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EXPLORING THE POTENTIAL USAGE OF UNDERUSED URBAN SPACE: HAJJ SITES IN MECCA AS CASE STUDY

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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AYMAN AMIN IMAM

DIRECTOR:
Dr. JOSEP ROCA CLADERA

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Abstract

The term Underused Urban Spaces (UUS) refers to spaces within urban areas that have become unused, or that are being used to a lesser degree than they could or should be. The emergence of such spaces has therefore encouraged researchers, urban planner, social and local authorities to explore ways in which to utilise these spaces in alternative ways, particularly in order to bring about positive social, economic and environmental benefits.

Since the Islamic pilgrimage sites, known as the Hajj Sites (HS), are viewed as a type of UUS, the main objective of this research is to explore the effectiveness of using the HS in a different manner, specifically when the Hajj is not occurring. This investigation was conducted by exploring the different aspects that may inform how likely it is that the use of the HS might be a success. This was achieved by exploring their internal and external features, the potential benefits due to their location, along with the possibilities they offer in terms of people accepting the alternative use of the HS when the Hajj is not in progress.

Current theory and information regarding practices relating to the UUS concept and the HS was gathered from secondary data sources. Subsequently, a quantitative approach was adopted in order to achieve the goals set out for the research, which employed advanced urban analysis methods, including remote sensing and GIS techniques, a morphological index, multiple regression analyses and online questionnaires. Therefore, all of these components aimed to enhance the outputs of the research.

The results showed that using the HS when the Hajj is not taking place has the potential to be hugely effective and advantageous, mainly as the sites possess the capacity to be used for this purpose. Their internal potential includes the diversity and quality of their existing facilities, and their external potential encompasses their connectivity and the proximity of their surroundings. Their future potential can be demonstrated by Mecca's urban growth patterns, alongside the social potential, which is represented by people's acceptance in terms of the possibility of using the HS differently and

when the Hajj is not in progress. Their willingness to utilise the facilities at alternative times, if this was offered, is also of significance. The methods employed in this research could also be applicable with regard to future research focused on examining either HS or similar contexts, possibly in a comparative study.

Resumen

El término Espacios Urbanos Subutilizados (en adelante UUS) se refiere a espacios, dentro de un área urbana, que no han sido usados o que están siendo utilizados en menor medida de lo que podrían o deberían ser. El surgimiento de dichos espacios ha alentado por tanto a investigadores y urbanistas, así como a autoridades sociales y locales a explorar maneras alternativas de utilizar estos espacios, en particular con el objetivo de brindar beneficios sociales, económicos y ambientales.

Dado que los lugares de peregrinación islámica o sitios de Hajj (en adelante HS) son vistos como un tipo de UUS, el principal objetivo de esta investigación es explorar la eficacia en la utilización de los HS de una manera diferente, específicamente cuando el Hajj no está ocurriendo. La investigación se llevó a cabo mediante la indagación de los diferentes aspectos que pudiesen explicar qué tan probable es que el uso de los HS sea un éxito. Esto se logró a través del reconocimiento de sus características internas y externas, de los beneficios potenciales debidos a su localización, junto con las posibilidades que ofrecen en téminos de la aceptación de la gente a un uso alternativo de los HS cuando el Hajj no está en curso.

Para proporcionar la teoría actual y la información respecto a las prácticas relacionadas con los UUS y los HS se utilizó fuentes de información secundarias. Se adoptó después una investigación empírica en el cual empleó métodos avanzados de análisis urbano, incluyendo teledetección, técnicas de SIG, un índice morfológico, análisis de regresión múltiple y cuestionarios en línea. De esta forma, todos estos componentes tenían como objetivo mejorar los resultados de la investigación.

Los resultados mostraron que el uso de los HS cuando el Hajj no está ocurriendo tiene el potencial de ser enormemente eficaz y ventajoso, principalmente porque los sitios poseen la capacidad de ser utilizados para este fin. Su potencial interno incluye la diversidad y la calidad de las instalaciones existentes, y su potencial externo abarca la conectividad y la proximidad de sus alrededores. El potencial futuro de los HS puede ser

demostrado por la importancia de su ubicación dentro del crecimiento urbano de La Meca, y a la vez, por el potencial social representado en la aceptación de la gente en términos de la posibilidad de utilizar los HS de manera diferente y cuando el Hajj no ocurre. La disposición a participar en la utilización de las instalaciones en momentos alternativos al Hajj, si ello llegara a ejecutarse, también es destacable.

Estas revelaciones pueden desempeñar un papel importante en las futuras decisiones y en el planeamiento en relación con los HS y con el crecimiento urbano de La Meca. Por otra parte, los métodos empleados en esta investigación también podrían ser aplicables a futuras investigaciones centradas en examinar ya sea los HS o contextos similares, o posiblemente en estudios comparativos.

Acknowledgments

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Acronym	Definition
AOI	Area Of Interest
CA	Cellular Automata
CBD	Central Business District
EVI	Enhanced Vegetation Index
GIS	Geographic Information System
HS	Hajj Sites
HPEC	High Possibility Expansion Cells
LC	Land Cover
LSU	Linear Spectral Unmixing
NDSI	Normalised Difference Soil Index and
NDVI	Normalised Difference Vegetation Index
NEP	Northeast Part
NWP	Northwest Part
RS	Remote Sensing
RUUS	Reusing Underused Urban Space
SAVI	Soil Adjusted Vegetation Index
SC	Soil Cover
SEP	Southeast Part
SUC	Studio Urban Catalyst
SWP	Southwest Part
TCVI	Tasseled Cap Vegetation Index
TU	Temporary Uses
UC	Urban Cover
UUS	Underuse Urban Spaces
WP	West Part

Chapter 1 Introduction

1.1 Background

Underuse urban spaces (UUS) refers to spaces within urban areas that have become unused, or that are being used to a lesser degree than they could or should be. This issue has become increasingly relevant in recent times, chiefly due to a large number of these types of spaces becoming more evident and publicly acknowledged worldwide. This can be cited to a number of factors; such as some areas' economic decline, a fall in population in some neighborhoods, and post-industrial changes (Németh, J., & Langhorst, J., 2013). In addition, other factors contributing to increased UUS include destruction due to wars, changes in political systems, natural disasters and major events, such as exhibitions and sports competition (Urban Catalyst Studio, 2003).

The characteristics of UUS tend to vary. For example, the spaces may be composed of buildings and facilities or sometimes spaces without any fixed structure. Moreover, they might be in central locations or on the outskirts of a town or city, belonging to public authorities or private owners (Németh, J., & Langhorst, J., 2013). Academics, authorities, planners and professionals have given these UUS different names, including 'vacant land', 'waiting spaces', 'abandoned structures' and 'temporary spaces'. However, they all fall under the umbrella term of UUS.

It has become apparent that contemporary economics, as well as social and cultural trends, are causing a growth in support in terms of people's interest in exploring the potential for reusing or reactivating such spaces, since the use of these spaces may result in numerous social, economic and environmental benefits. *"Vacant land remains a key competitive asset for implementing a number of economic development strategies: creating jobs, increasing tax revenue, improving transportation infrastructure, and attracting residents,"* (Pagano, M. A., & Bowman, A. O. M., 2000. P1). In most of the relevant literature, the concept of reusing underused urban spaces is referred to as 'temporary uses' (TU) of urban space.

Moreover, research into this phenomenon has shown that the concept of exploiting UUS by implementing TU is already commonplace in many cities, in a variety of different ways. This has occurred for both small and very large spaces, with some uses being informal, and others being formal (Bishop and Williams, 2012). Street sports activities represent a clear example for both side, they could informal such as street cricket or skating those played by people of all genders and all ages in gardens, back yards, on the street, in parks, car parks, beaches and any area not specifically intended for the purpose, while the organized sporting events and festival such as the marathons represent formal temporary uses of space whether it is large or small.

With regards to urban issues, the concept of TU is not generally considered as a feature of urban development projects. In fact, TU may, at times, be in opposition with the master plan. This is due to the fact that it usually stands apart from urban planning, enacted in response to the area's current make up and situation, rather than being put in place in relation to a distant goal. In addition, it also seeks to exploit what already exists in an environment, rather than starting something from scratch (Urban Catalyst Studio, 2003).

For example, usually, when a building or area becomes vacant, it is expected that the area will be subject to a planning process and will be built upon and made use of as soon as possible. However, in some cases, due to reasons including financial crises or delays in planning and implementation procedures, the vacant spaces are used temporarily for things such as neighborhood car parking (Urban Catalyst Studio, 2003). Recently, central parks in some countries have been used temporarily for demonstrations and protests, and in some circumstances, these areas have also acted as spaces for temporary accommodation for the demonstrators.

On the other hand, there are examples such as Paris-Plages, where there was a plan run by the mayor's office of Paris to introduce the TU concept by creating temporary artificial beaches each summer along the river Seine in the centre of Paris. Thus, since 2007, every July and August, roadways on the banks of the Seine are closed off and various activities are hosted there,

including the creation of sandy beaches and the arrival of palm trees. While many Parisians leave the city for the holidays between mid-July to mid-August, some do not have this opportunity. Therefore, the Paris-Plages (Figure 1.1) demonstrate the potential for temporary projects to fill unmet needs within spaces, which are normally dedicated to other purposes. Until the development of this project, opportunities for summer recreation and escape were limited in the middle of the city. Whereas now, Parisians can enjoy a beach atmosphere without having to leave the city (Urban Catalyst Studio, 2003).

Figure 1.1: The temporary summer beach in Paris
Source: James McAuley. (2016). Fake Seine beaches are part of a Paris summer. *The washington post.*(goo.gl/OnL58w)

Such an example thus illustrates that the TU concept is not appropriated only for vacant or abandoned spaces or structures but rather could be employed for alternative uses in any urban space, even those dedicated for a specific purpose. This could also be especially significant when some economic, social or environmental benefits can be achieved simultaneously.

The Progressive Field in Cleveland city demonstrates another possibility of the TU concept, where the concept has been introduced as alternative way in which to keep the stadium neighbourhoods alive in the off-season when the

stadium and all of its facilities become underused during the winter at the end of baseball season. All the seats are left vacant, the hot-dog concessions closed, the field empty, and the gates padlocked until the following spring. However, since 2010 and in order to maximise the year-round utility of one of the biggest pieces of infrastructure in town, the Indians[1] have converted the field into a vast winter playground where they have laid an ice track around the field for skaters and built a snow-tubing hill from the bleachers onto the outfield (Figure 1.2). Hence, this has been a good way for Cleveland to embrace winter at the Progressive Field. Moreover, many economical and social benefits have been achieved due to this concept as the event drew about 50,000 people to downtown Cleveland last winter, who otherwise would have been bundled up at home, while the events have also injected money into the surrounding entertainment district and restaurants (Badger, 2011).
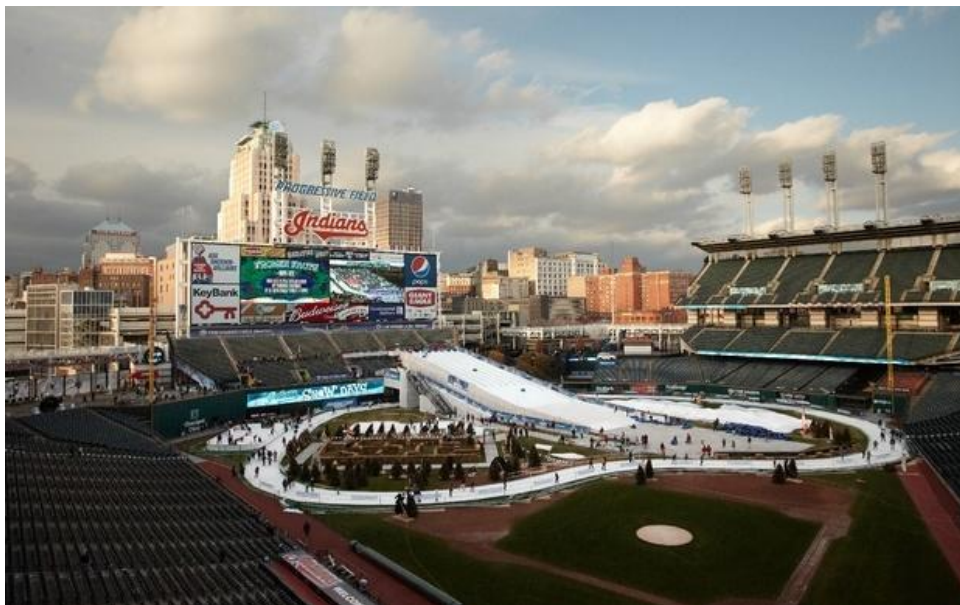
Figure 1.2: Cleveland's Progressive Field is converted to a winter wonderland during the off-season.

Source: http://www.citylab.com/cityfixer/2011/10/stadium-neighborhoods-alive-off-season/260/

Whether TU of the UUS is formal or not, planned or unplanned, the process of evaluating the effectiveness and the benefits of TU varies case by case. This is dependent upon many issues, such as the size and location of the

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[1] The Cleveland Indians are an American professional baseball team based in Cleveland, Ohio.

UUS, the facilities have attached to it, and how long the space has been underused for. Most recent discussion regarding the effectiveness and benefits of TU of UUS have been based on examples that have already taken place. In other words, many of the existing examples were analysed in order to understand how effective the TU was and what the benefits were of the usage. However, research concerning the concept of TU of an UUS is limited and is still in its infancy (Bishop and Williams, 2012). Consequently, in this research, appropriate methods have been attempted to be identified in order to provide a preliminary assessment in terms of the effectiveness of reusing the Islamic pilgrimage sites in times other than the Hajj when the sites and this facilities become underused.

The Islamic pilgrimage sites in Mecca represent a prime example of UUS. The sites are dedicated to a specific and temporary event, known as the "Hajj rituals", taking place for just five days of a year. The event is the world's largest gathering of Muslims and the largest annual gathering in the world (Figure 1.3), as nearly 2.5 million people perform the ritual (CNN, 2013)[2]. However, the shortness of the event leaves these sites underused during the rest of the year.

Figure 1.3: Part of the Hajj sites showing how it looks when Muslims gather during the Hajj
Source: https://themuslimtimes.info/2013/10/12/hajj-gifs-take-you-inside-mecca/

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[2] http://ireport.cnn.com/docs/DOC-1049213

The huge number of pilgrims in a limited geographic area at a specific time has created a myriad of challenges for the Saudi government. Ensuring the necessary arrangements have been made each year, particularly in the face of a growing number of pilgrims, poses a real logistical challenge for the government of Saudi Arabia (Shafi et al., 2016).

