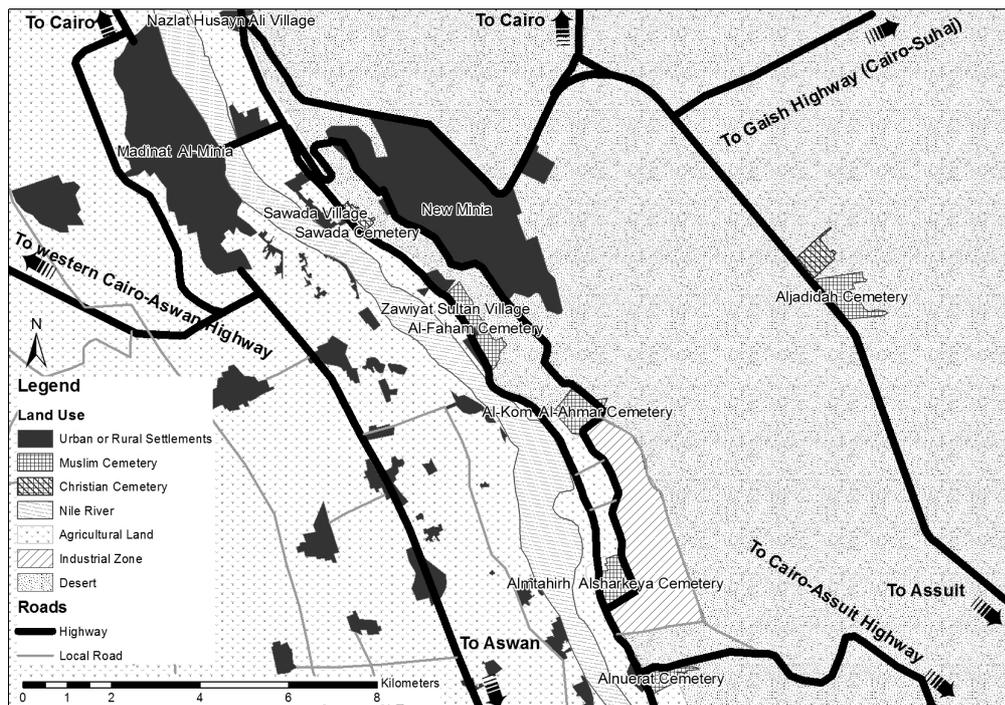


FIGURE 5. Map of towns, villages, and cemeteries in Minia. (Map adapted from EGSA, 1992; GOPP, 2002, 2007.)

provides a comparison of the two cities. The author selected these cities for two reasons: first, they represent the two different kinds of urban settlements in Egypt (Minia consists of five semi-attached urban and rural settlements; Kharga is a geographically detached urban settlement); thus, their selection ensured that both kinds of Egyptian settlements were covered in the study. The second reason is related to the author's university's aim of service to one's community: the author is affiliated with Minia University, and Kharga is his hometown. The study involved general observations of the two case studies and a structured questionnaire to ascertain residents' perceptions about their cemeteries and their thoughts on the problems related to sprawling, unplanned cemeteries. This section will discuss, explore, and analyze the cemetery sites in the two Egyptian cities; the problems that have arisen from the selection of poor locations for the cemeteries; and the impact of these site selections on both current and future urban development in both cities.



FIGURE 6. Sawada Cemetery.



FIGURE 7. Al-Faham Cemetery.



FIGURE 8. The road that divides Al-Kom Al-Ahmar Cemetery into two parts.

Case Study 1: Minia

Minia is a city located in the Minia governorate in the region of North Upper Egypt. It consists of two towns, Madinat Al-Minia and New Minia, and a number of villages. This case study focuses on the two towns and three of the villages, Nazlat Husayn Ali, Sawada, and Zawiyat Sultan, which are located very close to the cemeteries used by the two towns. The distances between the six shared cemeteries and the five urban and rural settlements of Minia are shown in Table 2.

Observations regarding cemetery sites in Minia

Figure 5 shows a map of the towns, villages, and cemetery sites in Minia. All of the cemetery sites are located on the east side of the Nile River. These areas were initially rural settlements; cemeteries; and in some cases, archaeological sites. They were not developed until the early 1980s, after a bridge connecting Minia to the east side of the river was constructed and a master plan for New Minia was prepared. In the early 1990s, an industrial zone was established on the east side of the river. These sprawling cemeteries have constrained the growth of the surrounding urban development projects and, as a result, have greatly affected the progress of both current and future developments.

Sawada Cemetery is a Christian cemetery that occupies an area of about 30 acres (Minia Municipality Project Sector, 2004). It is located behind a row of houses adjacent to the road that leads to the industrial zone and some scattered rural settlements on the east bank of the Nile (Figure 6).

Al-Faham Cemetery is a Muslim cemetery located in the village of Zawiyat Sultan. It extends for about 1.2 miles (2 km) and has an average width of about 1,312 ft. (400 m) (Minia Municipality Project Sector, 2004). It was planned for 137 tombs across an area of 10 acres, but it spread randomly until it en-

compassed an area of approximately 179 acres (*ibid.*). Currently, there is no precise count of the number of tombs in the cemetery. It is surrounded by the residential areas of the village located beside the main road in Minia. Figure 7 illustrates the indiscriminate sprawl of the cemetery.

