DEVELOPING MUSLIM CEMETERY MANAGEMENT SYSTEM USING GIS APPLICATION IN KAMPUNG TUA, SIMPANG EMPAT SEMANGGOL, PERAK

by

MUHAMMAD SYAHIR BIN ZULKIFLI

A final year project report submitted in fulfillment of the requirements for the degree of Bachelor of Applied Science (Natural Resources Science) with Honors

FACULTY OF EARTH SCIENCE
UNIVERSITI MALAYSIA KELANTAN

2024

DECLARATION

I declare that this thesis entitled "Developing Muslim Cemetery Management System Using GIS Application in Kampung Tua, Simpang Empat Semanggol, Perak" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name : MUHAMMAD SYAHIR BIN ZULKIFLI

Date : 10/6/2024

ACKNOWLEDGEMENT

بِسْمِ اللهِ الرَّحْمٰنِ الرَّحِيْمِ

First of all, I would like to thanks Allah, the Most Gracious and Merciful that has permitted me to reach until this extend.

Throughout the writing of final year project report, I have received a great deal of support and assistance. I would first like to thanks my supervisor, Ts Dr. Noor Janatun Naim Jemali, whose expertise was invaluable in the formulating of the research topic and methodology in particular. I would like to thank everyone who contributed to the successful completion of this final year project. Their guidance, support, and encouragement are invaluable.

I am extremely grateful to my friends and classmates for their continued support and for providing an important collaborative environment for brainstorming and refining ideas.

I am deeply indebted to my family for their unwavering support and encouragement throughout my academic journey. Their faith in me has been a source of strength and motivation.

Finally, I would like to thank all the participants and contributors who have provided valuable data and insights for this project. Your cooperation and willingness to help is greatly appreciated.

Thank you all for making this projects a reality.

Developing Muslim Cemetery Management System Using GIS

Application in Kampung Tua, Simpang Empat Semanggol, Perak

ABSTRACT

The study aims to create a digital cemetery management system using geographic information system (GIS) technology for the Muslim cemetery located at Kampung Tua Simpang Empat Semanggol, Perak. The conventional management of this cemetery had demonstrated inefficiency and susceptibility to mistakes, leading to challenges in maintaining precise records and retrieving information. 97 cemeteries data was collected and at each cemetery, information includes graveyard locations, burial records, and genealogical information was recorded. By using satellite image from Google Earth, the data was integrated and produce a map. By converting the cemetery data into a digital format, a comprehensive database was developed. To publicise the database for community use, a website called e-kubur was created to provide public access to this information. This enabling people to effortlessly search for burial details compare to conventional method. The deployment of this system was anticipated to optimize cemetery management, enhance the precision of records, and provided improved community access to information. This effort also seeks to safeguard the cultural and historical history of the cemetery, guaranteeing the preservation of the community's tradition for future generations.

Membangunkan Sistem Pengurusan Tanah Perkuburan Islam

Menggunakan Aplikasi GIS Di Kampung Tua, Simpang Empat

Semanggol, Perak

ABSTRAK

Kajian ini bertujuan untuk mewujudkan sistem pengurusan tanah perkuburan digital menggunakan teknologi sistem maklumat geografi (GIS) bagi tanah perkuburan Islam yang terletak di Kampung Tua Simpang Empat Semanggol, Perak. Pengurusan konvensional tanah perkuburan ini telah menunjukkan ketidakcekapan dan mudah terdedah kepada kesilapan, membawa kepada cabaran dalam mengekalkan rekod yang tepat dan mendapatkan maklumat. 97 data tanah perkuburan telah dikumpul dan di setiap perkuburan maklumat termasuk lokasi perkuburan, rekod pengebumian, dan maklumat salasilah direkodkan. Dengan menggunakan imej satelit daripada Google Earth, data telah disepadukan dan menghasilkan peta. Dengan menukar data tanah perkuburan ke dalam format digital pangkalan data yang komprehensif telah dibangunkan. Untuk menghebahkan pangkalan data untuk kegunaan komuniti, sebuah laman web yang dipanggil e-kubur telah dicipta untuk menyediakan akses awam kepada maklumat ini. Ini membolehkan orang ramai mencari butiran pengebumian dengan mudah dengan kaedah konvensional. Penggunaan sistem ini dijangka dapat mengoptimumkan pengurusan tanah perkuburan, meningkatkan ketepatan rekod, dan menyediakan akses komuniti yang lebih baik kepada maklumat. Usaha ini juga bertujuan untuk menjaga sejarah budaya dan sejarah tanah perkuburan, menjamin pengekalan tradisi masyarakat untuk generasi akan datang.

TABLE OF CONTENT

	PAGE
DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
ABSTRAK	iv
TABLE OF CONTENT	v
LIST OF FIGURE	vii
LIST OF ABBREVIATIONS	viii
LIST OF SYMBOLS	ix
CHAPTER 1 INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	3
1.3 Objective	4
1.4 Scope of Study	4
1.5 Significant of Study	5
CHAPTER 2 LITERATURE REVIEW	
2.1 Cemetery Management	6
2.2 Mapping Cemetery Lot and Database Establishment	7
2.3 Current Practices of Muslim's Cemeteries in Malaysia	8
CHAPTER 3 MATERIAL AND METHOD	
3.1 Study Area	11
3.2 Materials	12
3.3 Method	
3.3.1 Image Capture	12