Since the 1950s, they have spent more than $100 billion on facilities for pilgrims. Major projects, concerning housing, transportation, sanitation, and healthcare have also been implemented by the government, with the results being evident in that the pilgrims now enjoy modern facilities and perform the various rites involved with ease (Arabnews, 2015)[3]. However, all of the modern facilities are wasted during the remainder of the year (Figure 1.4).

Figure 1.4: The same areas from the previous figure showing the situation during the remainder of the year

Source: http://www.spa.gov.sa/galupload/normal/000-470488721381677804921.jpg

According to the Okaz[4] newspaper in 2012, the annual operating and maintenance cost of the monorail project is only around $53 million, while the annual return of its operation during the Hajj season is around $36 million, which is less than 45% of the maintenance and operating costs. In

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[3] http://www.arabnews.com/saudi-arabia/news/805891
[4] It is an Arabic Saudi Arabian daily newspaper located in Jeddah. The paper was launched in 1960 and its sister publication is Saudi Gazette.(http://okaz.com.sa/article/510899/)

addition to that, according to the Alriyadh[5] newspaper in 2012, the annual maintenance cost of the mosques and toilet complexes within the HS is around $5 million and are only used during the season.

Current locally conducted research and discussions regarding the Hajj Sites (HS) mostly centre around issues related to the usage of the sites during the Hajj. While, the issue of the sites being underused at other times is still under-researched, even within local research facilities. The dean of the Hajj Research Centre, Dr. Mohammed Idrees[6] said in 2006 that, *"Currently we don't have any research about Hajj sites status during the off-season but we may do some in the future"*[7]. Yet, until this research was started in 2013, no research had previously examined the status of the HS in the off-season.

However, some press reports have recently discussed this issue (a copy of each is provided within appendix A). One of Mecca's newspapers published an article in 2014, titled "Hajj Sites are out of service for 270 days"[8]. The report was based on field observation work by the writer. In the article, the sites not having an official use during the other 270 days was discussed.

The report noted that the sites are, however, still visited by different groups of people, including foreigners visiting the sites as part of their religious tourism in Mecca, local citizens using the open spaces for some social activities such as picnics, sports and weekend family reunions, and some vendors selling to visitors of the sites. It was also highlighted that visiting groups often voiced complaints about the facilities (such as mosques, toilet complexes, and healthcare facilities) always being closed, despite visitors having a need for them (Figure 1.5).

Another press report, published in 2014 by the *Ainalyom* newspaper[9], reported that some parts of the HS are even being used daily by Mecca citizens, as citizens take advantage of the available lighting and the wide asphalted areas. Many activities occur there, such as cricket games,

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[5] It is a Riyadh-based, pro-government Saudi daily newspaper. Its sister paper was Riyadh Daily that was disestablished on 1 January 2004. Al Riyadh is one of the dominant papers in Saudi Arabia http://www.alriyadh.com/766089
[6] Mohammad Edrees is the former dean of the research centre of pilgrimage studies, Mecca
[7] http://archive.aawsat.com/details.asp?issueno=9896&article=399391#.WLsbKm8rK2w
[8] It is an Arabic press report available at http://bit.ly/29QZAFp (last accessed on 17/04/2015)
[9] http://3ym.co/380799

motorbike races, and horse and camel riding, along with families spending some of their free time there. The report also emphasized again that the facilities, such as the mosque and the toilet complexes, are all closed, despite a huge demand from such visitors.

Figure 1.5: Some of the closed HS mosques show the demand for use while they are closed.
Source: Author's collection

Furthermore, a recent press report, published in February 2017 by the Okaz newspaper[10], reported that most of HS facilities are exposed to theft and vandalism after the season ends. It was mentioned within the report that most of toilets doors, sewage covers and the electrical cables are being stolen during the off-season as a result of the absence of security and adequate monitoring. The report also noted that some parts are affected more than others as they are large open spaces with easy access and individuals can exit

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[10] http://bit.ly/2oCwEJ6

without any security checks taking place. Moreover, according to a visitor who was interviewed within the report, he said that it is quite shocking when someone visits the HS and sees the many broken doors and destroyed electrical boxes within a space which is supposed to be sacred and well maintained (Figure 1.6). The director of the maintenance department was asked by the author of the article about the issues and he said that every year before the Hajj season starts, his department is in charge of repairing or replacing every broken or stolen door and sewage cover and so on, which costs money and additional work that could be avoided if there was more security in place year round and the sites were not being underused in the long-term.

Figure 1.6: Broken doors of one of the toilet complexes
Source: http://bit.ly/2oCwEJ6

This research therefore aims to address the research gap in terms of Hajj site usage outside of Hajj time. The underused status of HS was focused on by exploring the effectiveness of using the available facilities for different purposes other than the Hajj. This research was conducted by identifying the different potential HS had, through using advanced urban analysis methods and technologies, including remote sensing (RS), geographic information system (GIS), a morphological index, and multiple regression analyses. The main reason for employing multiple methods was due to the fact that this aids in adding more value to the general discussion of UUS.

1.2   Objectives

The research's general aim was initially to review contemporary theory and practice regarding UUS, as well as to understand the effectiveness of reusing UUS to achieve social, economic and environmental goals. It was later refined to the following objectives:

- To explore the effectiveness of using HS in an alternative manner when the Hajj is not occurring, chiefly by illustrating the different potential that the HS may have that may enhance the likelihood in terms of the success of the TU of the HS.
- Determine whether the HS can be classified as a type of UUS through examining their background, development and urban characteristics. This would help to show how the HS are unique spaces and vary from other UUS, as well as to discover the current internal and external potential of the HS.
- Quantify the relationship between the HS locations and Mecca's urban growth patterns, in order to understand the importance of the HS locations in the context of urban changes that have occurred and that are likely to occur in the future.
- Examine Mecca's resident's perceptions in relation to, and acceptance of, the use of the HS facilities when the Hajj is not occurring in order to anticipate their response to such an event.
- Improve our understanding of the use of new technologies, such as remote sensing and GIS, as essential tools for urban planners during the process of decision-making, and how they can be used for the analysis of urban areas for policy purposes.

In order to meet these objectives, research questions needed to be designed, as they enable the researcher to identify and address the issues relating to the TU of the HS.

1.3 Research questions

The research questions were formulated as follows:

The first research question is concerned with the current discussions relating to the emergence of UUS. The main question is; what are the potentials of UUS for alternative uses? And in order to answer that question, some sub-questions are stated, such as; what are the spaces that are considered to be a kind of UUS? Further, what are the reasons for their existence? Moreover, how are they apparent within an urban context and what do the spaces represent in the cities they are located in? These questions require a deep overview of the relevant literature, and the most pertinent studies need to be taken into account for the research's case studies.

The second set of research questions relate to the case of the HS, where the main question is; what is the potential usage of the underused spaces in the HS during the off-season? While the stated sub-questions in regards to this part include; can the HS be considered a type of UUS or not? Moreover, how effective would it be to use the HS when the Hajj is not occurring? Sourcing the answers to these questions requires an exploration of the HS urban characteristics, with consideration also being given to their history and development, along with their situation when the Hajj is not in progress.

The third research question regards the methods used in this research, with the main question being; what are the most appropriate methods for exploring the potential usage of the HS during their underused period? Additionally, which advanced methods and technologies could be applied in order to improve the research outputs? This will require an investigation of the methods used in similar studies, which will be presented in the literature review of this research. Additionally, an investigation of new methods and technologies that have been recently used for urban studies and analyses will need to be undertaken.

The last question is; how can the main findings and conclusions from this research aid future knowledge around UUS in general and HS in specific? This will not only provide guidance for planners, architects and urban

designers on a local scale, but also to others who are researching similar cases. However, it is important to note here that while researchers may benefit from the methodologies and the proposals used in this research, no single model will be applicable for all types of UUS.

1.4   Research methodology

In order to achieve the research objectives and to address the research questions, it was imperative to determine the best methodology for these tasks. As discussed previously, research exploring the potential alternative uses of UUS is limited in general, and information relating to the underused status of the HS is even more limited. Thus, it was hard to find appropriate guidelines or approaches that had been used in other cases that could be applied to this case study.

Overall, for contemporary research, there are two main approaches that can be used; quantitative and qualitative. Quantitative research generates numerical data or information that can be converted into numbers. On the other hand, qualitative research generates non-numerical data; instead focusing on mainly verbal data. Gathered information is then analysed in an interpretative, subjective, impressionistic or even diagnostic manner (Johnson and Christensen, 2000).

Therefore, determining whether research should be conducted quantitatively or qualitatively is often the first decision to be made in terms of research design. However, a researcher must consider what specific methods of data collection will best suit the study (Sandelowski, 1995). Thus, since the main objective of this study is to explore the effectiveness of using UUS in alternative ways by employing advanced urban analysis that uses numerical data, the study will utilise the quantitative approach in order to generate more in-depth information and knowledge regarding the research problems.

The research first started a theoretical part to include subtle details by outlining the general concept of reusing UUS, which was achieved by

reviewing relevant literature. The specific case of using the HS when the Hajj is not taking place was also explored by analysing the HS backgrounds, their histories, and their characteristics, as well as Mecca's urban development. the collection of data and information for this part was collected from related primary and secondary sources.

The quantitative approaches posteriorly was employed in order to examine the relationship between the HS and Mecca with regard to urban growth patterns, and further, to enhance our research findings and outputs by quantifying the level of acceptance from Mecca's citizens in terms of the HS being used in the off-season. Moreover, these approaches were used to assess the likelihood of them using the facilities if they were made available at other times (Figure 1.7).
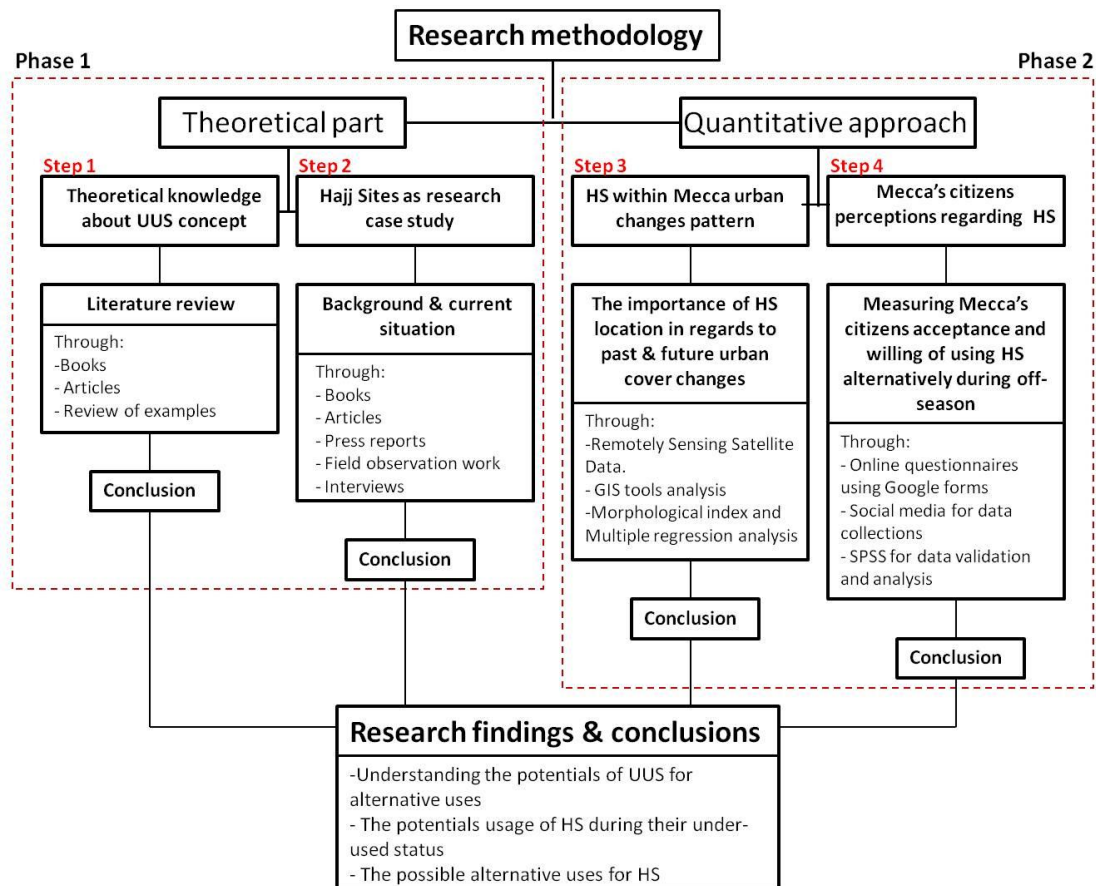
Figure 1.7: Research methodology flowchart

Source: Edited by author

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The main goal of this was to add more value to the outputs of the research through introducing new contemporary technologies to this research area, some of which have been used recently in other pieces of research so as to achieve better results for urban analysis. Thus, many tools were used for data collection and analysis in this step, including remote sensing, GIS, a morphological analysis called *Entropy*, a multiple regression analysis and an online survey that used an electronic questionnaire, which was distributed via various social media apps. Moreover, within the chapters of this research, more detail will be provided with regard to the methods and tools that were used to meet the goals identified for each chapter

1.5   Research structure

This research is structured in a way which addresses each of the objectives and the research questions in turn, all of which were stated above. The six chapters encompass different approaches, methods, data and analysis. The research is divided into two main parts overall: the theoretical and the empirical. The theoretical section covers chapters 1, 2 and 3, while the empirical section covers chapters 4 and 5. Chapter 6 is dedicated to the study's conclusion and discussion.

Chapter 1 provides a general introduction and an overall outline of the research and discusses the research's background, scope and objectives, questions, methodology, structure, and limitations.

Chapter 2 reviews literature regarding UUS and examines the fundamental features of this concept. Its main objective is to examine the possibility and feasibility of dealing with UUS, and to examine why it is important in an urban context to study and discuss UUS. Moreover, the chapter explores the concept of TU as a concept that could be utilised within such spaces to accomplish many social, economic and environmental goals.

Chapter 3 introduces the case of the HS as a form of UUS. The context of the Hajj rituals, the origins, history, procedures and the geographical location of

the HS are also explained, in order to clarify the relationship between the event and its location. An urban analysis of the sites is then provided, showing their current urban characteristics and facilities and in addition, their connectivity and proximity with their surroundings is mapped. The objective of this chapter is to explore the current internal and external potential of the sites for possible alternative uses.