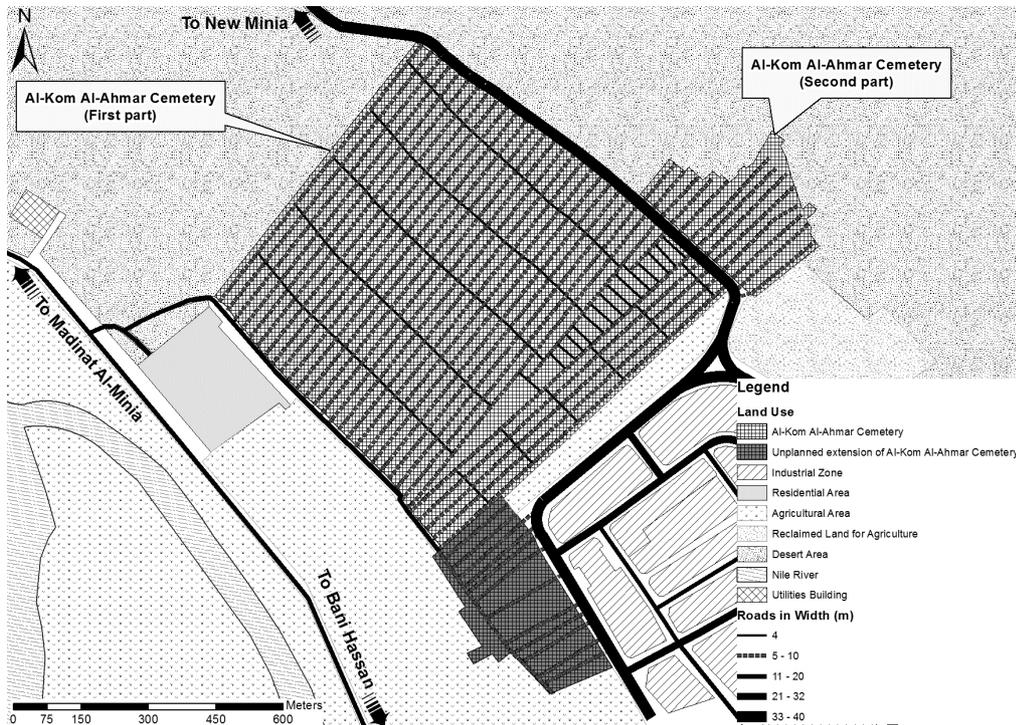


FIGURE 9. Condensed layout of the tombs in Al-Kom Al-Ahmar Cemetery. (Map adapted from EGSA, 1992; GOPP, 2002, 2007.)

Al-Kom Al-Ahmar Cemetery is a Muslim cemetery located outside the urban space of the village of Zawiyat Sultan. It occupies about 177 acres (Minia Municipality Project Sector, 2004). The road connecting the industrial zone and New Minia divides this cemetery into two areas (Figure 8). The cemetery includes 11,252 plots for burial, 8,252 of which have been reserved for residents of the city of Minia; the remaining 3,000 plots have been reserved for both urban and rural inhabitants of the Minia region (*ibid.*). The first part of the cemetery, on the western side of the road, lies adjacent to the industrial zone on the north side. Within this part are 30 smaller roads, each 20 ft. wide and 2,949 ft. long (6 m x 899 m). The plots are divided into sections containing 25 plots; between each section is an “interval street” measuring 13 ft. (4 m) wide (Figure 9). These interval streets have been infringed upon and exploited to construct tombs. The network of streets has only one entrance and one exit, with no other options for entering or leaving. Figure 9 illustrates the condensed layout of the tombs in the cemetery, and Figure 10 shows the cemetery’s long streets and large area. The second part of the cemetery is located east of the main road and directly adjacent to a small hill. The cemetery’s surface is not level. The plots



FIGURE 10. A long street in Al-Kom Al-Ahmar Cemetery.

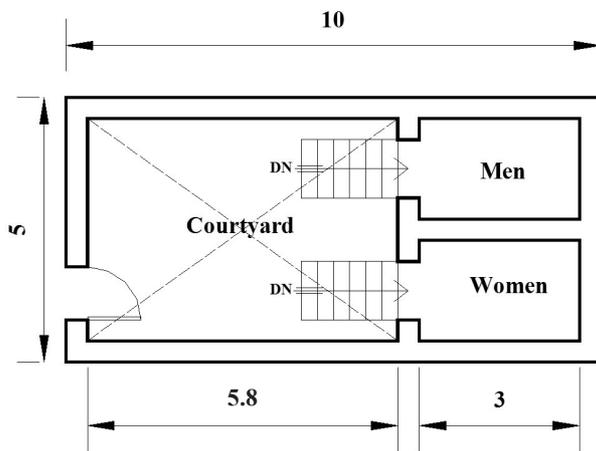


FIGURE 11. Plan of the tombs in Al-Kom Al-Ahmar Cemetery. (Units shown in meters. "DN" indicates the stairs going down in the direction of the arrow.)

within the cemetery are usually fenced, with only one door beside the street providing access. Each burial plot measures 16 ft. x 33 ft. (5 m x 10 m). Within each plot, a tomb is built with two chambers and a courtyard. Each tomb can be used for up to four burials. The tombs are usually constructed of limestone, with the floor below ground level, and the roofs are usually raised on walls to create a vault above. Figure 11 shows a plan of the tombs in Al-Kom Al-Ahmar Cemetery. Over time, the cemetery has continued to sprawl, and there has been an unplanned extension of the cemetery onto the agricultural land to the southeast (Figure 9).