3.3.2 Field Data Collection 13

3.2.3 Observing the Vegetation types near the cemetery site 13

3.3.3 Data entry and transfer 13

3.3.4 Publicize cemetery database by website development 14

CHAPTER 4 RESULTS AND DISSCUSSION

4.1 Cemetery information 16

4.2 Image capture and analysis 17

4.3 Publicize database through website 19

4.4 Vegetation surrounds the cemeteries area 21

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion 24

5.2 Recommendations 26

REFERENCES 27

LIST OF FIGURES

NO.	TITLE	PAGE
3.1	The location of study site	11
3.2	Research flow chat of this study	15
4.1	Gender classification of Kampung Tua's cemeteries	16
4.2	An aerial view of study area taken from Google Earth platform	18
4.3	Integration of field data and created shapefiles using ArcGIS 10.8	19
4.4	Map of Kampung Tua cemetery with coordinate	19
4.5	Interface of e-kubur website of Kampung Tua cemetery	20
4.6	Example of trees or vegetation at the Kg Tua cemetery	22
4.7	Palm oil tree planted at the study area	22

LIST OF ABBREVIATIONS

GIS	Geographic Information System
GPS	Global Positioning System

LIST OF SYMBOLS

km^2	Square Kilometer
%	Percentage

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Cemetery management is an important aspect of funeral, cemetery, and crematorium business operations. Cemetery management systems are capable of managing all activities associated with funeral, cemetery, and crematorium business operations. Nowadays, cemeteries use manual systems in recording and monitoring, which are time-consuming, effort-consuming, and often not accurate. Cemetery management is important for addressing issues such as cemetery overcrowding, gravesite inventory, and sharing gravesite and burial information with the public. Cemetery management can be improved by using geospatial technologies such as GIS for cemetery mapping and inventory. Sustainable cemetery management is an emerging field of study that focuses on issues such as sustainability, community open space, and respect for the dead. Cemetery studies are of interest to personal genealogies and family histories, and there are projects that seek to document cemeteries throughout the world using GPS and crowdsourcing.

Cemetery Management can be used to develop an authoritative cemetery and gravesite inventory and share gravesite and burial information with the public. Cemeteries are valuable historic resources that offer insight into a community's unique population. Creating a cemetery database is an important and transformative endeavor, redefining cemetery management. Traditionally, cemeteries have relied on outdated and

inefficient record keeping methods. Many cemeteries still use paper- based systems or fragmented digital databases, resulting in significant inaccuracies and difficulties in maintaining accurate and accessible records of those buried. Grave details and genealogical information can be confusing, leading to confusion for visitors. The lack of an efficient system for recording and managing grave information has been a long-standing challenge, and this is where grave databases can play an important role in bringing much-needed transformation.

Finding a specific grave in a cemetery is often a difficult task. Inadequate mapping and record keeping systems contribute to the complexity of this process. In an era of urbanization and limited land resources, efficient space management in cemeteries is essential. Demand for burial plots continues, and cemeteries must allocate this space wisely to ensure their long-term sustainability. Grave databases can help optimize land use, provide ways to efficiently manage space and make informed decisions about expansion, while respecting the sanctity of these areas.

In an era of urbanization and limited land resources, efficient space management within cemeteries is vital. The demand for burial plots is ongoing, and cemeteries must allocate these spaces judiciously to ensure their long-term sustainability. A database of graves can help optimize land usage, providing a means to manage the space efficiently and make informed decisions about expansion, all while respecting the sanctity of these grounds.

The digital age has ushered in new opportunities for cemetery management. Modern technology, including geographic information

systems (gis) and digital databases, offers the potential to streamline grave management, enhance record- keeping accuracy, and improve accessibility and transparency. By embracing these technological innovations, cemeteries can bring themselves into the 21st century, better equipped to serve the needs of their communities and preserve the history contained within their gates.

The development of a comprehensive database of graves is not just a practical step forward but a moral one as well. It recognizes the significance of cemeteries as places of history, culture, and remembrance, and it acknowledges the challenges faced by those responsible for their care and those who visit them. This study aims to explore the design, development, and impact of such a database on cemetery management and visitor experiences, paving the way for a more dignified and accessible environment for all who enter these hallowed grounds. Furthermore, the database will contribute to the preservation of cultural and historical heritage, ensuring that the stories of our ancestors continue to be told and that the legacies of our communities endure for generations to come.

1.2 Problem Statement

Cemetery areas in Kampung Tua, Simpang Empat Semanggol, Perak do not have a systematic management such as inefficient record keeping. Many cemeteries rely on manual paper-based record keeping, making it difficult to maintain accurate burial records, maps and genealogical data. This leads to mistakes, confusion, and delays in finding graves. Hence, the lack of accessibility on information about burials and

cemetery services is not easily accessible to the public. Moreover, visitors may have difficulty finding the grave of a loved one or understanding the available services and regulations.

In Malaysia, the applications of digital cemetery system such as e-pusara are not widely implemented, especially in rural areas. Residents of rural areas experience many problems in the management of graves, cemeteries and others. In rural areas the management system is still using the old system and therefore, using GIS application such difficulties could be overcome.

1.3 Objective

The objective of this study is to develop a database and produce map of cemeteries in Kampung Tua, Simpang Empat Semanggol, Perak.

1.4 Scope of Study

The cemetery location is focus at Kampung Tua, Simpang Empat Semanggol, Perak. This is a small cemetery area. This study covers the development of a cemetery database, including database management system options, data structures, and user interfaces. The database will include grave details such as location, burial records, genealogical information, and any additional data deemed relevant for efficient cemetery management.

Integration of geographical information systems (GIS) is important component of the database. This will include incorporating GIS and GPS technology to accurately map the location of graves within the cemetery. It

will include the process of mapping graves and linking them to the corresponding database entries.