Chapter 4 explores and analyses the relationship between the locations of the HS and Mecca's urban growth patterns. It first quantifies the urban growth changes that have occurred in Mecca, in order to demonstrate the importance of the HS in terms of those changes. Subsequently, the results and findings extracted from the first step are used to build an urban growth model, in order to predict the possible direction of future urban growth. Thus, this helps to explain the importance of the HS in terms of the future urban growth of Mecca. Advanced techniques and methods used include remotely sensed satellite images, GIS, an entropy index and multiple regression analyses

Chapter 5 assesses Meccas residents' opinions regarding the idea of using the HS facilities in an alternative way when the Hajj is not taking place, and explores further how accepting Mecca's citizens would be if this idea were to be implemented. Thus, the chapter first measures the respondents' general opinions and moreover, explores the respondents' willingness to use the facilities at other times. The objective of this chapter is to explore potential acceptance levels, as this would affect the success of any plans of using the HS in the off-season. An online survey was used to gather data and it was distributed via modern social media networks, such as WhatsApp, Twitter, and Facebook. Finally, the chapter provides a statistical analysis using SPSS 22 and Excel.

Based on the theoretical and practical discussions, Chapter 6 provides the conclusions obtained from the study, in order to address and assess the overall concept of UUS, and more specifically, the case study of the HS in this study. The chapter explains the major findings and outputs of the research and the effectiveness of the methods that were used to achieve the different research goals. The chapter finishes with some recommendations

and proposals for future work to support and enhance the outputs of this research. (Figure 1.8).
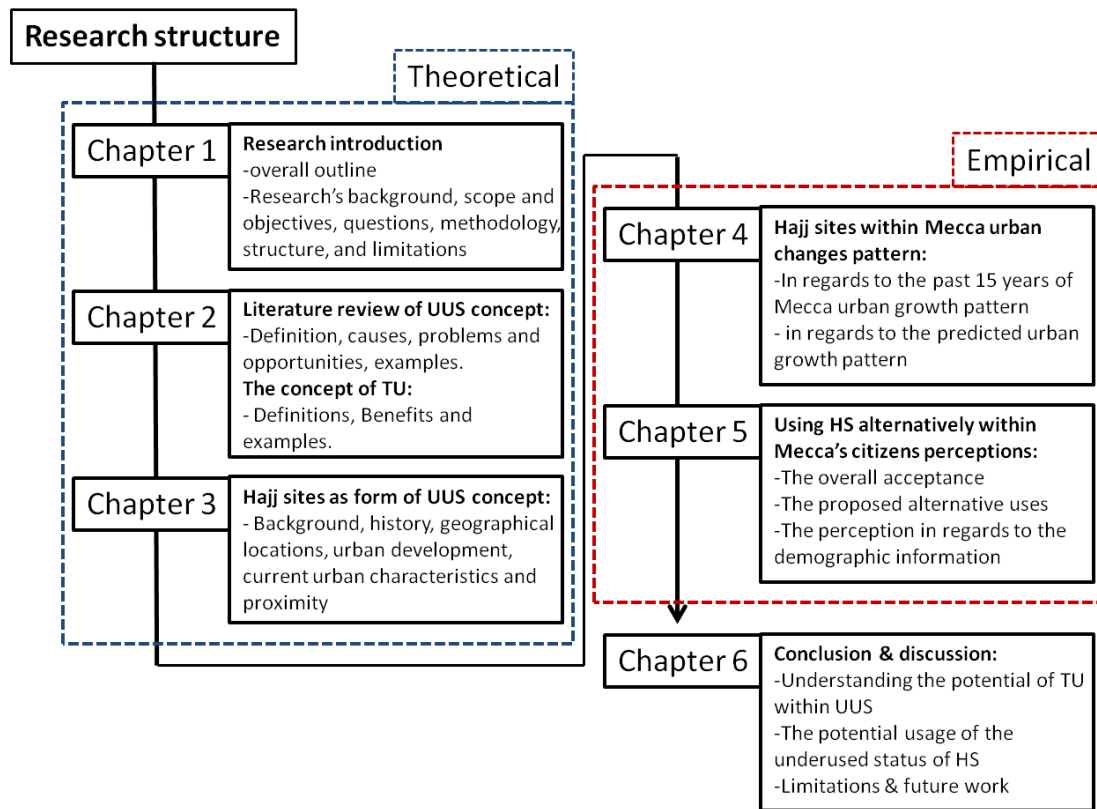
Figure 1.8: Research structure

Source: Edited by author

1.6   Research limitations

The case study was limited to the HS and Mecca, where these sites are located. The methods used are not applicable for other UUS cases studies in Saudi or, indeed, in any other country. Each case study will have its own individual socio-economic and urban characteristics. Other limitations, as identified by the author, are:

1. The literature review is reasonably small since there are a limited number of studies and research regarding the HS when the Hajj is not taking place, alongside the low profile of the HS within prior studies and research relating to UUS.

2. The remote sensing and GIS analysis have not adopted the demographic expansion (census data) due to the lack of updated available data at a local level. Besides, the available census data of Mecca does not detail the population distribution by cells, nor by district or zones, thus it was hard to add the census data into the calculation analysis during this research.

3. Online surveys have been rarely used for urban analysis studies, and the accuracy and reliability of their outputs is still under discussion. Although the sample size is large, there is still the possibility of fake data. However, for the Saudi culture as it is considered quite conservative in regards with some social limitation between men and women, it provides a good option as it deals with potential time and privacy issues.

Chapter 2 Profiles of underused urban spaces within past literature and studies

2.1 Introduction

The process of reviewing past literature and studies, particularly those related to the case study of the Hajj sites, presented difficulties for this research. This is due to the fact that there were no prior studies or research that focused on the status of the Hajj sites during the off-season, even at a local level. The head of the Hajj research centre, a dedicated centre for Hajj research, previously stated that, *"Currently we don't have any research about Hajj sites' status during the off-season but we may do some in the future,"* (Edrees, 2006). Yet 2006, only a limited number of press reports have discussed the issue and even then, only from a social perspective as referred to in chapter one.

The lack of local research available therefore led to this research undertaking a review of some of the general literature and studies, which discussed the concept of underused urban space in a broader sense. Hence, this chapter provides an overview of such previous research surrounding the issues relating to underused urban spaces (UUS). This will help to fill the gaps among general theories and practices of UUS with regard to the Hajj sites, while also aiding the researcher to assess the key data collection requirements necessary for the empirical tasks that need to be conducted in the course of this study.

The chapter will first introduce the reader to a general explanation of UUS issues from an urban perspective. This will include a review of academic terms and definitions that can be applied to the case of the Hajj sites, an explanation of the reasons behind the emergence of UUS worldwide, and the opportunities such spaces can provide. Furthermore, this will help to determine whether the Hajj sites may be able to provide similar opportunities for usage as the cases discussed.

Secondly, the chapter will discuss the concept of reusing UUS in a temporary manner to take advantage of the potential opportunities they provide, alongside possible social, economic and environmental benefits for the community which is extracted through the analysis of some examples. This discussion will cover the terms and definitions for the temporary use (TU) concepts, the benefits of its implementation within UUS and the framework for its implementation. The aim of this section is to determine how likely it is that such a concept could be applicable in the case of the Hajj sites since the TU concept could provide a conceptual framework for measuring the effectiveness of using the Hajj sites during the off-season.

2.2 Underused urban space context

2.2.1 Definitions

In an urban context, UUS refers to spaces within urban areas that, for certain periods of time, are used below their optimum levels. There are many different terms in the current relevant academic literature that have the same meaning as UUS. Merten Nefs (2006) argued that there are two main types of UUS - spaces that were kept vacant during the formation of the city around them, and spaces that were previously occupied, but that have been abandoned at later some point (Figure 2.1). In general, the second category involves built structures, which in this case, are considered to be abandoned buildings or structures. For instance, the Expo Zaragoza structure represents a clear example of such phenomena in that the exhibition has now finished and all buildings have been abandoned since 2008. In contrast to vacant spaces those have never been occupied in any form

Pagano and Bowman (2010) confirmed that the scale of abandoned buildings or structures varies, ranging from a single building to an entire city structure. They also stated that some cities define a structure as abandoned if it has been unoccupied for 60 days, while others employ a threshold of 120 days or longer. However, this can also differ from one city to another. Depending on the local authority's perception, some structures would be considered

abandoned in one city but not in another. Moreover, the term "abandoned buildings and structures" can be applied to the case of the Hajj sites since, as we explained in chapter one, the sites contain buildings and structures that are, at times, abandoned for more than 120 days at a time. However, the difference in the case of the HS is that the local authority of Mecca doesn't consider the HS to be abandoned nor vacant, rather that they are sacred protected places that are dedicated to the Hajj[11]. Thus, even though the Hajj sites share the same status as the abandoned structure phenomena, it is inappropriate for it to be included within such a concept, which however, represents an obstacle with regard to the comparison analysis.
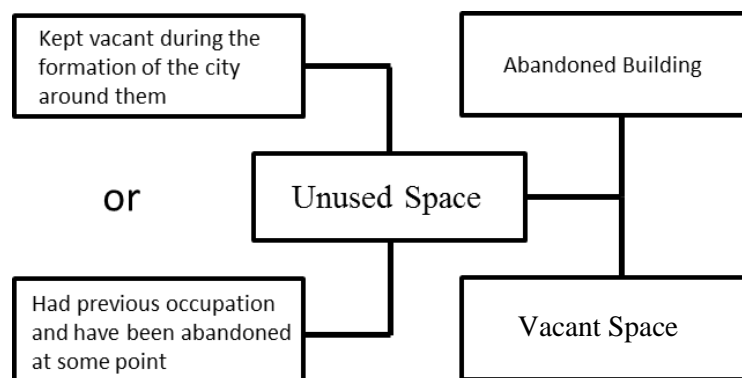
Figure 2.1: The possible types of UUS, according to Cathy Lang.
Source: Edited by author

Pagano and Bowman (2000) while, used the term *vacant* to refer to all UUS, whether or not they contained structures that were unused or those that have been abandoned in the long-term. While Németh and Langhorst (2013) indicated that vacant land can occur in any location, but is most likely to occur along transportation corridors (i.e. transit or automobile-oriented zones), in areas of transitioning use (e.g. former industrial or commercial areas), in transitional zones between different morphological patterns, at the edges of cities and suburbs, or in sporadic, individual or contiguous lots in downtown areas or neighbourhoods. This wide definition is also applicable for our case study, in which the Hajj sites are unused in the long-term.

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[11] Based on an interview with Eng. Mohammed Burhan, a member of Mecca's authority committee of urban planning of Mecca and the Hajj sites.

However, as mentioned above, except that this explanation is more appropriate to use for spaces that do not contain any structures or buildings.

Meanwhile, Florian and Temel (2006) used the term *temporary space* to refer to a place with a time gap – a moment of standstill between the collapse of the previous use of the space and the beginning of the new use or development of such space (Figure 2.2). They explained that this time gap varies from case to case, in accordance with the larger economic and social context of the particular site. According to the same authors, this time gap has sometimes provided an opportunity for new, unplanned activities, or what can be referred to as "*Temporary Uses*" (TU), which is explained as:

> *"Temporary spaces are places where there is a gap in the cycle of utilisation, which can be used in the short-term for other purposes, usually not with purely economic motives, and multiple uses, which seek to anchor other forms of use alongside the 'dominant' prescribed ones," (Florian & Temel, 2006).*

This term can also be applied to the Hajj sites, as there is a gap of time in between the seasons, whereby the sites become temporarily unused. The Hajj season takes place once a year, yet between the seasons, there is a moment of standstill, providing an opportunity for other temporary uses of the sites.
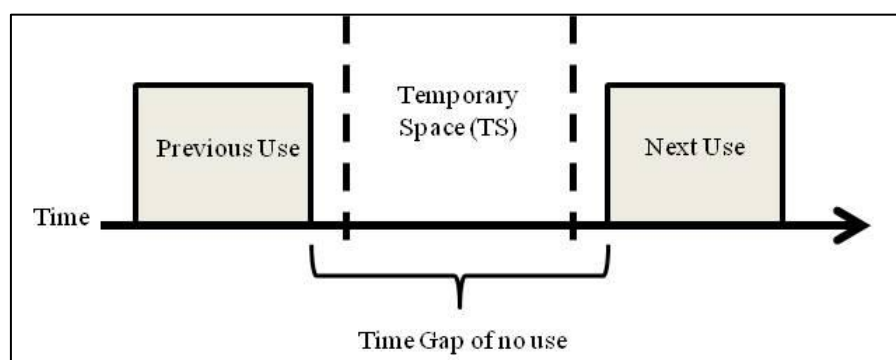
Figure 2.2: Temporary space concept diagram
Source: Edited by author

Due to differences in understanding of the concept of UUS among authors, there are many other terms in literature that have been used to describe this

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concept. For example, the term *residual areas* has been employed in some of the relevant literature such as the *temporary urban space* book edited by Florian and Temel in 2006 to refer to areas that are vacant, and these are characterised as:

a) Sites within an urban settlement that possess at least some of the infrastructure needed for buildings (e.g. access, energy, water supply, or sewerage).

b) Areas that are out of use for more than one year or sites where former types of use have ended (e.g. de-industrialisation), with no prospect of a new type of use in the near future (Hentilä & Timo, 2003).

On the other hand, Colomb (2012) uses the term *wastelands* for sites that are being "wasted" due to no investment or profitable use being found for them, or for "urban sites that appear to be unmarketable in the medium to long-term". *Interim spaces* were also discussed by Colomb, when he referred to spaces used "temporarily" in a variety of ways.

Schaneekloth and Franck (1994) utilised the term *loose space* to refer to spaces called upon to serve their primary functions at a particular time of the day, week or year. At other times these functions are in abeyance, as are the management groups of the spaces and the user groups that maintain them. However, the looseness of the spaces varies across time. The sports venues can provide a clear example of such phenomena since they host sporting events at certain times on a weekly or monthly basis, while the time in-between those events offers the opportunity for other temporary activities to take place in these spaces.

On the other hand, Franck and Stevens (2007) believed that loose spaces offer cities life and vitality. They argued that in loose spaces, people can relax, observe, buy and sell, protest, mourn and celebrate. According to them, loose spaces further allow for chance encounters, spontaneous events, the enjoyment of diversity and the discovery of the unexpected.

It is believed by the researcher here that the case of the Hajj sites can be included in this definition more appropriately, as their primary function is for

pilgrimage at a particular time of year. At other times, however, this function is in abeyance, leaving the space without life. Yet, the authors also believe that these kinds of space can give cities life and vitality when they are not traditionally being used, for example through spontaneous activities.

However, the diversity of terms that have been applied does not change the common understanding of UUS. UUS basically refers to a space being left, within urban areas, without any official use. This being despite the existing demand to use it, whether or not it possesses facilities. The most important point to note is that the aforementioned authors considered these spaces as part of history, platforms for temporary use, or as having the potential for future use in order to achieve various social, economic or environmental goals (Nefs, 2006). Therefore, the Hajj sites, during their unused periods, can be considered to be abandoned buildings, temporary spaces, or even loose spaces. This makes them a potential platform for temporary uses and gives them the potential to be used for future activities that may meet different goals and reap benefits; more of which will be detailed later in this chapter.