Aljadidah Cemetery is a new, planned Muslim and Christian cemetery located beside the new eastern highway in Minia. In Egypt, cemeteries are usually allocated exclusively for a certain religious group, but some of the new cemeteries are used jointly by Muslim and Christian communities, with separate portions allocated to each group. The cemetery extends over 395 acres. In plans for the cemetery, two-thirds of the area is allocated to residents of the city of Minia, while the remaining third is allocated to residents of the Minia region (Minia Municipality Project Sector, 2004). The cemetery is subdivided into 9,000 plots for Christians and 13,680 plots for Muslims. Each plot measures 16 ft. x 33 ft. (5 m x 10 m). A street measuring 46 ft. (14 m) wide separates the Muslim plots from the Christian ones. The construction line is located 344 ft. (105 m) away from the eastern highway. Streets measuring 20 ft. (6 m) wide subdivide the cemetery along its 3,035 ft. (925 m) length, as shown in Figure 12 (*ibid.*). The aerial layout view in Figure 13 shows the 8,180 tombs that have been constructed in the new cemetery thus far, all of which have been allocated to residents of the city of Minia (5,300 for Christians and 2,880 for Muslims). Residents of the Minia region have not yet received any of their allocated plots. Figures 12-13 illustrate the difference between the planned allocation and the construction that has been completed, which is a result of errors introduced by poorly qualified land surveyors when transferring the plans for the cemetery to the land using survey equipment. Religious buildings are allowed to be constructed within the cemetery. For example, a church was built inside the area allocated for Christians on an area of 3,229 ft.² (300 m²), and two mosques were built in the Muslim area, one beside Street No. 20 and another on Street Nos. 14 and 15 (Figure 12). Plots for tombs in the cemetery are inexpensive and relatively easy to obtain. Each plot costs less than 30.5 Egyptian pounds (roughly US\$4.25 in 2014). As a result, the demand for plots has increased, and the waiting list has grown to some 27,000 requests (*ibid.*). Because the plots are so inexpensive, there have been instances of people selling their plots at a higher price after receiving them from the municipality.

Almtahirh Alsharkeya Cemetery is a Muslim cemetery that borders the western side of the industrial zone, which prevents the further extension and development of both the cemetery and the industrial zone on that side. The cemetery extends over an area of about 95 acres (Minia Municipality Project Sector, 2004).

Alnuerat Cemetery is a Muslim cemetery that borders the residential area of the village of Alnuerat (a dependent village of the Zawiyat Sultan Municipality) on the cemetery's west side, which prevents the further extension and development of both the village and the cemetery on that side. The cemetery is allocated specifically to the village of Alnuerat (a special case) and covers an area of about 21 acres (Minia Municipality Project Sector, 2004).

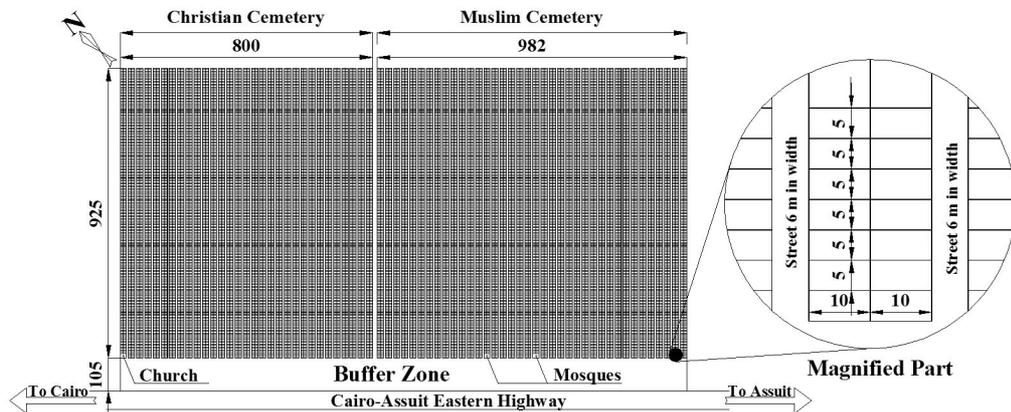


FIGURE 12. Plan for Aljadidah Cemetery showing the subdivision of plots. (Units shown in meters.)

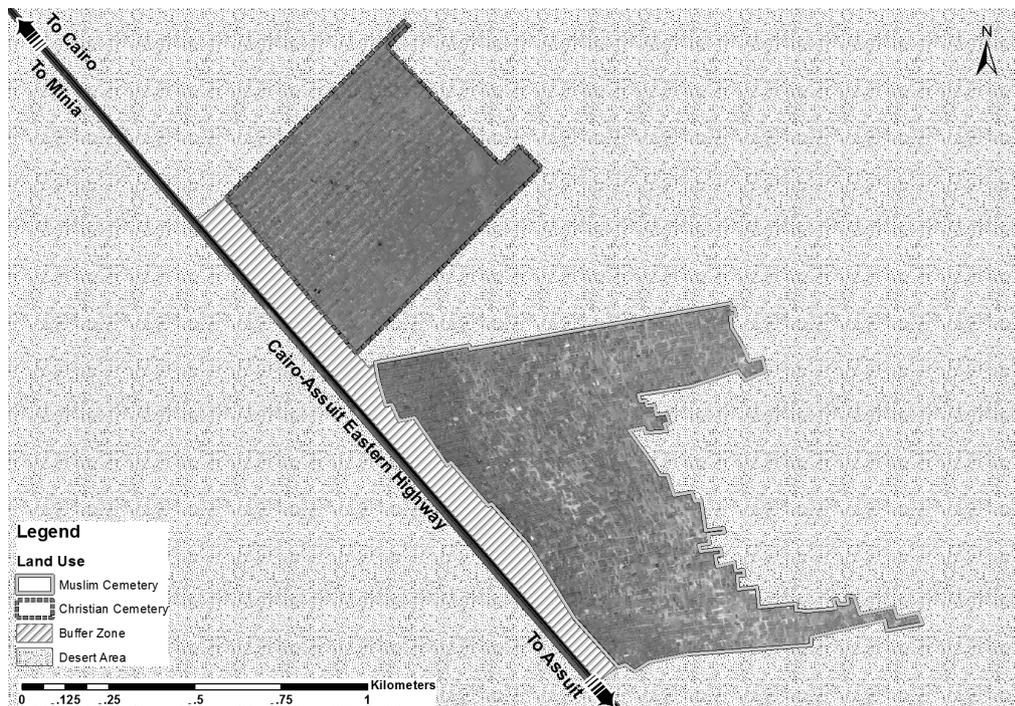


FIGURE 13. The allocation of tombs to Muslims and Christians in Aljadidah Cemetery thus far. (Map adapted from EGSA, 1992; GOPP, 2002, 2007.)