1.5 Significant of Study

Developing a database, storing and maintaining cemetery data in databases can allow for easy access to demographic data. Geospatial technologies can be used to create cemetery geodatabases that are easy to update and provide an ideal framework for spatial and attribute queries. This can simplify the maintenance requirements of the records and improve cemetery management techniques. Online cemetery databases are one of the most accessible sources for researching an ancestor's burial. Cemetery database websites collect burial information from around the globe, and volunteers gather this information to grow the database, which is then searchable at the click of a button.

CHAPTER 2

LITERATURE REVIEW

2.1 Cemetery management

Cemeteries constitute a vital component of every society. The appropriate management of deceased individuals impacts both the sanitation and cultural integrity of a community (Thorsheim, 2011). Although burial customs may vary by culture and location, they serve as a place of remembrance and lamentation, and the desire for resolution is universal (Pattison, 1955). Burial sites, including crematoriums and traditional cemeteries, play a crucial role in society and necessitate proper maintenance and planning.

In addition to impeding orderly land management and logical urban development, the existence of cemeteries and the haphazard placement of burials contribute to critical factors that negatively affect the natural environment and living space. Notwithstanding the implementation of burial legislation and other strategies to tackle this concern, a number of barriers persist as a result of the absence of a comprehensive grave management system and inadequate data pertaining to individual graves. For this, Sallay et al. (2023) had delineates the process of cemetery management system was developed utilizing geographic information system (GIS) technology. The main purpose is to efficiently manage and supervise the daily operations of each cemetery. This method can be used to implement a time-limited burial system and manage cemeteries for

people with no family ties by creating a database that records the location and characteristics of each grave. Data collection is by using administrative systems or primary surveys. This approach is designed to be a comprehensive management plan that can be passed down from generation to generation, in keeping with the cultural customs of burial that place a premium on family relationships (Sultana et. al., 2021).

2.1.1 Mapping Cemetery Lot and Database Establishment

It remains feasible to establish a database for a preexisting cemetery situated on a piece of land. There are ongoing obstacles, namely in convincing individuals who adhere to traditional thinking patterns, commonly referred to as "old people," to embrace new modes of thinking. A study utilising QGIS software was effectively conducted to develop a cemetery database in Section 21, Shah Alam by Shazlin Omar (2012). However the implementation of this database by the Shah Alam city council (MBSA) is still pending.

In an article of Jewish Cemeteries and Mass Graves in Europe: Protection and Preservation has revealed in detail how cemeteries have been brought to a very high degree by the Jews. Sentences such as "the right to rest in peace" were taken into account. While concrete evidence is lacking, it is plausible to argue that a nation possessing comprehensive knowledge of a cemetery, whether by physical means or in the event of the country's destruction by natural calamities, may assume control over it (Ibnor Azli, 2013). The sophisticated countries such as the United States have created a cemetery management system that uses technology instead

of employing the previous cemetery-related information storage system. Implementing a contemporary data storage system for cemetery-related information can enhance the organisation and efficiency of the cemetery management system.

2.1.2 Current Practices of Muslim's Cemeteries in Malaysia

Islamic burials adhere to well-defined rituals, although they may be influenced by local practices and customs. Diverse burial practices and styles might vary throughout different regions due to varying methodology and approaches to burial procedures (Sulaiman et. al, 2014). Islamic instruction is exclusively provided within the confines of reputable burial grounds. For instance, in Islam, it is advised against constructing a structure on top of a grave and instead encourages the establishment of a cemetery adorned with abundant foliage or shrubs.

In Islam, direct burial is prescribed for the deceased in order to facilitate swift decomposition and metamorphosis. In the teachings of Islam, the construction of elaborate graves that command attention should be abstained from. Regulations governing the interment of deceased individuals and the construction of monuments are established. The protocol dictates that the deceased be entombed in a burial facing Qibla, surrounded by a covering of straw or adobe wood, before the grave is backfilled with soil. It is recommended to construct a grave using rectangular adobes, limestone, or wood, or cover the grave with materials such as stone or wood. The grave should not exceed a hand span from the earth. The grave must be facing the Qiblah (i.e., Mecca) in accordance with

Islamic teachings (Baduroon, 2012). The determination of cemeteries, lots, plots, and circulation systems is influenced by the direction of Qibla, as the shorter side of the grave is aligned with that direction.

Cemetery management plays a crucial role in honoring the departed while addressing environmental and urban planning considerations. The integration of Geographic Information System (GIS) applications with natural resources science provides a powerful toolset for developing comprehensive and sustainable cemetery management systems. Schmidt (2018) explores the significant relationship between these domains, highlighting key aspects that contribute to efficient resource utilization, environmental sensitivity, and effective urban planning.

The GIS facilitates the collection, storage, and analysis of diverse cemetery data, including grave spaces, walkways, gates, and statues. The creation of a comprehensive database enables long-term planning and efficient management. By leveraging GIS capabilities, cemetery managers can maintain accurate and up-to-date information, ensuring the seamless organization of spatial and non-spatial data related to cemetery infrastructure. Besides that, GIS could also assist in developing authoritative cemetery and gravesite inventories, associating burial and ownership information with each gravesite (Schmidt, 2018). This streamlines cemetery operations, reducing the likelihood of errors and enhancing the overall management of burial sites. The ability to efficiently track and manage gravesite information is crucial for maintaining order and facilitating effective decision-making in cemetery management.

Addressing environmental concerns is paramount in modern cemetery management, with concepts such as eco-cemeteries and green burials gaining prominence. Eco-cemeteries, designed with ecological sensitivity, can be strategically planned using GIS to promote environmental transformation. Similarly, GIS contributes to the planning and management of green burials, focusing on non-polluting burial methods and sustainable cemetery practices (Schmidt, 2018). Again, the GIS technologies could assist in assessing and ensuring the sustainability of cemetery areas. Hence, the GIS tools is also vital studying the role of urban cemeteries in providing ecosystem services and habitat protection. Geospatial technologies help urban planners understand the significance of cemeteries in urban areas, enabling the incorporation of these spaces into comprehensive urban planning strategies. By recognizing cemeteries as integral components of urban ecosystems, planners can develop strategies that balance urban development with the preservation of green spaces.