Furthermore, it is important to clarify the difference between unused and underused, as both concepts have been mentioned previously. According to Cırık (2005), the definition of an underused space covers the definitions of vacant, abandoned, derelict or unused space as an umbrella definition. Thus, for the purposes of this research, underused urban space will be regarded as (partially) unused.

2.2.2   Causes behind the existence of such spaces

Before exploring the opportunities that UUS can provide for a city, it is key to highlight some of the reasons for the existence of UUS. The reasons vary from case to case due to economic, social, political and environmental factors, yet understanding the reasons behind the emergence of UUS can help in identifying the opportunities presented by each case (Németh and Langhorst, 2013). For instance, dealing with UUS caused by social factor such as population shrinkage is different to dealing with UUS caused by economic factor such as deindustrialisation or environmental factor such as

natural disasters. There are countless reasons for the emergence of the concept of UUS worldwide. However, according to (Hentilä and Lindborg, 2003), there are some common reasons that can be agreed upon in terms of most UUS emerging, including:

- War or natural catastrophes, such as earthquakes, which cause destruction and shrink a population as well. In some cases, the entire city can become abandoned.
- Changes in political systems. In most cases, political systems implement developments and projects until a new system decides to take action, either by continuing the previous implementation or cancelling it, resulting in sites becoming unused.
- Changes in technologies and modes of production (e.g. de-industrialisation, modernisation of infrastructure, or the intensification of the original use of premises due to competition), which causes the closure of many factories and converts industrial zones into abandoned structures.
- Losses of populations, which can also be as a result of factories closing, as discussed above.
- Political decisions, related to new land use patterns, creating rent gaps and outdated current uses, or a delay in political decision-making and planning processes.
- Unclear ownership rights of land or exceptionally high construction costs, normally caused by soil contamination and old infrastructure, which leads to an unclear development plan.

As previously mentioned, the reasons outlined above have resulted in the emergence of different kinds of UUS worldwide and gaining an understanding of such reasons provides an indication of the UUS characteristics that usually emerge as a result of each underlying reason. For example, generally, earthquakes have led to abandoned or destroyed buildings, deindustrialisation has resulted in vacant industry buildings in many cities, and a loss of population has led in some regions that the whole cities to be completely abandoned. However, the reasons discussed above, and the UUS caused by them, differ greatly from the case study of the Hajj

sites. Therefore, the way in which this case study is dealt with will be dissimilar to the previously cited cases, particularly as the causes of UUS in this case study vary. That is to say, even if the UUS in this case study share the same terms and meaning in terms of being unused, and despite the availability of buildings and structures, the opportunities they can provide are not the same. The reason for demonstrating the previous theory and examples, even though it is believed here that there are some inconsistencies with the case study, is to clarify the obstacles and limitations the researcher faced when reviewing previous studies and literature, mainly due to the fact that previous examples were not identified as sharing the same characteristics as the Hajj sites.

In 1997, Goldblatt used the term *special event sites* to describe spaces utilised for grand, temporary events, such as the Olympic Games, the World Cup and exhibitions, and initiatives such as Cities of Culture, cities of religion used for pilgrimages, and Garden Festivals. The Hajj sites deserve to be included in this definition since they are spaces that are used for a temporary, specific use.

> *"The term special events has been coined to describe specific rituals, presentations, performances or celebrations that are consciously planned and created to mark special occasions, and/or to achieve particular social, cultural or corporate goals and objectives,"* (Bowdin et al., 1999).

Generally, most of the spaces in question are only used during the event and often, after the event, they become unused or underused. Therefore, the researcher believes that they can be considered to be another type of UUS. However, most event sites provide almost all the services that would also be found within a large city, such as, parking areas, access to roads, transport, security, health services, fire-fighting services, cleaning and waste collection. This concept has recently been associated with major event structures, such as exhibition centres, structures built for Olympic Games and the football world cup (Goldblatt, 1997) These *special event sites* and spaces are similar to the Hajj sites in many ways. However, the difference here is that the Hajj

occurs every year at the same place, while the other examples occur every four years, and in different places. This difference means that the time that the Hajj sites are being underused is limited, while most of other similar examples are underused after the event has finished for an unknown duration, especially when no clear plan is out into place in terms of dealing with the use of the space after the event is concluded.

According to Bishop[12], the HS can be included within the seasonal events (occasional use) sites that host the same event every year/month/week on specified dates. He argued that the comparison could be closer to that of festival spaces, musical/cultural gatherings and the infrastructure and facilities of exhibitions or sporting venues, which are often vacant between events, even if it is for less than 60 days, yet they share many of the characteristics with the HS.

However, nowadays, there are countless seasonal events that occur every year in the same place, although not every seasonal event site can be compared with the HS. For instance, The Burning Man festival in Nevada's Black Rock Desert is one of these cultural events that occur every year in the same place, whereby each year, thousands of revellers make their way to a temporary community city situated in Nevada and gather to create Black Rock City (Figure 2.3), which is a temporary metropolis dedicated to a sense of community, art, self-expression, and self-reliance. The event begins on the last Monday in August and ends on the first Monday in September (Moorhead, 2016).

Although, the event shares the same concept of the Hajj gathering, which also occurs in the same place every year, The Burning Man event has no fixed infrastructure, nor permanent facilities and every year, people move around with their own cars, caravans and tents…etc. Moreover, after the event, every structure, tent, bicycle, glow stick, and piece of trash is removed, thus, there is no potential for using the site when the event is not taking place.

Therefore, the comparison examples share the same concept of the HS in terms of the seasonal events occurrence but with permanent infrastructure

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[12] Based on a personal interview in 2014 with Prof.Peter Bishop, the author of the temporary city book.

dedicated to the event. However, before highlighting such examples, it is of great importance to understand what the existence of UUS could represent; whether they be vacant land, abandoned structures, loose space or seasonal events space when the event is not occurring, and so on.

Figure 2.3:Black rock temporary city
Source: https://burningman.org/

2.2.3 Expected problems and opportunities for underused urban spaces

After addressing the context of the UUS by describing their main terms and definitions, as well as the main causes for their emergence and the context of our case study, it is also important to discuss what the UUS represent for the urban communities in which they are located. By doing this, it will aid with gaining an understanding of how to deal with UUS issues in a general sense, and specifically, what the underused status of the Hajj sites represents for the city of Mecca.

Whether the cause of a UUS's existence was due to economic, social or environmental reasons, and regardless of whether we know how long a UUS will be unused, the presence of UUS within urban areas, without any official intervention, can result in both problems and opportunities (Németh & Langhorst, 2013). Problems may occur due to the fact that the existence of these types of spaces can attract undesirable activities, such as illegal

dumping and vandalism, as well as creating an impression of neglect, leading to negative feelings from people living near to the UUS (Aurelie, 2013).

Moreover, Németh & Langhorst (2013) summarised some of the political, economic, social and ecological problems that can occur due to UUS. They highlighted that UUS sometimes occur due to political problems, including urban blight, a city down on its luck, uneven developmental patterns, systematic low investment, and the marginalisation of whole neighbourhoods and demographics. Moreover, they claimed that the economic problems caused by the existence of UUS include diminished revenues, ongoing costs (e.g. tax liabilities and maintenance costs), liabilities from environmental impacts, and the lowering of surrounding property values.

With regard to the Hajj sites, there are also some economic problems, such as the facilities' maintenance costs, as mentioned in chapter one. For instance, the annual maintenance of the monorail project alone is around $53 million, while the annual return of its operation during the Hajj season is around $36 million, which is less than 45% of the maintenance and operating costs. In addition to that, some features are being damaged or stolen due to them being unused for a long period of time, which is resulting in costly repairs when preparing the sites for the upcoming season[13].

Regarding social aspects, Németh & Langhorst (2013) argued that UUS can sometimes represent a sign of a breakdown in society, especially when the spaces become occupied by unwanted social groups. In some cases, these spaces also represent issues concerning environmental hazards, contamination, and environmental justice. In relation to the HS, despite the buildings and facilities located there, the underused status of the sites can mean that some illegal activities occasionally occur. Consequently, this potentially generates a bad image for the sites, which are supposed to be sacred[14]. Furthermore, with regard to the negative environmental aspects, the underused status of the sites, especially after the heavy human activity during

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[13] Based on an interview with Dr. Fisal Osrah, the director of the urban planning research department at the Hajj research center.
[14] Based on an interview with a security guard working in the HS

the five days of the season, can lead to attracting of rodents and insects, which exploit the underused status after the season to proliferate[15].

On the other hand, opportunities can occur due to temporal ways of inhabiting and experiencing the city inside the UUS, along with the management and regulation of the UUS. The UUS can even be used for events such as concerts, conferences, sports performances, and public activities, as playgrounds, art galleries, small satellite libraries, and bicycle sharing points, and even missing urban public facilities, such as car parking space or green areas (Bishop and William, 2012).

Németh & Langhorst (2013) divided the opportunities into political, economic, social and ecological aspects. They argued that for the political aspects, UUS could be ripe for improvement, depending on new uses of instruments to alleviate patterns of uneven development, and that with regard to economic opportunities, the spaces could offer easier access to land and lower development costs (based on existing infrastructure and economic incentives). The social opportunities available are that the spaces can be used for new public or communal spaces or for community-based initiatives. In addition, the spaces can be a place where non-human (natural) processes re-establish or a new habitat could be created.

In terms of the potential opportunities that the underused status of the HS possess, reusing the sites' buildings and facilities is the most significant one. The modern buildings and the advanced infrastructure (that will be detailed further in chapter 3) means that the sites could be reused in order to achieve many alternative economic, social and environmental goals, or even to provide some of missing urban public facilities for the sites and their surroundings. However, at present, the duration of the underused status of the sites is recognised and limited, thus other uses of the sites' facilities need to be temporary and must also respect the original use of the sites.

Moreover, it is very important to note that the problems and the opportunities that the UUS represent varies from one case to another, depending on a

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[15] Based on the interview we had with Dr. Sami Barhameen, the former president of The Development Commission of Mecca and the Hajj Sites and the current dean of the Hajj research centre .

number of issues, such as their appearance, their location in an urban area, their size, and the availability of buildings or structures within these spaces.

On the other hand, the concept of reusing UUS in a temporary manner has been widely discussed in recent years. In many similar cases, examples of opportunities that the UUS can present for their surroundings have been discussed, with the objective of achieving various economic, social and environmental benefits for the surroundings (Haydn & Temel, 2006). Therefore, within the following section, the reuse of UUS will be explored by reviewing relevant literature and studies in order to establish what kind of benefits might be achieved, along with how UUS can be reused in general. Furthermore, the Hajj sites in particular, will be explored in more detail in order for a framework to be formulated, which hopes to evaluate the effectiveness of reusing the Hajj sites during their underused time periods.

2.3 The opportunity to reuse underused urban spaces

The concept of reusing underused urban space (RUUS) has been widely considered and has become a more fashionable and respectable concept, particularly due to economic stresses in most contemporary cities nowadays, alongside many cities trying to "abate" the public nuisances associated with vacant and abandoned properties by regulating and managing vacant land with short-term fixes rather than long-term solutions (Pagano & Bowman, 2000). However, it has been argued that UUS may be acceptable in the countryside, but they are not in inner-cities, since most cities nowadays are facing a shortage of space that is suitable for social needs.

"*There is, or should be, a strong case for doing something rather than nothing. Set-aside may be acceptable in the countryside, but is surely not in the middle of cities,*" (Reynolds, 2011).

During this study's review of the literature and previous studies that have focused on the concept of RUUS, many terms and definitions were identified that were linked to the concept of RUUS in a temporary way. These terms include temporary use, ephemeral use, interim use, meanwhile use and

interwhile use. Yet, the term temporary use (TU) was the term that was most frequently used to describe the concept of RUUS, which is the term that this research will predominantly use also.

TU has been examined by published articles and projects from a wide range of perspectives. *The Temporary Uses as Means of Experimental Urban Planning,* edited by Panu Lehtovuori and Sampo Ruoppila, provides a typology of temporary uses, socio-spatial conditions and goals. For instance, the *No Vacancy!*[16] Project, issued by a Team of Portland State University Urban and Regional Planning graduate students, demonstrated the possibilities of temporary use by investigate the potential to enliven the Central Eastside Industrial District by activating vacant spaces with temporary activities & developments.

Furthermore, the cutting-edge research of the Berlin's Urban Catalyst group has provided an invaluable record of interim solutions to urban problems.[17] The results of this research, and a follow-up study, the Raumpioniere Project,[18] documented almost 100 temporary-use projects in disused sites or buildings across Berlin, which was published in *Urban Pioneers*.

Another publication, *Temporary Urban Spaces,* edited by Florian Haydn and Robert Temel, featured a series of essays surrounding the topic, and a further 35 case studies relating to temporary uses in European and North American cities. Subsequently, all of this work has been referenced by those seeking a solution to the vast areas of dereliction and under-use caused by dramatic population losses in the world's 'shrinking cities', particularly in areas such as Detroit and Cleveland[19]. While a common finding across the European contexts was that temporary uses are not an exception or marginal issue – they are instead becoming central and strategic components of urban

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[16] http://novacancyproject.wordpress.com
[17] Between 2001 and 2003, Urban Catalyst (an interdisciplinary team of architects, planners, lawyers, sociologists and local government representatives based in Berlin) conducted research (funded by the European Commission within the Key Action 4 City of Tomorrow and Cultural Heritage Program of the European Union) with 11 partners in six countries that were coordinated by the Technische Universitiit Berlin.
[18] A study, symposium and exhibition on temporary uses in Berlin 2004-5 undertaken by the studio Urban Catalyst and commissioned by the Berlin Senate Department for Urban Development.
[19] Detroit is one of many cities in America's rustbelt, like Cleveland, Flint, Buffalo, Pittsburgh, Youngstown and Rochester, which have seen dramatic drops in population over the past half century or so. When manufacturing left these cities, so did their residents.

planning, development, and management, with clear input in relation to urban, cultural and social policies (Panu, and Ruoppila, 2012).

Furthermore, in their book, *The Temporary City,* Bishop and Williams cite numerous examples of private sector activation in the UK, as well as cases where temporary uses are implemented through planning and organised as phases of development. The Parck House, located in Oxford Street (London), is one such example, whereby the development was delayed during the recent property slump, which resulted in there being a vacant space within a street that witnesses over 2,400,000 visitors per week[20].

Thus, rather than leave the sites empty, Land Securities employed events specialist; Think Tank Events; with the aim to generate income and also to maintain activity and footfall in that part of the West End. Many events have been organised within the area and one of them attracted over 55,000 people. Land Securities were careful to engage local residents through a series of consultation meetings until the long-term development of the site commenced in 2011. This example, among many others within the book, highlights the importance of temporarily using the underused status of a space, especially when it is located within an important and highly visited part of a city. Later in this chapter, more examples will be provided in order to aid with understanding regarding the potentials of the RUUS concept.