Case Study 2: Kharga

Muslims in Kharga use the legitimate Islamic burial method used since the Islamic conquest of Egypt, while Christians follow the same method the Copts used before the Islamic conquest. Both groups bury bodies in a hole in the ground; Christians place the body in a coffin before burial, while Muslims wrap the body in grave clothes (variously referred to as cerecloths, shrouds, or winding sheets) before burial. While these burial methods have helped to limit the problem of cemetery sites increasing in size because no permanent tombs are constructed (as in Minia), residential buildings have now been constructed all around the cemeteries, and neither the cemeteries nor the surround-



FIGURE 14. Cemetery sites in Kharga. (Map adapted from EGSA, 2002; GOPP, 2004, 2007.)

ing buildings have room to expand in the future. Figure 14 shows the two cemetery sites in Kharga, which are trapped within urban developments.

Observations regarding cemetery sites in Kharga

The Muslim cemetery in Kharga is located in an area surrounded by buildings on all sides, including schools, public services, and residential buildings for both government officials and private citizens. The current Muslim cemetery is the third one built in Kharga. Its location was chosen after the first two were filled. The sites of the first two cemeteries were replaced by schools after more than 40 years had passed since the date of the last burial. The current cemetery extends over an area of approximately 16 acres (Figure 14). The burial method adopted in the cemetery follows legitimate Islamic traditions, but there is still not enough available space, and the urban development surrounding the cemetery means there is nowhere for it to expand. As a result, new graves have been constructed on the paths between the older graves, so there are no paths left. The residential buildings for government officials were constructed ad hoc in the middle of the cemetery without a clear plan or a predetermined arrangement, which has created a difficult situation, as Figure 14 shows. This example provides strong support for the research hypothesis that unplanned cemeteries negatively impact urban development.

The Christian cemetery in Kharga occupies a small area (less than .7 acres) located in the midst of the Basateen residential district. It is bordered on the north by a group of homes, on the east by a bus station, on the south by a street, and on the west by an elementary school. Because it is small and limited in area, the cemetery does not currently have a negative effect on urban development. However, from an urban-planning perspective, Kharga's master plan has not sufficiently dealt with the absence of a green area to separate the cemetery from the surrounding houses or the lack of space for future expansion of the cemetery.

Analysis of Case Studies

The analysis of the case studies above yielded the following observations.

Minia

First, the cemeteries in Minia are scattered in different zones. These unplanned cemeteries show a high level of continuous sprawl around residential areas, as evidenced by the indiscriminate sprawl of Al-Faham Cemetery in the village of Zawiyat Sultan. The cemeteries occupy an area of approximately 897 acres in Minia. The total area of Minia, including the urban space adopted in 1998, is about 2,466 acres (GOPP, 2002). Thus, cemeteries represent 36.4% of the total physical space in Minia. The projected population of Minia in 2020 is 380,048 people (CAPMAS, 2007), which means the predicted acre/person quota of the Minia cemeteries will be 2.36 acres per 1,000 inhabitants. The cemeteries in Minia are surrounded by residential areas and have become an obstruction to urban growth, particularly in the village of Zawiyat Sultan. In addition, Al-Kom Al-Ahmar Cemetery and Almtahirh Alsharkeya Cemetery block the extension of the industrial zone to the north and west respectively, and Alnuerat Cemetery may block the extension of the industrial zone to the south unless some control is placed over the unplanned extension of the cemetery. Moreover, the location selected for the Aljadidah Cemetery is the best location in the area for urbanization because of its rare flat land; thus, this land could have been allocated for a more productive use than a cemetery.

Kharga

Compared with those in Minia, the cemeteries in Kharga occupy relatively small areas because of the burial methods adopted there; neither Muslims nor Christians in Kharga build tombs in their cemeteries. The cemeteries in Kharga occupy about 17 acres of the city's total physical urban space of 4,782 acres, about .36%. The population of Kharga is expected to be about 80,000 people by the year 2020 (Soliman, 2003). Thus, the acre/person quota of the Kharga cemeteries will be .2 acres per 1,000 inhabitants. The cemeteries are adjacent to residential areas, and the Muslim cemetery has negatively affected urban development in the city. The lack of planning for future expansion of the Christian cemetery is likely to also affect urbanization in the future. Although the current cemeteries are nearing their capacity, the 2017 future plan for Kharga does not provide any alternative locations for future cemeteries (GOPP, 2004). It is likely that this will result in ad-hoc site selections for future cemeteries.

RESIDENT SURVEY

Goal

For this research, the author also administered a questionnaire survey to residents of Minia and Kharga with the aim of identifying problems resulting from the unplanned cemeteries in those cities. The survey inquired about individuals' needs related to cemeteries, their awareness of the importance of planning cemeteries, and problems they associated with unplanned and sprawling cemeteries. It also sought to ascertain information about the burial culture in Minia and Kharga.