Most of current practice in cemetery management in a village is using traditional methods of data keeping. The problems of this practice are data loss and degradation, limited accessibility, inaccuracy and inconsistency and inefficiency in retrieval and management (Schmidt et. al, 2018). An efficient management of gravesite ownership and burial information is crucial for maintaining the aesthetics and functionality of cemeteries. In order to have an effective monitoring and management of cemetery operations, a proper record-keeping and data management is essential for maintaining accurate databases. In this case, GIS technology

with the centralized platform will record and update cemetery information, streamlining administrative tasks and ensuring that the cemetery's records are comprehensive and reliable.

The integration of GIS applications in cemetery management represents a significant advancement in resource utilization, environmental stewardship, and urban planning. By leveraging natural resources science and GIS technologies, cemetery managers can develop comprehensive and effective management systems that promote the long-term sustainability of cemeteries

CHAPTER 3

MATERIALS AND METHOS

3.1 Study Area

The study site located at Kampung Tua, Simpang Empat Semanggol, Perak (Figure 3.1). Located at latitude and longitude of 4°58'06" N and 100°37'48" E, the cemetery is within Kerian district. The cemetery is located next to the primary school named Sekolah Kebangsaan Kampung Tua and close to the housing area and local community. The whole study area is about 0.003 km^2 with a total of 97 graves counted up to April 2024.

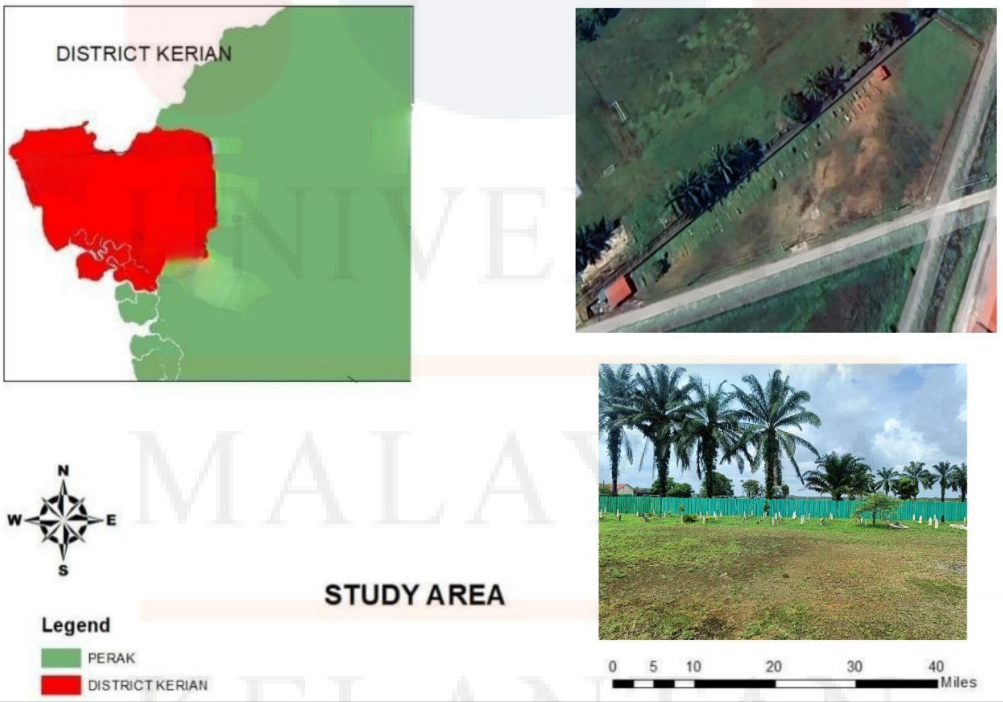

Figure 3.1: The location of study site

3.2 Materials

In order to map the cemetery area from aerial view, an image from Google Map Web at the study site was capture and exported. Image was then analyzed in ArcGIS Desktop version 10.8 to draw the location and position of each cemetery. A map of cemetery area and its surrounding was created.

For field data collection, data on each graveyard were recorded. It includes the position of the graveyard that was collected using GARMIN® handheld Global Positioning System (GPS), the relevant information such as name, date of death and date of birth that was written on the tombstone including gender classification were carefully recorded. Data was transferred to an attribute table in excel using Microsoft Excel software before it was imported to ArcGIS software.

3.3 Methods

3.3.1 Image capture

With Google Earth image, the entire of cemetery area was captured. The image was imported in ArcGIS and the shapefile of each graveyard were created. This image also act as additional data layers that viewed together with field data collected on the ground. This overlaying method is useful which can provide more information about the site. Besides that, using Google Earth image could enable to see the street view of the area. This can provide a ground-level view of the site. From the image, the vegetation and non-vegetation area could also determine.

3.3.2 **Field data collection**

Field data collection was done by recording information in each grave manually. It includes the position of the graveyard, information of deceases such as their name, date of death and date of birth that was written on the tombstone including gender were prudently recorded. Data was transferred to an attribute table in excel using Microsoft Excel software before it was imported to ArcGIS software. This necessary information and coordinates had been recorded correctly so that there were no problems during the process of entering the recorded data into Microsoft Excel or ArcGIS software.