2.3.1   Temporary use definition

The key question is; what is the most appropriate definition of temporary use (TU) in an urban context? Through reviewing prior studies and literature, the most common definition of TU, in an urban context, appears to refer to any use of an UUS with a specific time duration in mind. In other words, any use with a defined start and end time (Haydn and Temel, 2006).

Whereas Lehtovuori & Ruoppila (2012) defined the concept of TU as the temporary use of UUS, where no immediate development demand. Further,

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[20] http://content.tfl.gov.uk/londons-street-family-chapters-3-6-4.pdf

they believed that any action that uses a place for something other than its common use for a period of time is TU.

Overall, TU can be understood as the use of UUS for something other than its common use and for a specific period of time, with the clear intention of the use being impermanent (Figure 2.4).

The uses can include events such as, fashionable leisure activities, theatre projects or concerts in disused warehouses and on former industrial sites, weekday bars in empty shops or stores, commercial markets and businesses, fairs, cultural activities, sports and leisure, commercial activities, migrant economies, gardening and urban agriculture, as well as social projects (Franck & Stevens, 2013).
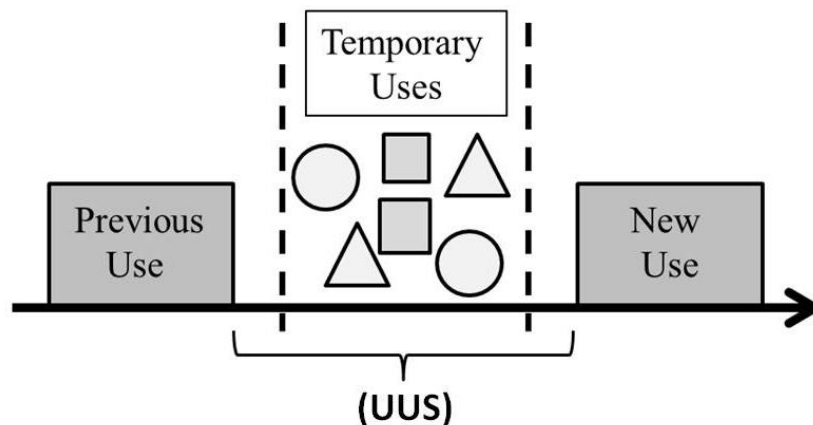
Figure 2.4: TU concept diagram.
Source: Edited by author

For the Hajj sites, the concept of TU can therefore be applicable between the seasons. In other words, the use of the sites during the Hajj season is considered to be *seasonal use* and the empty time between these seasonal uses or events provides an opportunity for other uses, which can be considered to be TU (Figure 2.5).
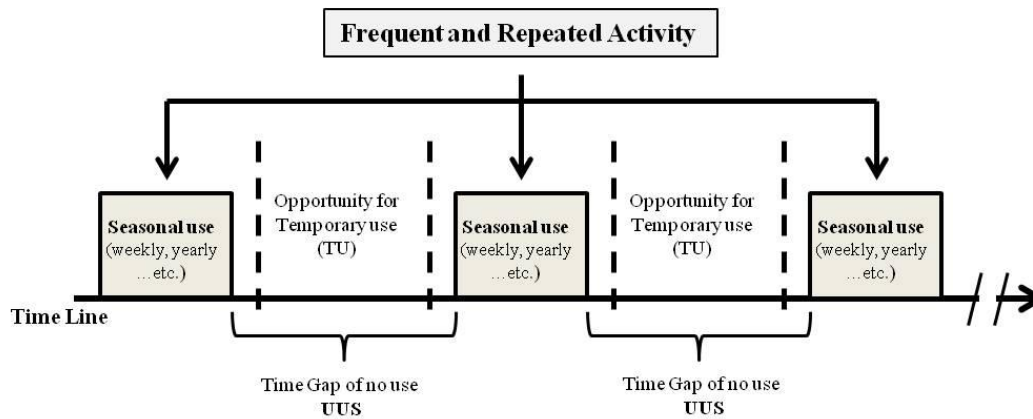
Figure 2.5: Seasonal use diagram.

Source: Edited by author

2.3.2 Examples of temporary use's successful implementation

It is believed by the researcher that in order to better understand the potential benefits of introducing TU within UUS, it is of great importance to highlight some of successful practices and examples worldwide where the TU concept benefiting the community where they are located can be demonstrated clearly. During the process of research regarding such examples, there were countless numbers of examples where the community initiated temporally using the UUS in order to achieve many benefits and make maximum use of such spaces, whether they contained facilities or not.

- **Tempelhof Airport**

Tempelhof Airport in Berlin is one of those examples where the airport was shut down in October 2008, but was opened temporary to the public as a park while a planning process was ongoing. The airport terminal, originally built in 1927 and later reconstructed in 1941 by the Nazi Government, is an imposing structure that curves around one end of the park (Figure 2.6).

Nowadays the airport is being use alternatively for temporary activities until the next development plan is initiated. It is considered an incredible place to get some exercise, ride bikes and go on rollerblades, using the perfectly flat runways. While, dedicated grassy areas have been designated for BBQs and

picnic zones. There is an entire section between two runways which had also been developed into community garden plots. Moreover, there are some families which have been using the opportunities the park provides by going for an evening walk (Jones, 2012).

This example is among many others in Berlin that followed the fall of the Great Wall, with Berlin's urban landscape being filled with a large amount of "voids" and disused sites, which have gradually been occupied by various individuals, groups, or entrepreneurs for "temporary" or "interim" uses (Colomb, 2012).

Figure 2.6: Temporary social activity at Tempelhof Airport, Berlin.
Source: Urban gardening takes off at Berlin's fabled airport. Available at
(https://en.tengrinews.kz/environment/Urban-gardening-takes-off-at-Berlins-fabled-airport--4144/), last
accessed on November 2013.

- **The *AgroCité* project**

Urban farming and gardening is another practice which is being utilised in many cities nowadays, which involves taking abandoned lots or vacant land and converting them into vibrant, profitable micro-farms in order to strengthen the local food system. Moreover, it helps with providing a

healthy and affordable source of nutrition for the community and turns the UUS into something beautiful and productive (Hodgson et al., 2011).

An important example of such a concept is the *AgroCité* project near to Paris (Figure 2.7), where a European organisation known as R-Urban started a community garden plot including education facilities, a seed library and a local café on what was previously a vacant plot of land. The garden works in experimental ways to create energy from composting and understanding the natural cycles of organic materials. Plots like this give an opportunity for a knowledge and skill exchange between the local citizens, organisers and educational groups, whilst also bringing ecological advantages to the area (Taktal, 2015).

Figure 2.7: AgroCité, the temporary community garden plot installed on vacant land

Source: http://agile-city.com/community-project/r-urban-colombes-a-sustainable-network-of-agriculture-and-building-processes/

- **Spitalfields market**

Moreover, the Spitalfields market building in London represents an example of some of the great economic benefits achieved by TU. The building had been emptied of its boisterous life prior to redevelopment in the mid-1980s. The movement of the wholesale business left a four-and-a-half-acre hole in the area. With a four-year gap in business, an interim alternative project was therefore embarked upon including a temporary mix activities, such as, culture, sport and food, which has created an interesting area and serves as a great outlet for local and non-local people to enjoy (Figure 2.8). The area has changed from a space with zero activity — even the banks and pubs had shut — to a now valuable economic engine (Reynolds, 2011).

Figure 2.8: The temporary alternative activities at the Spitalfields Market buildings

Source: http://www.walsh.co.uk/our-work/old-spitalfields-market-phases-1-2/

Despite the aforementioned examples, they all differ from the HS. All the examples have demonstrated different forms of TU within different forms of UUS, in addition to showing how such practices have benefited their surrounding communities in terms of social aspects, such the case of Tempelhof airport in Berlin, or in terms of the environmental aspects, as discussed in relation to the *AgroCité* project in Paris, or in terms of the economical aspects, as is the case with the Spitalfields market in London. While all of these examples have been implemented on vacant land or within

empty buildings waiting for redevelopment, the HS are not a single piece of land or one building, but are complete urban spaces that contain buildings, facilities and infrastructures. Thus, although the previously discussed practices being able to be applied to some extent, according to Bishop[21], such comparisons are inappropriate in some senses. While Bishop proposed that a better comparison could be made with examples such as occasional festival sites or sports venues that have some similarity to what occurs in the HS in terms of them being used occasionally and on specific repeated dates, whether it be on a yearly, monthly or weekly basis. While, between those dates, the sites become unused. Therefore, in the next section, some examples will be highlighted in accordance with Bishop's ideas.

- **Alternative uses for sports venues**

The first example the researcher believes that could share some characteristics with the HS are baseball stadiums and their gigantic structures, which are only used to host baseball games 81 days a year (Lee, 2015). Most of American cities have invested in multimillion dollar structures that typically draw in tourists, diners, and hotel bookings in the surrounding neighbourhoods only during the baseball season (Badger, 2011). While the offseason brings a period of quiet and vacancy for the ballparks. Moreover, these quiet periods and vacancies often translate into a decline in revenue (Sportsdigita, 2015). It is therefore argued that it is a waste for them to sit unused for the other days in the year when there's money to be made and amusement taxes to be collected (Lee, 2015).

To combat this revenue drop, some baseball teams have therefore worked to keep fans coming to their ballparks. For example, the Indians team from Cleveland (as mentioned in chapter 1), laid an ice track around the field for skaters and built a snow-tubing hill from the bleachers onto the outfield. Inconsequently, some winters, the event drew about 50,000 people to downtown Cleveland who otherwise would have been bundled up at home (Badger, 2011). While, the Colorado Rockies team have utilised ballparks

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[21] Based on professor Peter Bishop's evaluation report of the first draft of this research

outside of games as a special event space, such as using it as a wedding venue and as a corporate meeting space (Sportsdigita, 2015).

Whilst cities with more remote, parking-stranded stadiums could get additional use out of them through other large-scale events, and some already do this, such as the Dodgers Stadium (Figure 2.9) that hosts an off-season monster truck rally, and Miller Park in Milwaukee, which has hosted a bowling tournament (Badger, 2011), Moreover, every year, a musical artist goes on tour and ends up playing a bunch of baseball and football stadiums, often squeezing in performances during off-days and road trips (Lee, 2015).

Thus, most of the aforementioned baseball teams have generated good revenue thanks to these alternative uses, while hosting this type of event during the off-season also allows fans to remain tied to the team during this period (Sportsdigita, 2015).
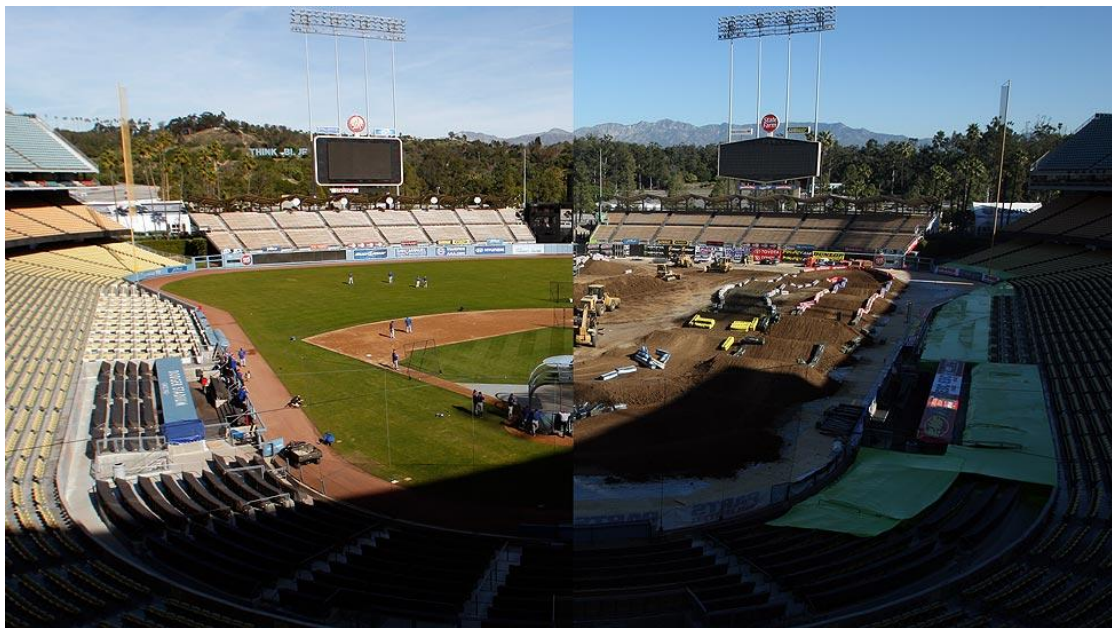
Figure 2.9: The Dodgers stadium during the baseball season and monster truck events

Source: http://framework.latimes.com/2011/01/24/time-lapse-video-dodger-stadium-filled-with-dirt/

On the other hand, more so than, ever football stadiums in the UK, have been utilising their space for alternative uses, such as for concerts, since most of them have excellent facilities in place and are able to hold large numbers,

while also being experienced in managing crowds (Bei, 2016). Events like rock concerts or alternative sports, such as rugby league or rugby union matches, thus maximise football stadiums' usages, instead of simply limiting them to approximately 3-4 hours on one occasion every couple of weeks (Morrow, 1999).

According to Adam Williams[22], many benefits can be achieved due to exploiting other uses of sports grounds, such as the fact that such events can assist in redefining the stadiums as a destination for entertainment and leisure on non-event days, in addition to maintaining activity, improving safety and generating further revenue. Essentially, it is about capitalising on the stadium's uses and maximising investment and the public's experience (Figure 2.10).

Figure 2.10: A concert event at the Etihad Stadium in east Manchester, UK

Source: https://briansimpsons.wordpress.com/category/concerts/

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[22] AECOM director of global sports, quoted from (https://sourceable.net/mixed-use-sports-stadiums-not-fun-games/)

2.3.3 Expected benefits of temporary uses

The previous examples were mainly discussed in order to understand how the alternative temporary uses of underused spaces can provide various benefits for the community in which such spaces are located. For any case of UUS, there are many economic, social and environmental benefits linked with TU implementation (Graham, 2012). One of the prime economic benefits of TU is that no new land or facilities need to be created in terms of adapting the space for the future needs of the community since the use of the UUS can be quickly altered to offer more profitable uses. In contrast, not using UUS can be costly and time-consuming in terms of maintaining the property and facilities (Németh & Langhorst, 2013).