Population and Sampling

The survey was conducted among residents of both Minia and Kharga. It is difficult to define a specific cemetery for each settlement in Minia because many of the settlements are connected to each other, and most of the cemeteries are not significantly closer to any specific settlement. According to the 2006 census (CAPMAS, 2007), Minia has a population of 287,941 residents in five settlements, while Kharga has only 68,390 residents. Kharga has only two cemeteries (one for Muslims and one for Christians), and there are no other settlements close to it.

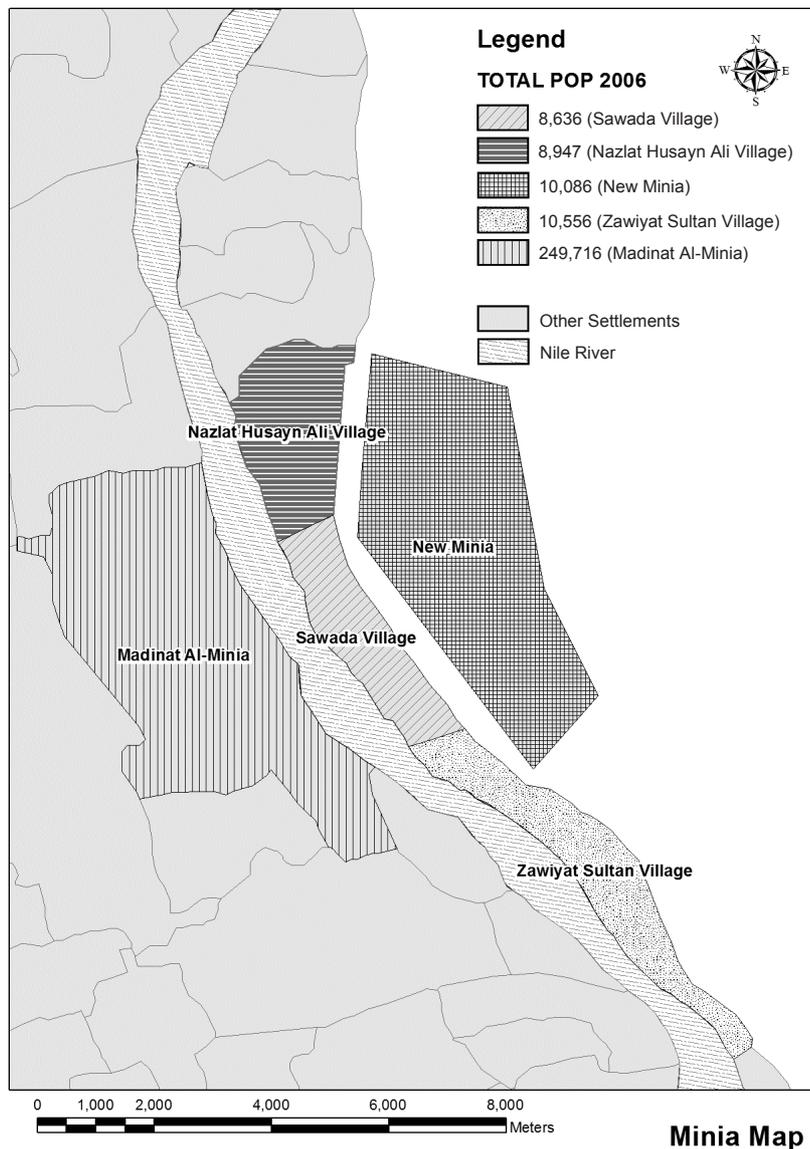


FIGURE 15. Map showing the spatial distribution of the population in Minia. (Map adapted from EGSA, 1992; GOPP, 2007.)

The demographics of the populations in the two cities defined the survey samples. The spatial distribution of the inhabitants was more important in Minia (because residents were spread across five settlements) than in Kharga (with only one settlement). The percentage of people who affiliated with certain religions also differed between the two cities. In 2006, Christians and Muslims accounted for 18% and 82% of the population respectively in the Minia governorate and 1% and 99% respectively in the New Valley governorate, of which Kharga is the capital city (CAPMAS, 2007).

Figure 15 shows the spatial distribution of the population in Minia. The author used a stratified random sampling technique for this research in relation to both the religion and population percentages for each of the five settlements in Minia. As a result, the author determined the sample

TABLE 3. Extracted results of the sample-size calculations (Data source: CAPMAS, 2007).

Case study	Sample size	Settlements	Population	% of total city population	Target respondents		
					Total	Muslims	Christians
Minia	384	Madinat Al-Minia	249,716	86.7%	333	273	60
		New Minia	10,086	3.5%	13	11	2
		Nazlat Husayn Ali	8,947	3.1%	12	10	2
		Sawada	8,636	3.0%	12	10	2
		Zawiyat Sultan	10,556	3.7%	14	11	3
Kharga	382	Kharga	68,390	100.0%	382	378	4

size was well representative of the population and would ensure accurate results. To calculate the Minia and Kharga sample sizes for the survey, the author used a 95% confidence level and a confidence interval of five and assumed a worst-case percentage (50% of the sample chose a particular answer). The following equation was used to derive the sample sizes:

$$Ss = (Z^2 \times P \times [1 - P]) / C^2$$

where Ss = sample size; Z = Z value; P = percentage of respondents who selected a particular answer, expressed as a decimal; and C = confidence interval, expressed as a decimal (Creative Research Systems, 2012). The following equation, where Pop = population size, was used to correct for the finite population (*ibid.*):

$$\text{New } Ss = \frac{Ss}{1 + \frac{Ss - 1}{Pop}}$$

From these calculations, the author determined that sample sizes of 382 in Kharga and 384 in Minia were needed. Table 3 shows the extracted results of the sample-size calculations.