3.2.3 **Observing the vegetation types near the cemetery site**

Analyzing the vegetation around the cemetery was done using the captured image from Google Earth. The landscapes vegetation that inhabit the cemetery environment was classify. Vegetation such as grasses, palm oil trees and cemetery flowers are among the common vegetation in this area. The comprehension of vegetation may yield significant knowledge for the evaluation of biodiversity, the design of landscapes, and the aesthetic administration of cemeteries.

3.3.3 **Data entry and transfers**

Every information and coordinates recorded at each graves were key-in into the Microsoft Excel software in attribute table. MS Excel made easier to store the information and coordinates of each recorded cemetery. Name, date of death, date of birth and age as well as the exact location coordinates of each grave was carefully key in so that there were no mistakes during the process. Proper data helps in data transfers and web site development soon. Data from MS Excel spreadsheet was then imported into ArcGIS to generate a cemetery map along with its corresponding attribute data. Layers consist of points plotting the longitude and latitude of each individual's grave. It also includes a table that provides specific details of each grave. Using the geodatabase the cemetery database was developed.

3.3.4 **Publicize database by developing website of the cemetery**

To share the developed centralized data and make it accessible to the community, it should be publicized. Using a website platform, the data could be viewed and managed digitally. The cemetery website of the study site was developed using the WordPress.com framework. The WordPress.com offers several advantages such as user-friendly interface, free platform (cost-effective) and customization and flexibility in term of selecting themes and plugins especially for community-based projects like a centralized graveyard data repository. This website has information about each grave, including the name of the deceased, the date of their passing, and a link to a picture of each respective cemetery. The research flow chart of this study is presented in Figure 3.2.

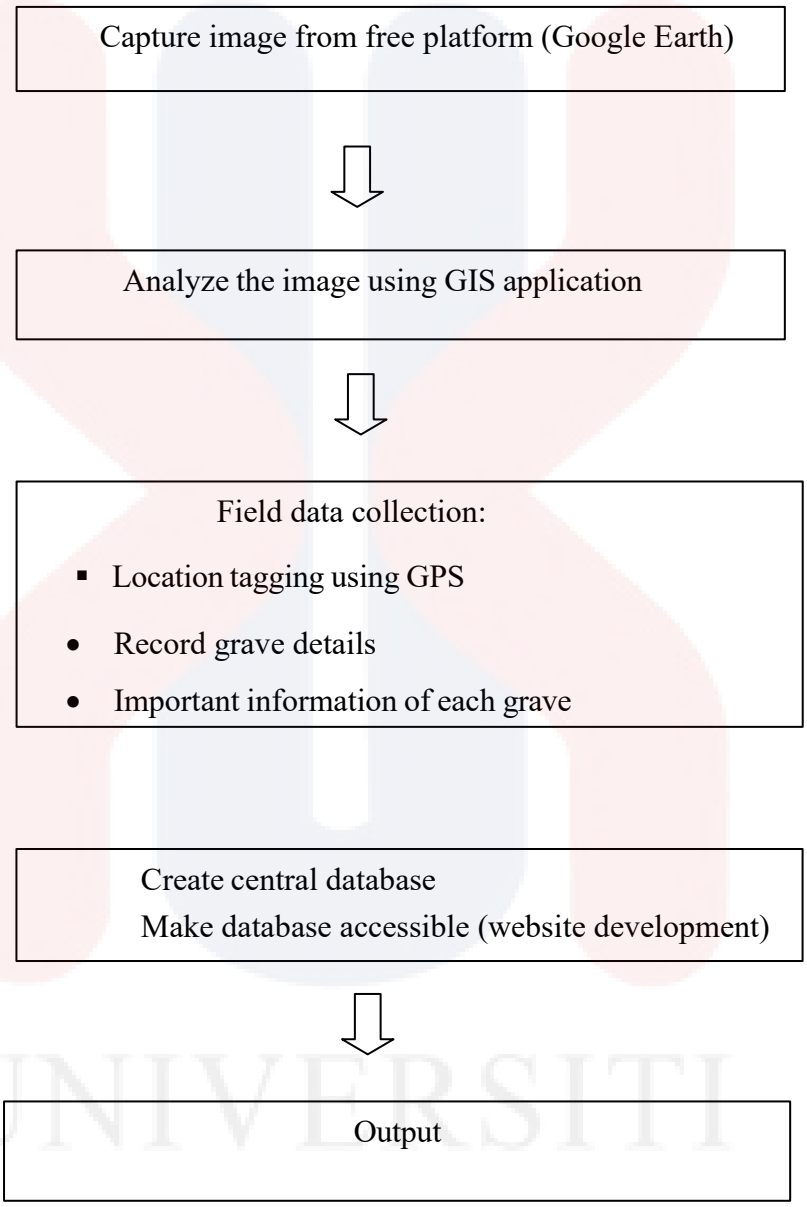

Figure 3.2 Research flow chat of this study

CHAPTER 4

RESULTS AND DISSCUSSION

4.1 Cemetery information

The Kampung Tua cemetery located at Simpang Empat, Semanggol, Perak and it was established in 2014. It covered an area of 0.003km^2 and managed under Masjid Kampung Tua. Through the field data collection, a total of 97 graves were recorded at the study site. There were 51 (58%) male and 37 (42%) female cemeteries as shown in Figure 4.1. The age range of the deceased is between 18 to 88 years old. From the data, the average age of death is 64 years.