Moreover, from a social perspective, the TU of UUS can motivate communities to interact more with their city or neighbourhood as it is argued that the use of open spaces for all kinds of activities empowers individuals and communities to increase their quality of life (King, 2014). With regard to the environmental benefits of the TU of spaces and buildings, they can also contribute to improving urban public spaces and green spaces, preserve natural habitats and depolluting areas, as well as promoting urban agriculture and local produce (François Jégou et al., 2016).

Generally, most of the relevant literature (for example those mentioned in section 2.2 of this chapter) highlighted many economic, social and environmental benefits that the TU of UUS provides for the local communities, some of which will be set out below.

A) Economic benefits

1. Temporary uses have important short-term economic impacts and increase the diversity of the economic life of the city by giving businesses room to take risks and experiment, and create hybrids between culture and the economy (Hentilä & Timo, 2003).
2. TU of UUS attracts commercial use and can change the image of an area. If legal, the users are likely to pay rent and local taxes, and will,

at times, create new part or full-time jobs within the community (Haydn & Temel, 2006).

3. TU allows for the maintenance of public property and the avoidance of decay and vandalism to be acquired for free. For example, TU helps to save on the cost of a site's protection and surveillance (Haydn & Temel, 2006).

4. There is a clear contribution to social objectives through the creation of new, publicly accessible open spaces at little to no cost to the public purse (Colomb, 2013).

5. The "buzz" that the TU of UUS creates, may have a considerable effect on real estate values, even in the wider or surrounding areas (Hentilä and Lindborg, 2003).

6. TU can also provide rental income from properties that would otherwise not be offering a revenue stream (Lehtovuori & Ruoppila, 2012).

7. Non-commercial use can attract commercial uses. For instance, if one part of the property is rented affordably to theatres, another part can be leased to a restaurant at a decent rent. It has been shown via different examples (see immediately below) that when there is a temporary social event, there will be also some commercial kiosks servicing the audiences (Bishop and Williams,2012).

8. TU can provide an affordable office or working space for new creative businesses and arts, which may indirectly support innovation activity (Lehtovuori & Ruoppila, 2012).

B) Social benefits

1. The TU of UUS can showcase the creative talent of a city. This is especially important in a cultural capital like Berlin for example, where young artists flock to the city seeking an outlet for their ideas (Blumner, 2006).

2. TU can offer a means to compete with the suburbs to attract residents. The example of the urban farm concept shows that residents can

practice agricultural activity within their urban area instead of going to suburbs for instance (Graham, 2012).

3. TU offers the possibility of average citizens being able to take a more active role in the development of their neighbourhood, which may be seen as an opportunity for risk, depending on the city and its politics (Blumner, 2006).

4. TU is a good tool in place-making through creating attractive, lucrative and active urban spaces, recognised by the wider public. (Lehtovuori & Ruoppila, 2012).

5. TU are a concrete tool that promotes bottom-up approaches in exploring the potential of spaces. They eventually become people-created places, which may use and develop collaborative practices (Lehtovuori & Ruoppila, 2012).

C) Environmental benefits

1. The TU of UUS may help to avoid a place turning into a focal point for the gathering of unwanted animals and insects, and a place where people dump trash (Haydn & Temel, 2006).

2. In some cases, UUS can be used temporarily as an urban farm, which may improve the region's environment (Hodgson et al., 2011).

3. Exploiting UUS by TU can avoid possible contamination caused by former industrial activities (Blumner, 2006).

4. UUS can offer an opportunity to make cities greener, in order to follow the sustainability trends recently discussed in urban studies (Németh & Langhorst, 2014).

For the Hajj sites, the economic benefits of reusing the sites' facilities during their underused periods are similar to the previous examples. That is to say, the high cost of maintenance and security could be avoided through using the sites for other purposes, by renting those facilities to the private sector, or even by simply starting some non-commercial activities that help to attract commercial ones. Furthermore, reusing the sites during the underused periods could help in the discovery and detection of any defect in terms of the

facilities and enable problems to be fixed before the season begins, saving time and money overall.

Moreover, some other benefits can also be realised for the Hajj sites, such as a reduction in illegal activates through introducing legal ones instead, as well as having neighbours interact more with their community. The environmental benefits could also be exploited through making some areas of the sites greener, potentially improving the environment overall and reducing the shortage of green areas within the surrounding districts[23]. However, the possible benefits from reusing the Hajj sites temporarily during their underused periods needs to be discussed further with authorities, planners, related researchers and even the people living near to the sites, alongside those who are considered to be possible temporary users. What these discussions should entail will be outlined in more detail in chapter 5, where the data collected from questionnaires used to survey people living near to the Hajj sites will be analysed.

2.3.4   The temporary use implementation framework

After summarising the concept of TU and it possible benefits, as discussed in the previously mentioned literature and studies, it is very important to review some of the factors that play a key part when implementing TU within any UUS. This is due to the fact that the concept of reusing any underused urban spaces through TU must be undertaken in consideration of numerous factors, such as the local authority where the UUS is located, the UUS property owner, and the potential users and the agencies (Hentilä & Timo, 2003). These factors have been identified by reviewing examples of TU worldwide; most of them having been highlighted in the publication, *Temporary Urban Spaces* (edited by Florian Haydn and Robert Temel, 2006) and *Temporary City* (Bishop and Williams,2012). Below, the importance of each factor will be explained, alongside its impact on how successful and effective the reuse of a UUS using the TU concept may be.

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[23] Based on an interview we had with Dr. Fisal Osrah, the director of the planning research department in Hajj research centre

- **Local authority permission**

A site's local authority is the most important factor to take into account, as the reuse of a UUS cannot happen without their permission. Due to this, it is important for any person wishing to put together a project within the city reusing UUS to ensure that the project complies with the general regulations of the local area. In some cases, the local authority initiates the concept, while in many others, they need to be convinced with regard to the effectiveness of the concept to even consider it plausible (Haydn & Temel, 2006).

- **The property owner**

The property owner is the second most important factor. The owner can be a private or public owner, and the UUS owner can also initiate and promote TU of a site, as well as prohibit it when other kind of developments may be possible. It is all dependent on how they measure the relative advantages and disadvantages of a concept. Thus, obtaining the permission to use an UUS involves negotiations between interested users and an owner, who will often be seeking to improve the value of their UUS or to reduce their maintenance costs (SenStadt, 2007, p. 22). In many situations, the owners fear that "unwanted temporary users [will] block redevelopment and frighten away more profitable users", or will negatively affect the primary use of the sites, especially when talking about seasonal use sites (Hentilä & Timo, 2003). In some circumstances, such as in the case of the Hajj sites, the local authority and the owner of the sites and their building are the same entity, meaning the sites belong to a public authority.

Whether the permission of reusing the UUS is in the hands of a local authority or a site owner, both sides need to be informed in terms of the advantages and disadvantages of TU in relation to the target UUS. Hentilä and Timo (2003) discussed some advantages that may help in convincing the UUS owner and the local authority. These include:

- Protecting existing buildings or facilities from decay and vandalism.

- Lowering security costs by renting the spaces.
- Constructing a new image for the site and re-anchoring the site in the public and media's minds, with the help of temporary uses.
- Attracting potential tenants for the phase after the urban transformation.
- Legitimising new ways of using the site (due to noise, traffic, events) to local residents.
- Gaining bonus points from the municipality as socially conscious stakeholders, open to new ideas.

In some cases, the UUS owners fear some disadvantages, which may affect their decision with regard to whether to allow the usage within their property. These disadvantages also according to Hentilä and Timo (2003) include:

- Additional administration and estate management costs.
- The risk of raising the temporary user's or public's expectations to a degree whereby temporary use is considered equal to permanent use.
- Financial profits remaining low, if there are any.
- Basic repairs and alterations needed for temporary renting causing extra costs.

Generally, it is believed by the researcher that when considering proposing the concept of reusing any UUS, it is very important to clarify the different possible advantages and disadvantages for the decision makers, whether they are private owners or the public authorities. To do so, each case must be studied in accordance with its characteristic and current conditions.

- **The potential users**

The third factor, which also plays an important role in the concept of RUUS by TU, is the potential users or the society surrounding the area, as they are considered to be the target users. In other words, most of the potential goals and benefits of the RUUS will be directed at people living near to the UUS. Hentilä and Timo (2003) argued that the people near to the UUS are normally the catalyst behind the initiation of a TU concept. This is due to the fact that

the UUS are often reused temporarily by the site's neighbours when they are seeking a space to meet their social needs.

In many situations, artists are often seeking spaces to create art and build an artistic community. Additionally, entrepreneurs may be looking for publicity and cheap UUS for their start-ups and may wish to be near others like them. However, the users may also be looking to showcase an alternative lifestyle, such as eco-living, or may wish to make a political or personal statement. Moreover, there are some conditions regarding UUS, which determine whether surrounding citizens choose a space for TU. According to Florian & Temel (2006), these conditions include:

- The availability of inexpensive and/or flexible premises, including the availability of facilities or structure to be reused.
- A central location.
- Good access (i.e. transport and logistics).
- The proximity of services (e.g. banking, restaurants and administrative services).
- The proximity of sub-contractors (i.e. a production network for mutual co-operation).
- The social-cultural profile of the area.
- A social network (i.e. people like them in the site or close to the site).
- Demand (i.e. proximity to clientele and interaction with the local community).
- The cultural value of the site.

Therefore, in order to gauge an estimation of the likelihood of potential users getting involved in the project, it is crucial to consider the conditions mentioned above.

- **The agencies**

The fourth important factor that can be fundamental for RUUS by TU projects was highlighted by Studio Urban Catalyst (SUC) in 2003 and is known as the agencies factor. According to the case studies covered by SUC,

the role of agents is important in the initiation phase of temporary activities within any UUS. They take up roles such as setting up necessary legal and organisational frameworks, providing basic infrastructures and assisting other temporary activities with starting up (Hentilä and Timo (2003).

Therefore, most of the time, agents bridge the gap between the other three factors - the UUS owner, the local authority and the potential users (Figure 2.11). In many circumstances, the agent is the one who sees the opportunity to reuse an UUS and is the one who initiates the process of convincing the owner of the benefits of such a concept. Moreover, they are then likely to be put in charge of gaining the necessary permissions from the local authority. In addition, they will work to motivate potential users to get involved with the RUUS project.
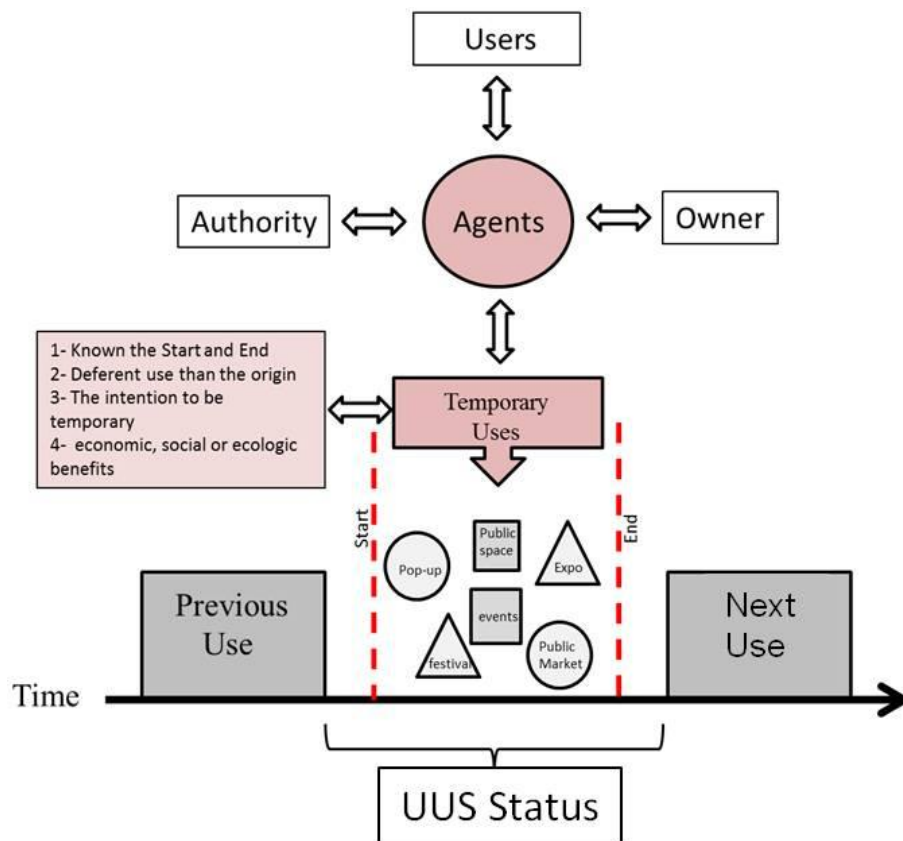
Figure 2.11: TU implementation diagram.
Source: Edited by author

Therefore, the agent can be understood to be the intermediary between the different parties, and could also be part of the local authority, or even the site

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owner, or the potential users, or a private company that is seeking to exploit the expected economic benefits of TU implementation. While, it could also be researchers or investigators who are seeking to explore the potential of introducing the TU within some UUS. There is no specific definition that can define who exactly could be the agent, but the common understanding is that the agent is the one that connects the previous three parties together in order to achieve successful TU implementation.

An important example that clarifies the role of the agencies is the *no vacancy*[24] project issued by a Team of Portland State University Urban and Regional Planning graduate students, who were investigating the potential of enlivening the district by activating vacant spaces with temporary activities and developments. The goal of the project was to provide a guide to process TU concept into vacant spaces in the central eastside industrial district in Portland.

Within the project, they first defined and selected some vacant spaces they thought had the opportunity to be used temporarily, then they had many conversations, seminars, workshops, meetings and so on, with the owners, authorities and potentials users. Their goal was to demonstrate the importance of TU concept to every party. In the end, they were able to provide practical guidance in terms of "how-to" act for the property owners and potential temporary space users in which both parties could make use of a step-by-step process for creating and hosting temporary projects, as well as resources that would help them work through the road blocks and challenges in terms of temporary projects. Such project has shown how a team can act as the agent, filling the gap between the owner, potential users and the authorities.

Overall, these four factors are the most important considerations and are commonplace within previous studies, such as *"The role of temporary use in urban (re) development: examples from Brussels",* edited by Aurelie in (2013); *"Central Micro-Peripheries: Temporary Uses of Central Residual Spaces as Urban Development Catalysts",* edited by Hentilä, Helka-Liisa,

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[24] file:///C:/Users/Home/Downloads/how-to_low-res.pdf

and Timo Lindborg in (2003); and *"Strategies for temporary uses–potential for development of urban residual areas in European metropolises",* edited by SUC in (2003). As the main considerations for any RUUS, when thinking of proposing similar projects for a UUS, these elements must be taken into account. Additionally, individuals must determine how to homogenate between them in order to launch a successful RUUS project that can achieve some of the economic, social and environmental benefits mentioned above.