Methodology

Egypt ranks relatively low in terms of Internet usage worldwide. In 2012, of the total Egyptian population of roughly 83.7 million, only 29.8 million (35.6%) used the Internet (Internet World Stats, 2012). Moreover, most Internet users live in megacities, such as Cairo and Alexandria. Therefore, in order to reach a larger portion of the population, a hard-copy questionnaire was used in this study instead of an online survey. Hard copies of the questionnaire were distributed in person to individuals in the cities and villages, as well as at the author's university. Participants were chosen randomly, but efforts were made to ensure people of various ages, genders, religions, education levels, and occupations were included. If a respondent indicated that he or she was not literate (which was not uncommon among the elderly in the villages), a member of the research team would read the questions to him or her and then write down the respondent's answers. The questionnaire was distributed to 120% of the target sample sizes (*i.e.*, 461 people in Minia and 458 people in Kharga) in order to ensure that the target sample sizes would be reached after any incomplete surveys were removed. Completed questionnaires were collected in a geodatabase for spatial and tabular analysis.

The questionnaire consisted of nine questions in addition to personal information, such as the respondent's name, religion, and address. Eight of the questions were multiple-choice questions with three or more possible answers. Three of these questions contained additional follow-up questions, also in multiple-choice format (see Table 4). The ninth question asked respondents to choose answers from a checklist of provided options (see Table 5). This variety of questions

encouraged respondents to think before answering and was designed to produce more accurate results. The questionnaire was designed to avoid bias that might result from the number of surveys that were rejected as invalid. It contained two aligned questions (questions three and four) to ensure the validity of the results. Incomplete questionnaires and questionnaires on which the answers to questions three and four did not align were rejected from the sample. From the remaining questionnaires, we selected a sample that was most representative of the Minia and Kharga population patterns to reach our target sample sizes.

Data Analysis

The author used geographic information system (GIS) techniques to conduct the spatial analysis. These techniques involved (1) inputting respondents' answers into table format, (2) mapping respondents' addresses in spatial format (points on a map), (3) joining the tabular data with the spatial data, (4) grouping respondents according to spatial zones to ensure coherence between the answers and the real distances, and (5) analyzing and interpreting the data groups.

Table 4 shows the breakdown of respondents' answers to the first eight survey questions. Respondents' answers to the first question indicated that the majority of people in Minia were unable to identify the number of cemeteries that were available for their settlement. There are six cemeteries available to all five of the urban and rural settlements in Minia. In contrast, based on their responses to the first two questions, all of the respondents from Kharga were able to easily identify the number of cemeteries allocated to the city generally and specifically to members of each religion (Muslims and Christians), likely because there are only two cemeteries, one for each religion. Based on the responses to question two, more than 50% of the respondents from Minia did not know there are five Muslim cemeteries and two Christian cemeteries in Minia (Aljadidah Cemetery is counted in both categories since it contains sections for both religions).

The third question addressed respondents' thoughts on the distance between the cemeteries and their houses. Interestingly, only 51.2% of all respondents felt the cemeteries were too close to their houses. However, these responses represented 100% of the survey sample in the villages of Sawada and Zawiyat Sultan and 90.6% of the sample in Kharga. This result indicates the problem of cemetery proximity to houses is more serious in these three settlements. The second part of question three asked respondents to provide a reason for their response. For the Minia villages of Sawada and Zawiyat Sultan, the main reason given was that the cemeteries block the expansion of urban development; fewer people said the cemeteries damage the urban character of the village and waste land that could be used for other purposes. In Kharga, the main reason given was that the cemeteries waste land that could be used for other purposes; fewer people said the cemeteries damage the urban character of the city. These results accurately reflect the effect of location in each case. The Sawada and Al-Faham Cemeteries surround the villages of Sawada and Zawiyat Sultan, blocking their extension. The cemeteries in Kharga are surrounded by houses, which damages the urban character of the city. The relative isolation of the other cemeteries in relation to the other settlements in Minia meant residents were less concerned about their proximity.

The results for question four showed that 80.4% of respondents believed that the current cemeteries were located in unsuitable locations. This was especially true for the villages of Sawada, Nazlat Husayn Ali, and Zawiyat Sultan, in which 100% of respondents were unsatisfied with the current locations of the cemeteries, either because it is expensive to obtain a tomb there or because they are located in an unacceptable environment. In Kharga, 79.3% of respondents were unsatisfied with the location of the cemeteries, either because the sites do not have enough space to meet burial requirements or because they are located in an unacceptable environment. In Minia, the high cost of tombs is explained by the burial methods used there, which increase ownership demand and consequently raise the cost of land in the cemeteries. The dissatisfaction of residents in Kharga is due to the fact that the cemeteries in Kharga are already full, and there is no room for them to be

TABLE 4. Respondents' answers to questions 1-8 of the resident survey.