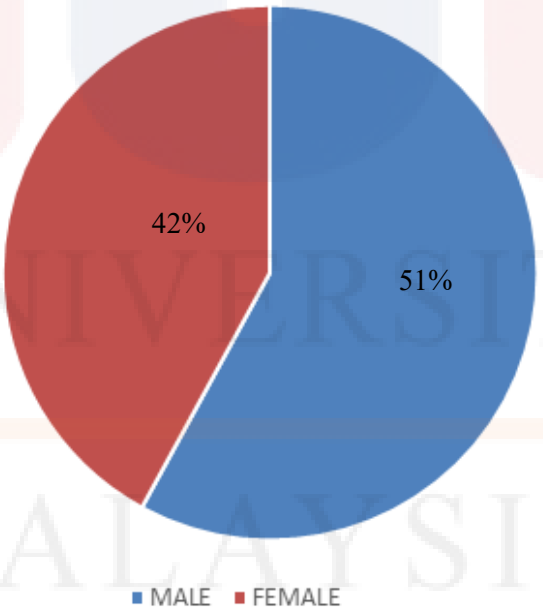

Figure 4.1 Gender classification of Kampung Tua's cemeteries

Among the 97 graves found in the Kampung Tua cemetery, only 9 graves have incomplete information due to the absence of inscriptions on their tombstones. These unmarked graves, without any written details, make no

identifiable information related to the 9 graves. The cemetery management system in Kampung Tua is less efficient resulting in no storage of data and information related to people who died in the study area. The lack of storage of relevant information like this makes it difficult to identify some graves where there is no information on the tombstone.

4.2 Image capture and analysis

Using Google Earth Web, an image of study site was captured. Figure 4.2 clearly show the study area and it aid for cemetery documentation, providing comprehensive imagery for layout as well as for dimensioning and environmental or vegetation analysis. Their aerial perspective offers a clear view of the landscape of the cemetery, helping in understanding the spatial arrangement and architectural features. In addition, the image facilitates the identification of surrounding vegetation, important for assessing ecological impacts and conservation efforts. This technology increases research efficiency while minimizing disruption at ground level hence it was freely downloaded from open sources. Even though the resolution is not very high as IKONOS satellite, it could somehow ensures careful documentation but also fosters an informed conservation strategy of cemetery management.

Figure 4.2 An aerial view of study area taken from Google Earth platform

This image is used in the mapping process with ArcGIS 10.8 to give a complete perspective of every cemetery, including the surrounding vegetation. An ID number is precisely allocated to every cemetery, allowing for organised data management and analysis. This methodical technique guarantees that no detail is missed, preparing the ground for a comprehensive examination. Simultaneously, data on the tombstone was systematically gathered and imported into MS Excel software, guaranteeing an extensive dataset for additional examination. All recorded information was tabulated, imported and analyzed as shown in Figure 4.3.