2.4   Conclusion

The emergence of underused urban spaces (UUS), as has been highlighted by reviewing the relevant literature, has become more popular recently due to many reasons, relating to economic, social and environmental issues. For example, most cities today are facing an economic decline, resulting in a lot of incomplete projects, abandoned industrial zones and vacant land within urban areas. In addition, the sites of seasonal grand events have become a type of UUS in many situations, normally as a result of an absence of alternative post-event plans. Therefore, the case of the Hajj sites is considered to be this type of UUS.

Whether the reason is economic, social or environmental, the presence of UUS of all kinds can be costly to their owners (public or private) in terms of maintenance, security and site insurance. However, simultaneously, they can be viewed as an opportunity to be exploited in order to achieve many goals and benefits for the community. Thus, these types of spaces have motivated the emergence of the concept of reusing underused urban spaces (RUUS) through temporary uses (TU). In recent years, the concept has been discussed in many studies in order to contextualise its characteristics, its advantages and disadvantages, its implementation and it expected obstacles.

There are many economic, social and environmental benefits associated with the implementation of TU within UUS. As mentioned previously in this chapter, these benefits include savings on the cost of site protection and surveillance, the attraction of commercial activities to the site, the possibility

of being a public open space for the community and avoiding possible contamination caused by former activities.

In order to introduce the concept of TU within any UUS and to obtain the different aforementioned benefits, there are some common factors that have played an important role in most TU projects. These include the local authorities, the sites' owners (public or private), the potential users and the possible agents. The homogeneity between these factors has resulted in successful TU projects in most cases. However, previous studies have also demonstrated that the agent's role is the most important element, due to their links between the different individuals and groups involved, as well as their role in evaluating the benefits and risk of RUUS for TU. In many cases, the agent is also the one who proposes a project and initiates the process.

To effectively reuse any UUS, each case must be studied and analysed individually, in order to determine the most appropriate type of alternative use, to achieve the greatest possible benefit, whether they be economic, social or environmental. Such studies and analysis should include the reason for the UUS's existence, the duration of its underused status, and its urban characteristics. Within the reviewed studies, it was noted that many methods have been used, including the documentation of a site's history and development, (semi-structured) interviews, field observation work and questionnaires presented to organisers (and where possible, to visitors and neighbours) of the site.

Regarding the underused status of the Hajj sites, and according to the reviewed studies and similar cases of introducing TU into UUS, it is believed that there are four aspects that can help with exploring the effectiveness of using the sites in an alternative way, specifically when the Hajj is not occurring. The first aspect is the analysis of the Hajj sites' urban characteristics, which can aid with illustrating the existing facilities and their potentials for alternative uses. While, the second aspect is the analysis of the proximity and connectivity of the sites' location with regard to their surroundings, which will illustrate the sites' potential to be accessed by the surrounding communities.

Moreover, the third aspect is the evaluation of the importance of the sites' location within Mecca's urban growth patterns, which can demonstrate their future potential for future urban growth needs. Finally, the fourth aspect regards measuring the social acceptance in relation to the concept of reuse, which helps to gauge the ability of the local communities to be involved with the implementation of such an idea. Therefore, the following chapters will discuss these four aspects in order provide information that can clarify how effective, reusing the Hajj sites during their underused status would be, as well as the extent to which they could or should be utilised in an alternate way.

Chapter 3 The underused status of the Hajj sites

3.1   Introduction

As discussed in chapter 2, so as to explore the effectiveness and benefits linked with reusing underused urban space (UUS), each case must be studied and analysed to understand the potential each space may have. The potential of an UUS depends on the existing underused facilities connected with the site, as well as their location within the city they are located in. Thus, this chapter will explore the potential of the HS from various angles. The chapter will first give an overview of the background of the HS, which will include a brief explanation of the Hajj event, its importance, procedures, relationship to the sites, the historical development of the sites and the reasoning behind such developments. While within section 2.2 of this chapter will focus on the sites' potential through highlighting their urban characteristics and existing facilities, along with exploring the relationship with the surroundings areas of the HS.

3.2   Background

As acknowledged in the introduction chapter, HS are places where millions of Muslims gather every year to perform an Islamic pilgrimage referred to as the *"Hajj"*. The Hajj is an ancient event, composed of a series of rituals, undertaken in Mecca and three other sites, called Arafat, Muzdalifa, and Mina (Timothy and Iverson, 2006). Mecca is located in the Western Province of Saudi Arabia and the three HS are located approximately five miles southeast of the centre of Mecca (Figure 3.1).

The origins of the Hajj date back to 2,000 B.C. when Ishmael, the infant son of the prophet Ibrahim (Or Abraham, as he is called in the Old Testament) and Ibrahim's wife Hager were stranded in the desert. With Ishmael close to death from thirst, Hager ran back and forth between the hills of *Al-Safa and*

Al-Marwah[25] looking for water until the angel Jibril (Gabriel) touched down to earth and created a spring of fresh water for the baby, known as the Well of *Zam-Zam*[26]" (Fetini, 2009) Following the orders of God, Ibrahim is said to have built a monument at the site of the spring known as the *Kaaba*[27]. Worshipers from all faiths traveled to revel at the site (Peters, 1994)

Figure 3.1 Map of Mecca, Mina, Muzdalifa and Arafat's locations

Source: Maps of the world, Available at (http://www.bbc.com/news/uk-england-leeds-25443977), last accessed in March 2013

The today Hajj recalls the life of Muslim's prophet Mohammed (peace be upon him), who was compelled to leave Mecca for Medina, returning later with his followers. And as the pre-Islamic pilgrimage was composed of a series of rituals, Muhammad took those traditions and reoriented them away from the worship of idols toward the worship of Allah. He is said to have removed numerous idols left at the Kaaba by non-Muslim pilgrims and rededicated it as the house of God (Allah), to which Muslims have flocked in the ensuing centuries (Grey, 2010).

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[25] Al-Safa and Al-Marwah are two small hills now located in the Masjid al-Haram in Mecca, Saudi Arabia between which Muslims travel back and forth seven times during the ritual pilgrimages of Hajj and Umrah (Minor hajj).
[26] The Well of Zamzam is a well located within the Great Mosque in Mecca, Saudi Arabia, 20 m (66 ft) east of the Kaaba. According to Islamic belief, it is a miraculously generated source of water from God, which began thousands of years ago when Abraham's infant son Ishmael was thirsty and kept crying for water. Millions of pilgrims visit the well each year while performing the Hajj or Umrah pilgrimages, in order to drink its water.
[27] The black cube located in the center of Mecca nowadays

Generally, pilgrims today follow the route of Muhammad (peace be upon him), who went on only one hajj before he died, and that ritual in some part is an emulation of Ibrahim's path. In effect, the later Muslim tradition 'harmonized' the Islamic version of the complex by identifying each of its elements with some incident in the Abraham legend, which was itself enriched by association with otherwise inexplicable practices in the Hajj ritual (Peters, 1994).

According to Islamic beliefs, if they have the physical and economic capacity, each Muslim is obligated to perform the Hajj ritual once in lifetime. For Muslims, the Hajj offers an example of unity within their faith, as pilgrims from all over the world come together to share the same religious objective. Race, color, nationality and language simply vanish in the face of a higher aim, and the only remaining connection is the spiritual rite that they perform together (Rasch, 1980).

The Hajj occurs every year from the 8th to 12th of *Dhu al-Hijjah*, which is the last month of the Islamic calendar[28]. Due to the Islamic calendar being lunar, eleven days shorter than the Gregorian calendar, the Gregorian date of the Hajj changes from year to year, for example, in 2014, it took place from the 2nd to 8th of October, while in 2015, it took place from the 21st September to 26th September.

During the five days, the pilgrims move between Mecca and the three HS in order to complete various rituals. These consist of a set of acts of worship involving several rituals and prayers designed to only be performed in Mecca and at the HS (Pearson, 1996). The following section briefly explains the procedure involved in the Hajj rituals in order to make it easier to understand the relationship between the rituals and the locations (Figure 3.2):

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[28] The Islamic calendar, Muslim calendar or Hijri calendar (AH) is a lunar calendar consisting of 12 months in a year of 354 days. It is used to date events in many Muslim countries (concurrently with the Gregorian calendar), and used by Muslims everywhere to determine the proper days on which to observe annual fasting, to attend the *Hajj*, and to celebrate other Islamic holidays and festivals.
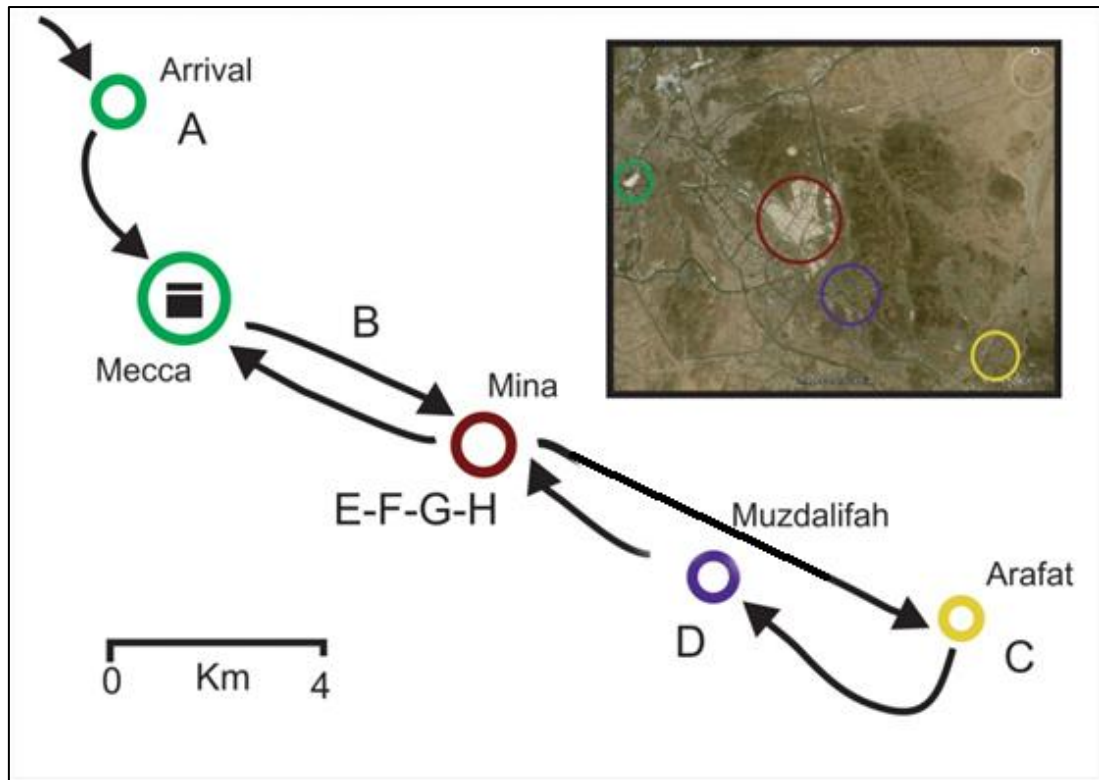
Figure 3.2: Simple diagram showing the steps of the Hajj and its locations.
Source: Edited by author.

A. The pilgrims arrive at Mecca prior to the pilgrimage period in order to pray and worship in the holy mosque. They usually arrive in Jeddah, the major port city nearest to Mecca (45 miles away).

B. On the first official day of the pilgrimage, they travel to Mina for the first ritual day, where they spend the day and the night in tents and rest ahead of the next day.

C. On the second day, pilgrims leave Mina to travel to the next site, called Arafat, for the culminating experience of the Hajj. They spend the entire day standing (or sitting), asking God for forgiveness and making supplications.

D. After sunset in Arafat, the pilgrims leave Arafat to go to a nearby open plain called Muzdalifa. This is the third component of the HS, roughly halfway between Arafat and Mina, where they spend the night.

E. On the third day, the pilgrims move on before sunrise, this time back to Mina. Here, they must undertake a specific ritual that involves

throwing stone pebbles at pillars that, according to Muslim beliefs, represent the temptations of Satan.

F. After the first stoning ritual, they go back to the tents to have a rest, and some pilgrims also go to Mecca to perform rituals inside the holy mosque.

G. On the fourth day of the Hajj the pilgrims begin the stoning ritual again in the afternoon, after which they rest until the next day.

H. At the beginning of the fifth day of the Hajj, after repeating the stoning ritual for the last time, the pilgrims pack up their belongings and prepare for their departure from Mina. At the end of this day, their relationship with the HS is officially over and they move back to the holy mosque in Mecca to pray for the last time and to travel back to their home country.

The explanation of the Hajj rituals above demonstrates the relationship between pilgrims and each of the three HS. While the rituals do not seem that complicated, the large number of pilgrims in a limited space, and the importance of performing the different rituals at specific times, provides a complicated situation in terms of providing the necessary services, such as food, healthcare, and many other logistical services. Therefore, nowadays, the HS offer a number of different facilities so as to provide the necessary services for the five days of the Hajj.

Before detailing the different facilities and urban characteristics of the HS nowadays, it is very important to briefly describe the development that has occurred over time for the HS and their accompanying facilities. This aims to improve understanding of how the sites have become what they are now, as well as illustrate the fact that reusing such facilities when the Hajj is not occurring could be more effective now than ever before.

According to Rasch (1980), during early Islam, and before the emergence of modes of modern transport, it was quite difficult to reach Mecca and the HS to perform the Hajj. Due to this, the number of pilgrims was therefore limited. The three HS were simply pieces of land surrounded by mountains with limited fixed facilities and signs indicating the location of different

landmarks, such as the mosques, the borders and the pillar marks for the stoning ritual (Figure 3.3)
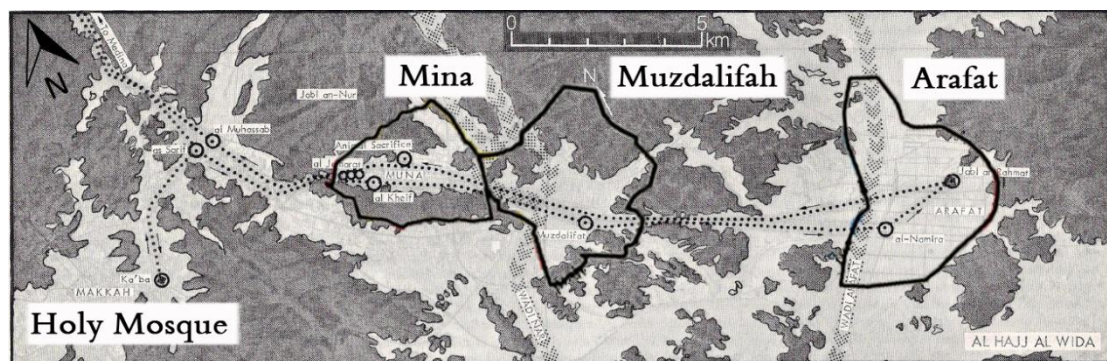
Figure 3.3 The three HS during the early age of Islam.