Questions	Answers	Total responses	Religious categories		Settlements						
			Muslims	Christians	Al-Minia	New Minia	Nazat Husayn Ali	Sawada	Zawiyat Sultan	Kharga City (n = 382)	
Total no. of respondents		766	693	73	333	13	12	12	12	14	382
1. How many cemeteries are available for your city or village?	2	562	521	41	155	7	6	0	0	12	382
	3	20	20	0	17	0	0	1	2	0	0
	> 3	184	152	32	161	6	6	11	0	0	0
2. How many cemeteries are available for members of your religion in your city or village?	1	582	542	40	172	7	6	1	1	14	382
	2	184	151	33	161	6	6	11	0	0	0
	> 2	0	0	0	0	0	0	0	0	0	0
3. Do you think the cemetery is too close to your house?	Yes	392	383	9	20	0	0	12	14	14	346
	No	48	40	8	38	0	0	0	0	0	10
	Slightly	326	270	56	275	13	12	0	0	0	26
If yes, select reason:	It damages the urban character of the city or village.	108	108	0	0	0	0	1	1	1	106
	It offends religious sensitivities.	0	0	0	0	0	0	0	0	0	0
	It wastes land that could be used for other purposes.	265	262	3	20	0	0	2	3	3	240
	It blocks the expansion of urban development.	19	13	6	0	0	0	9	10	10	0
4. Do you think the cemetery is located in a suitable site?	Yes	33	33	0	13	0	0	0	0	0	20
	No	616	552	64	275	0	12	12	14	14	303
	Somewhat	117	108	9	45	13	0	0	0	0	59
If no, select reason:	It is expensive to obtain a tomb there.	274	224	50	250	0	2	10	12	12	0
	It does not have enough space to meet burial requirements.	200	196	4	0	0	0	0	0	0	200
	It is in an unacceptable environment.	142	132	10	25	0	10	2	2	2	103

TABLE 4 continued. Respondents' answers to questions 1-8 of the resident survey.

Questions	Answers	Total responses	Religious categories		Settlements												
			Muslims	Christians	Minia (n = 384)										Kharga City (n = 382)		
					Al-Minia	New Minia	Nazlat Husayn	Ali	Sawada	Zawiyat Sultan							
Total no. of respondents		766	693	73	333	13	12	12	12	12	14						
5. How many times do you visit the cemetery annually?																	
0	Vehicle	377	307	70	333	13	12	7	8	4							
1	Foot	389	386	3	0	0	0	5	6	378							
2	Other	0	0	0	0	0	0	0	0	0							
3																	
> 3																	
6. How do people transfer the dead to the cemetery in your city or village?																	
Vehicle	Yes	48	47	1	39	0	0	0	1	8							
Foot	No	570	532	38	149	11	12	11	13	374							
Other	Some	148	114	34	145	2	0	1	0	0							
7. Do you think all of the current cemetery sites were planned for the purpose of burials?																	
Yes	Yes	175	145	30	171	2	0	1	1	0							
If yes or some, is the area sufficient?	No	16	11	5	8	0	0	0	0	8							
	Somewhat	5	5	0	5	0	0	0	0	0							
If no, what is the reason for selecting such unplanned sites?																	
Health issues	Health issues	124	120	4	14	1	2	1	1	105							
Low price of land	Low price of land	62	41	21	12	1	1	2	1	45							
Low cost to transfer bodies	Low cost to transfer bodies	25	21	4	4	1	2	2	2	14							
Government has no plan for cemeteries	Government has no plan for cemeteries	359	350	9	119	8	7	6	9	210							
8. Do you recommend replanning the cemetery sites?																	
Yes	Yes	594	529	65	262	10	8	12	11	291							
No	No	16	14	2	12	0	0	0	0	4							
Perhaps	Perhaps	156	150	6	59	3	4	0	3	87							

TABLE 5. Respondents' priorities for future plans for cemeteries (n = 766).

Needs	Frequency	Percentage	Priority
Sufficient area for cemetery	753	98.3%	1st
Located far from houses	746	97.4%	2nd
Available transportation	732	95.6%	3rd
Organized	720	94.0%	4th
Burial method is aligned with religious doctrines	623	81.3%	5th
Located close to houses	20	2.6%	6th

expanded in the future. Moreover, the burial method used in Kharga does not allow the same land to be reused for 40 years. The second reason in both cases indicates residents' desire to keep the cemeteries far away from the urban space.

According to the results for question five, which inquired how many times residents visited the cemeteries each year, 60.2% of the population in Kharga said they do not visit the cemeteries at all. This reflects the behavior of Muslims in the city, who follow Islamic doctrines related to visiting cemeteries. In comparison, 82.2% of the Christians in Minia and Kharga said they visit the cemeteries three or more times per year. However, overall, the majority of respondents in each of the surveyed settlements, as well as in the sample as a whole, said they do not visit cemeteries at all. For instance, in New Minia, 53.8% of respondents said they never visit cemeteries.

The responses to question six revealed that the method respondents used for transferring dead bodies to cemeteries depended on the distance between the cemetery and the residential area. Since the Muslim cemetery in Kharga is located in the middle of the city, 99.0% of respondents there (all Muslim) said they transfer bodies by foot, in accordance with the earlier Islamic doctrines. However, in the Minia settlements, the majority of people said they transfer bodies using vehicles. These majorities were smaller in the villages of Sawada and Zawiyat Sultan, where the cemeteries are closer to the residential areas, and many respondents said they transfer bodies by foot.

The responses to question seven showed that 51.0% of respondents in Minia believed that none of the current cemetery sites were planned for the purpose of burials. Moreover, only 43.5%, 15.4%, and 8.3% of respondents in Madinat Al-Minia, New Minia, and Sawada respectively (and none of the respondents in Nazlat Husayn Ali and Zawiyat Sultan) were aware of the planned Aljadidah Muslim and Christian cemeteries in Minia, which are located beside the eastern Cairo-Assuit regional highway (indicated by a response of "some"). In addition, 6.3% of all respondents thought all of the current cemeteries were planned. In Kharga, 97.9% of respondents believed the current cemeteries were not planned for the purpose of burials; only 2.1% thought they were. Just over 25% of all respondents believed that at least some of the cemeteries were planned (indicated by a response of "yes" or "some"); of these, 89.3% thought the areas provided for the cemeteries were sufficient; 2.6% were only somewhat satisfied with the areas provided. However, 74.4% of all respondents answered "no" to question seven, indicating they did not believe any of the cemeteries were planned. The follow-up to question seven, which offered four options, sought to identify why respondents held this belief. The majority (63.0%) of those who did not think the cemeteries were planned believed the reason was because the government had no plan for cemeteries. The other respondents mainly cited health issues (21.8%) and the low cost of the land at the selected sites (10.9%). Only 4.4% referred to the low cost to transfer bodies as the reason.