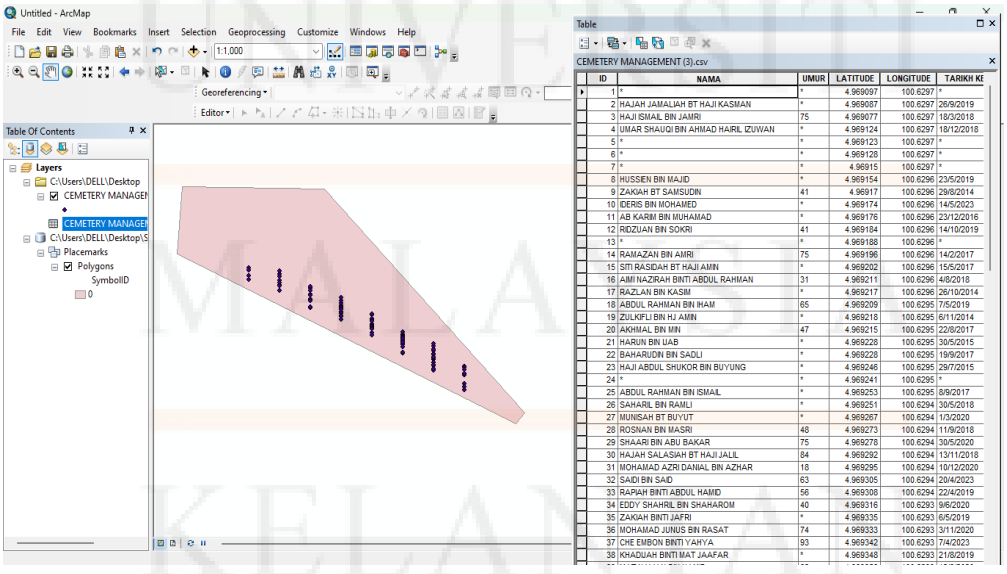

Figure 4.3 Integration of field data and created shapefiles using ArcGIS 10.8

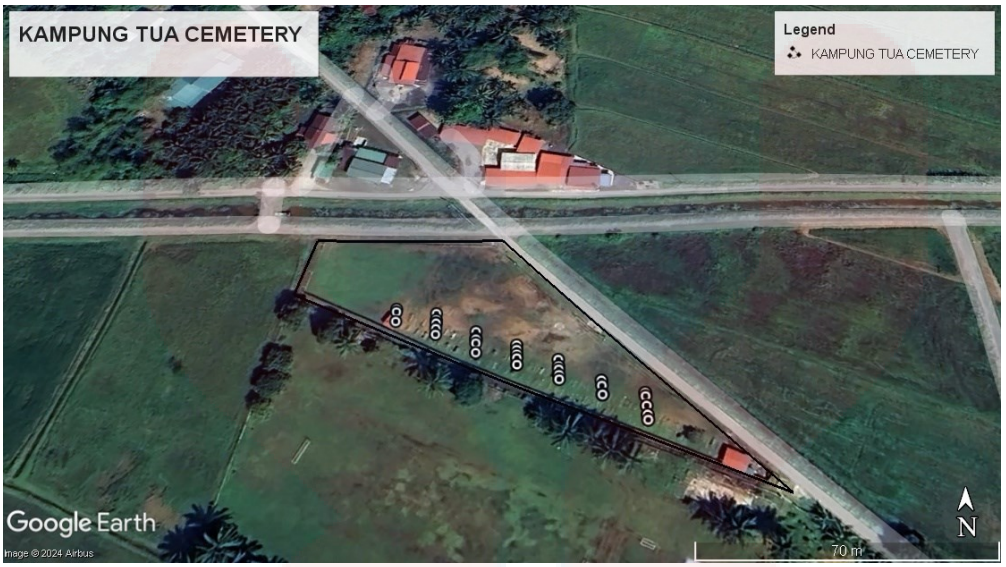

Figure 4.4 Map of Kampung Tua cemetery with coordinate

4.3 Publicize database through website

This website was developed using WordPress.com framework. It was called E-Kubur. It can access through http://e-kubur.unaux.com. The content on the website can be managed and organised by a system manager. It was originally created as a tool for publishing blogs but has evolved to support publishing other web content, including more traditional websites, internet mailing lists and forums, media galleries, membership sites, learning management systems, and online stores. Figure 4.4 shows the interface of website. In this website, community can access the information of each deceases by using keywords. For example by typing name or date of death, the website will help to search the data required.

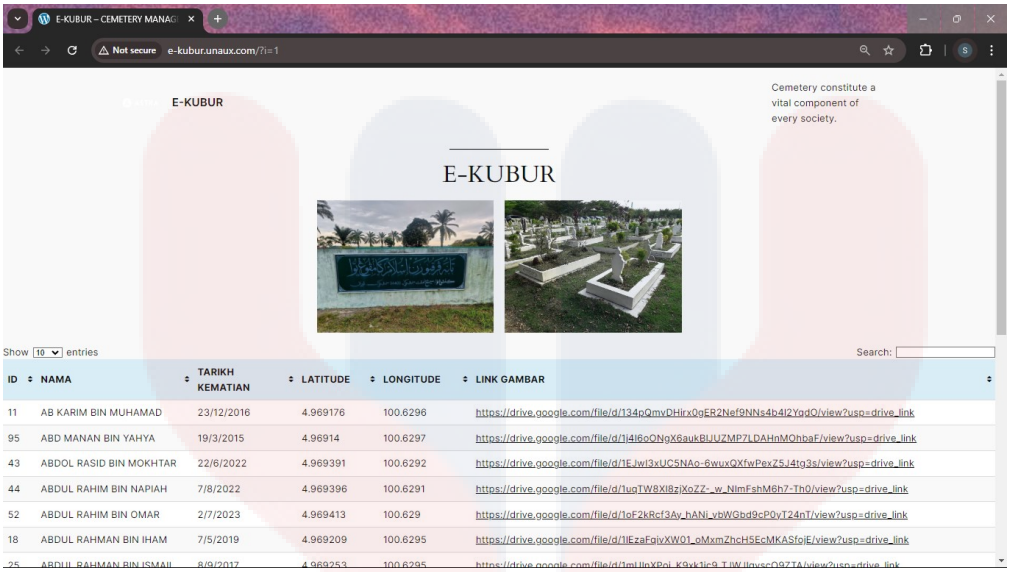

Figure 4.5 Interface of e-kubur website of Kampung Tua cemetery

This website was developed to improve the efficient storage of death records in the study area, aiming to avoid incidents such as the loss of critical death information especially in the Kampung Tua cemetery. By digitizing these records, websites ensure that valuable information is preserved and easily accessible, reducing the risks associated with physical record keeping.

One of the main features of the website is its robust search engine, designed to help users quickly and accurately find information about deceased family members. Provide users with an easy and reliable way to access the data they need. The digital platform offers a user-friendly interface that enables seamless entry and retrieval of death records. This not only facilitates the work of those who manage the records but also serves the community by preserving the legacy and history of those buried in the Kampung Tua cemetery. The website stands as a significant improvement over traditional methods, ensuring that death records are

secure, organized and available for future reference, thus preserving the community's heritage and memories.

4.4 Vegetation surrounds the cemeteries area

The vegetation around the cemetery area offers an urbane solution to understanding the flora close to the site. It was done using observation and image analysis. The aerial perspective from satellite image such as Google Erath platform allows for comprehensive mapping of plant species distribution. Meanwhile site observation could closely understand the species and assessment of the vegetation. These could give an idea of management and conservation efforts for cemetery mangers.

The Kampung Tua cemetery is located in the middle of a peaceful landscape, housing a variety of flora, including symbolic ones. Frangipani is a cemetery flower that decorates one of the graves as shown in Figure 4.5. Near this cemetery there are palm oil trees that add to the peaceful atmosphere of the cemetery as shown in figure 4.6. Beyond their aesthetic appeal, these serve as guardians of the environmental balance by offering various benefits to nature and humans. Understanding the flora of surrounding areas is important for managing vegetation encroachment, preserving the aesthetic appeal of cemeteries, and protecting against potential ecological impacts.

In the context of ecological stewardship, plants in cemeteries play an important role in fostering sustainability. Through the process of

photosynthesis, these plants act as diligent carbon sinks, absorbing carbon dioxide from the atmosphere and thereby reducing the adverse effects of greenhouse gas emissions in cemeteries. At the same time, they produce important ecosystem services by releasing oxygen. Based on this symbiotic relationship with the environment, they act as steadfast guards against the encroachment of air pollution, thus fostering a healthier.

Additionally, the verdant canopy provided by the foliage within the cemetery provides many additional benefits. Foliage not only provides a beautiful appeal to the grave environment but also acts as a natural barrier, ameliorating the urban heat island effect by offering shade and cooling the ambient temperature. This can provide comfort to the community who come to visit their deceased family members.