Responses to question eight showed that 77.5% of all respondents recommended replanning the cemeteries to find more suitable sites. Another 20.4% did not object to replanning the cemeteries, and only a very small minority (2.1%) said they did not recommend such replanning at all. These percentages were similar in all of the surveyed settlements except Sawada, whose respondents all recommended replanning.

The last question on the survey was a checklist of needs that respondents thought should be reflected in future plans for the cemeteries. Respondents were allowed to choose all of the options with which they agreed. As Table 5 indicates, the first priority of respondents was to provide sufficient areas for the cemeteries; their lowest priority was to have the cemeteries be close to houses.

Conclusions

To summarize, the author drew the following general conclusions from the analysis of the questionnaire results:

- Residents of the surveyed settlements were not satisfied with the locations or sizes of the current cemeteries or the burial methods used there, which have caused the price of plots to increase.
- Residents did not want the cemeteries to be attached to urban settlements.
- Since Islamic religious doctrine allows flexibility in burial methods for special reasons, many people had used vehicles to transfer dead bodies to cemeteries.
- Visiting cemeteries was not a popular activity.
- Most people recommended replanning the current cemeteries.
- Residents believed providing sufficient areas for cemeteries, locating them relatively far from homes, and having transportation facilities available should be high priorities in planning future cemeteries.

SUGGESTED PRINCIPLES AND GUIDELINES FOR CEMETERY SITE SELECTION

Cemeteries are one of the elements most often neglected in the planning process for urban settlements. Both unplanned cemeteries and urban settlements experience random, unplanned growth and development, which can cause urban spaces with adjacent cemeteries to suffer. This research has highlighted several issues to be addressed in the planning of future cemeteries. Pursuant to the outcomes of the case-study descriptive analysis and questionnaire results, the author derived several principles for cemetery site selection and guidelines that could be applied in the preparation of structural plans for urban settlements in Egypt. First, possibilities for future urban expansion must be considered when planning a cemetery in an urban area to avoid conflicts between urban growth and the possible expansion of the cemetery. Cemeteries should be well planned to discourage ad-hoc development, and clear regulations for building cemeteries should be established to avoid the misuse of land and the building of cemeteries that are incompatible with the established guidelines. Moreover, cemeteries should be located farther away from urban settlements to enable future urban growth; the current working distance of 656 ft. (200 m) is not adequate to separate cemeteries from urban settlements. Based on participants' responses, cemetery visits are rare, and modern transportation has made traveling longer distances easier, so being able to access cemeteries by foot is no longer necessary. Thus, cemeteries should be located far from urban settlements, about 15.5 miles (25 km).

The most suitable sites for cemeteries are less developed, agriculturally infertile, and/or in an area that will not be used for urbanization or industrial or commercial uses. Sites selected for cemeteries should not contain any sources of groundwater and should not be exposed to different levels of water during the year. The size of a cemetery will depend on the burial method used there. For instance, the burial method used in Minia requires about 86 ft.² (8 m²) per person, while the burial methods (both Islamic and Christian) used in Kharga require about 43 ft.² (4 m²) per person. The methods used in Kharga also have the advantage of making it possible to eventually reuse the cemetery. Figure 16 illustrates the small land consumption needed for burial using the Kharga methods, which this author recommends. Community awareness programs should be established to popularize and educate the public regarding the advantages of using the legitimate burial method.

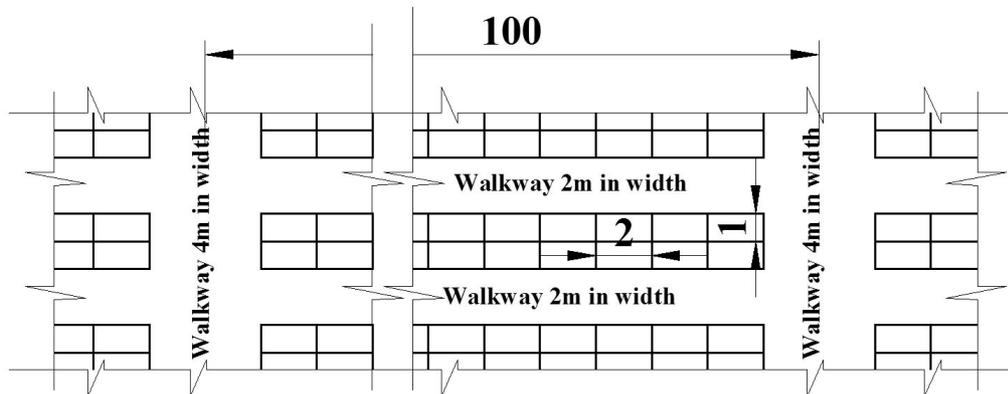


FIGURE 16. The recommended burial method, which requires only 4 m² per person (2 m² for burial space plus 2 m² for the walkway). (Units shown in meters. The graphic shows only a portion of the block, as indicated by the zigzag lines. The length of the entire block is 100 m.)

Plans for future cemeteries also need to take into account the services needed for the cemetery, such as available water or specific religious buildings, which vary depending on the religion using the cemetery. A security building should also be defined in the master plan. In addition, plans for future cemeteries should include inner and outer open spaces for greenery and water features, similar to cemeteries in Western countries, to increase their aesthetic appeal. Finally, the system of allocating free plots in cemeteries should also be reconsidered.

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