Figure 4.6 Example of trees or vegetation at the Kg Tua cemetery

Figure 4.7 Palm oil tree planted at the study area

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The Kampung Tua Simpang Empat Semanggol Perak cemeteries, which were established in 2014, have been the subject of a study that has yielded numerous significant findings and discussions. Masjid Kampung Tua oversees the cemetery, which occupies a modest area. The average age at mortality is 64 years, and 51 of the 97 recorded graves are male and the remaining are female. The absence of inscriptions on nine graves underscores the need for improved cemetery management and record-keeping.

Using geospatial technologies such as ArcGIS dan satellite images it is possible to do data management and mapping, guarantees comprehensive and organized records, which facilitates additional analysis and conservation initiatives. The E-KUBUR website's incorporation of digital records is a significant enhancement in the preservation of community heritage, the prevention of data loss, and the maintenance and access of death records. It is also aim to enables community to access the data and find their heir's graveyard through a friendly platform.

In conclusion, this study had successfully transformed the data and information of Kampung Tua's graveyard into a digital platform and it can be access by publics through a website. Hence, through the satellite image and observation of flora surrounded the cemeteries, a suggestion on management action could be develop in order to keep the area green and

fostering sustainability. The investigation underscores the significance of contemporary digital platforms and technologies in the enhancement of cemetery administration, the preservation of historical records, and the promotion of ecological stewardship.

5.2 Recommendation

Several recommendations to enhance the administration and record-keeping of the Kampung Tua Simpang Empat Semanggol Perak's cemetery are as follows:

- For mapping purpose, drones are suggested to get fast and high resolution image of the area. Drone will help to see the aerial view of vegetation and cemetery of the area. However, this method is costly and requires skills and expensive devices.
- Database developed in this study should be maintained and managed properly by data managers. The proper procedures need to be established to ensure the sustainability of data of new cemeteries. Regular updates to accurately represent any modifications in cemetery layout or newly added interment. Therefore training on practical use of website and data management is required in the future.
- Paid website is suggested since the freely available platform for website use in this study has limited customized buttons only.
- Ensuring community engagement and easy access are crucial aspects of cemetery administration to sustain this digital data for next generation.
- Identification of vegetation and trees in the area require expertise and landscape planner to ensure the area are dim and peaceful.

REFERENCES

Baduroon, N. (2012) The Washing and Shrouding of The Deceased. Al- Jazeera. Dr. Hassan Ali El-Najjar. Retrieved 17 February 2012.

Bittner, Stephen E. 2005. Concerning Axiom Business Systems: Cincinnati Catholic Cemetery Society.

Eissfeller, Bernd. 2015. "Global Navigation Satellite Systems (GNSS): The Utmost Interdisciplinary Integrator." Systemics, Cybernetics And Informatics 13(4): 7-12 ESRI. 2018.

E-Mem: An Interactive Graveyard Information Management Tool & Virtual Memoriam Database
https://Doi.Org/10.1109/Icsct53883.2021.9642654.

Ibnor Azli, "Hukum Penentuan Arah Kiblat Bagi Mayat Di Perkuburan", Muzakarah Falak 2013, Kuantan (27 – 29 Ogos 2013)

Johannsson, H., A. Vysniauskiene, I. Baliulyte, S. Zabiela, A. Sarris, and E. Peraki. 2005.

Kantor, Andrew 2005. Necropolis of the future. The Roanoke Times, Tuesday, April 26, 2005.

Management in a GIS Framework: A Case Study of Cemetery Management in a GIS Framework: A Case Study of Woodland Hills Memorial Park Woodland Hills Memorial Park. 2018.

Parker, H. Dennison. 1998. "The Unique Qualities Of A Geographic Information System: A Commentary." Photogrammetric Engineering And Remote Sensing 54(11): 1547-1549.

Pattison, W. D. (1955). "The cemeteries of Chicago: A phase of land utilization." Annals of the Association of American Geographers, 45, 245-257.

Sallay, Á., Tar, I. G., Mikházi, Z., Takács, K., Furlan, C., &Amp; Krippner, U. (2023, March 10). The Role Of Urban Cemeteries In Ecosystem Services And Habitat Protection. Plants(Basel, Switzerland). https://Www.Ncbi.Nlm.Nih.Gov/Pmc/Articles/PMC10053448/

Schmidt, Maureen L., et al. "Cemetery Mapping and Digital Data Analysis: A Case Study in Minnesota, USA." *Journal of Geography and Geology*, vol. 12, no. 2, 31 Aug. 2020, p. 40, https://doi.org/10.5539/jgg.v12n2p40.

Shazlin bt Omar, “Pemetaan Tanah Perkuburan MBSA Dengan Aplikasi Quantum GIS”, Kertas Kerja (2010)

Smart Pusara : Sistem Pengurusan Lot Kubur Inovatif Dan Patuh Syariah. (N.D.-B). https://Pintu.Instun.Gov.My/Assets/File/Attachment/Upcl5sprkthvmrfdrdvjol3vtt xbiazv.Pdf

Sultana, Maliha, Et Al. “Requirements Elicitation And Development Of A Graveyard Management System In The Context Of Bangladesh.” Requirements Elicitation And Development Of A Graveyard Management System In The Context Of Bangladesh, 5 Aug. 2021,

Sulaiman et. Al, Muslim Cemetery Management (MCM) In Malaysia: Practices, Issues https://www.researchgate.net/publication/261877363_muslim_cemetery_management_mcm_in_malaysia_practices_issues_and_challenges

Uslu. A., Baris. E. & Erdogan. E. (2009). Ecological Concerns Over Cemeteries; African Journal Of Agricultural Research. Volume 4 (13), Pp. 1505-1511.