Source: Rasch, B. (1980). *Tent Cities.* Stuttgart: Redaktion. p.19

A useful description of the three HS (Mina, Arafat, and Muzdalifa) was first produced in 1908 by a famous traveller called Rifa'at Ibrahim Pasha[29], who explained that Mina was located in a narrow valley, enclosed by steep mountains slopes, with two rows of buildings made of local stone (Al_harthy, 2007).

The buildings were separated by one central road crossing the valley, which contained the three pillars used for the stoning ritual. Most of the buildings were uninhabited, except for the few days during the Hajj season. The mosque of Mina, known as Al Khaif, was only a wall made of stone with no roof. Pilgrims during that time were self-organised and self-sufficient (Al_harthy, 2007) (Figure 3.4).

Arafat was also described by the same traveller as flat land in the form of a large arc. It was only distinguished by its borders, which were made of stone, a small 30-meter high mountain known as 'the mountain of mercy' and the mosque of Arafat, called Namera. The mosque was made of stone and had an area of 90x80 square meters (Al_harthy, 2007) (Figure 3.5).

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[29] He was the leader of the Egyptian groups who traveled to Makkah in 1901, before Saudi Arabia was formed, and after the collapse of The Ottoman Empire.
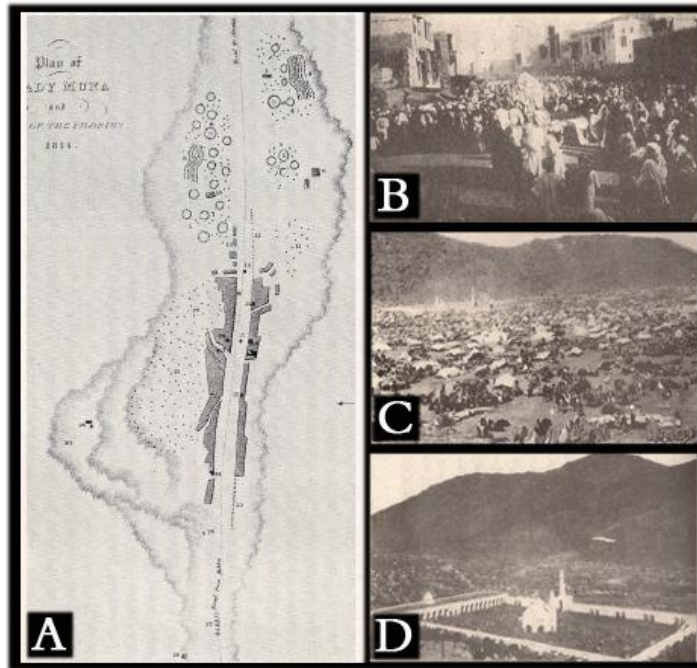
Figure 3.4: Mina during the early age, featuring: A) An old plan of Mina, B) The central road, C) Tent camps and D) The mosque of Mina.

Source: Rasch, B. (1980). *Tent Cities.* Stuttgart: Redaktion.
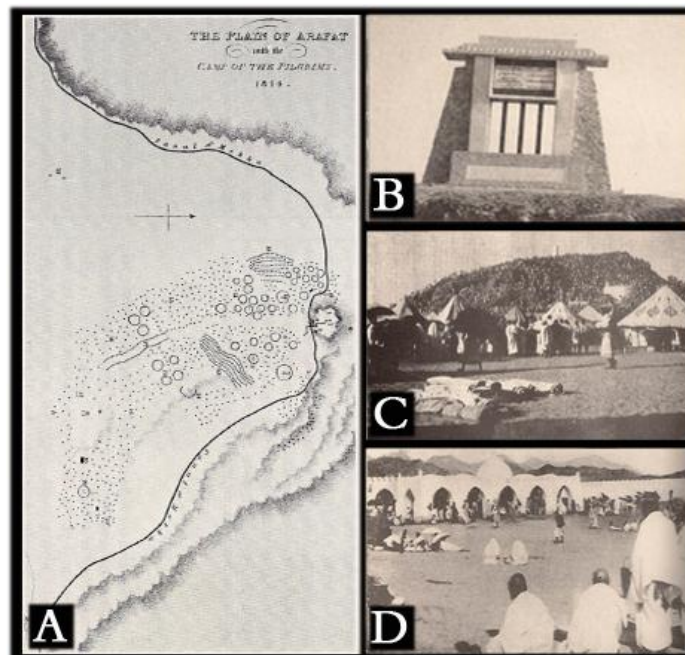
Figure 3.5: Arafat during the early age, featuring: A) An old plan, B) The border mark, C) The mountain of mercy and tent camp and D) Inside the Mosque of Arafat.

Source: Rasch, B. (1980). *Tent Cities.* Stuttgart: Redaktion.

While Muzdalifah, had no buildings, except for the border markings and the main mosque called Al-Mash'ar Al-Haram. The mosque was just a space surrounded by a wall in a square shape, with no roof and six doors. Muzdalifah has always been the HS with the least facilities and the smallest structure, mainly due to the short time that pilgrims spend in it (Al_harthy, 2007) (Figure 3.6).
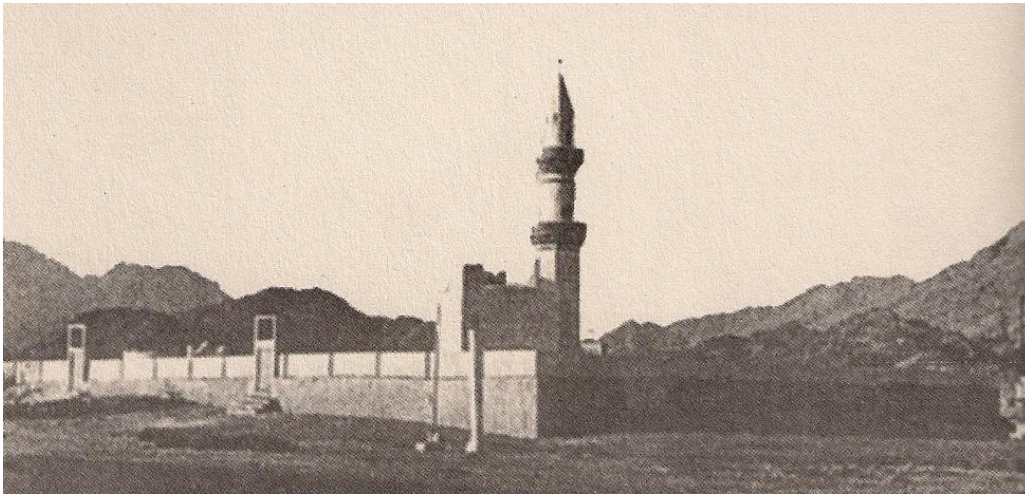
Figure 3.6: Muzdalifa mosque during the early age.

Source: Al_harthy, A. (2007). *Urban Development Of Mecca and its surrounds.* Riyadh: King Abdulaziz Public Library.

During this time, the city of Mecca was also only concentrated in the centre, where the holy mosque is located. The road between Mecca and the HS was semi-desert, and therefore, there was no sense at that time in using the sites and their small buildings during the rest of the year, when the Hajj was not occurring. The situation then in Mecca is similar to that of the modern-day Burning Man festival[30], where people install temporary facilities, such as tents, just for the event and once the event is over, the site becomes empty once again, except for some fixed signs and small buildings, which are not costly to maintain (Al_harthy, 2007).

The situation of the HS remained the same until modes of transport led to an increase in the number of pilgrims coming from further afield. This has also meant there was an increased need for new structures that could cope with

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[30] Burning Man is an annual gathering that takes place at Black Rock City—a temporary community erected in the Black Rock Desert in Nevada

new methods of transportation, such as cars. According to Rasch (1980), Mina in particular experienced a remarkable process of development during this era, due to the pilgrims spending most of their time conducting rituals there. Therefore, in 1929, four main roads were established, replacing the central path of Mina. Two of the new roads were dedicated to pedestrian movement, while the third was for the animals and the fourth for cars and trucks (Al_harthy, 2007). However, after 1936, many other roads were also established in order to facilitate the pilgrim's movements between Arafat, Muzdalifa, Mina and Mecca. In addition, a new dedicated pedestrian path for the three stone pillars was created, which after some time, was converted into a two-level path in order to increase the number of pilgrims that can pass at the same time. The project establishing the new roads resulted in Mina being converted into irregular rectangular and square spaces, separated by the road networks. These spaces were dedicated to space for pilgrim's tents and other services such as portable toilet complexes and few health kiosks…etc (Rasch, 1980). According to Al-Harthi (2007), this was the first urban organisation that Mina witnessed (Figure 3.7)
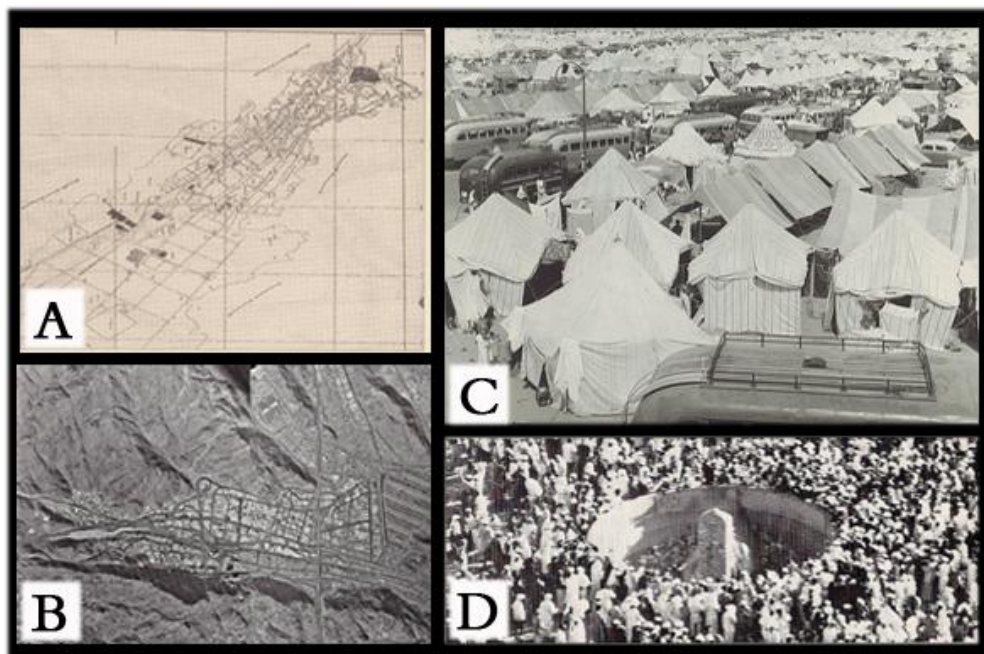
Figure 3.7: Mina during the beginning of the Saudi era, including: A) A plan showing the irregular spaces, B) A map showing the different roads, C) The tents organised differently after the introduction of cars and D) One of the stone pillars after remodeling.
Source: Rasch, B. (1980). *Tent Cities.* Stuttgart: Redaktion.

In 1947, Arafat's structure also changed due to the establishment of new roads and asphalting of the older ones, especially those surrounding the mountain of mercy, including one that served as a connection between the mosque and the mountain. The roads were between 18 and 30 meters wide, in order to facilitate the movement of vehicles, especially towards Muzdalifah, the next step of the Hajj ritual. At the same time, the mosque of Arafat expanded and a new minaret was created. Moreover, in this era, new toilet units and sources of drinking water were established (Rasch, 1980) (Figure 3.8).
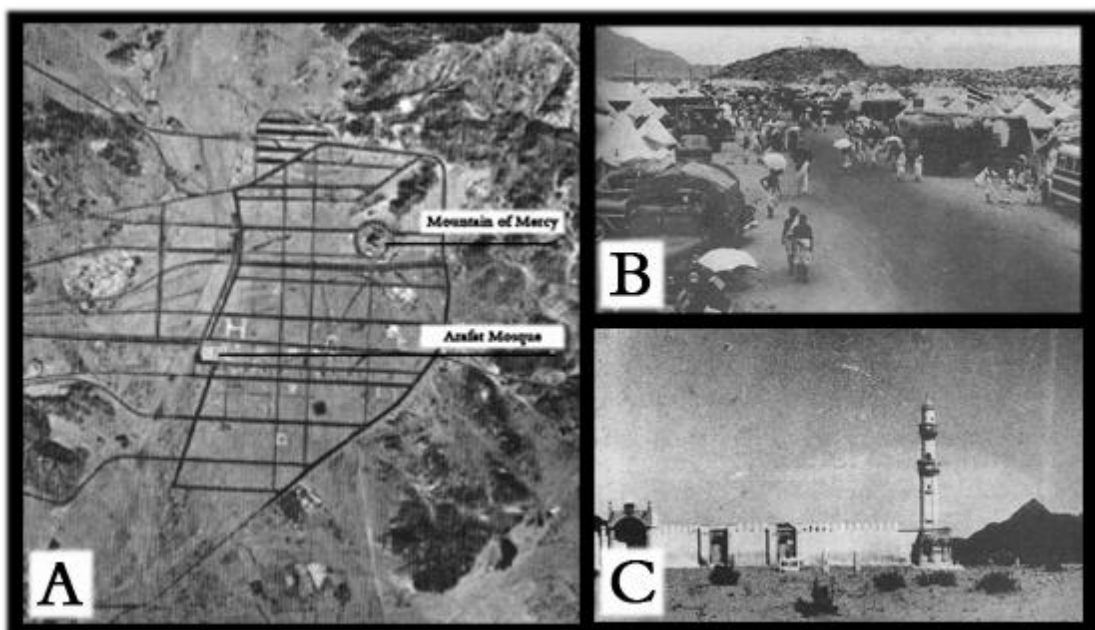
Figure 3.8: Arafat during the beginning of the Saudi age, featuring: A) Map of the new asphalted road network, B) The situation after the introduction of cars and C) The mosque of Arafat after adding the minaret.

Source: Rasch, B. (1980). *Tent Cities.* Stuttgart: Redaktion.

Further changes to Muzdalifah also included asphalting its roads, adding new toilet units, increasing the drinking water units and renovating and expanding the mosque of Muzdalifah. The asphalting project changed Muzdalifah into what became, and is still used now as, a large parking area, as pilgrims tend to stay there for just one night and most of them now stay beside their car or bus (Rasch, 1980) (Figure 3.9).
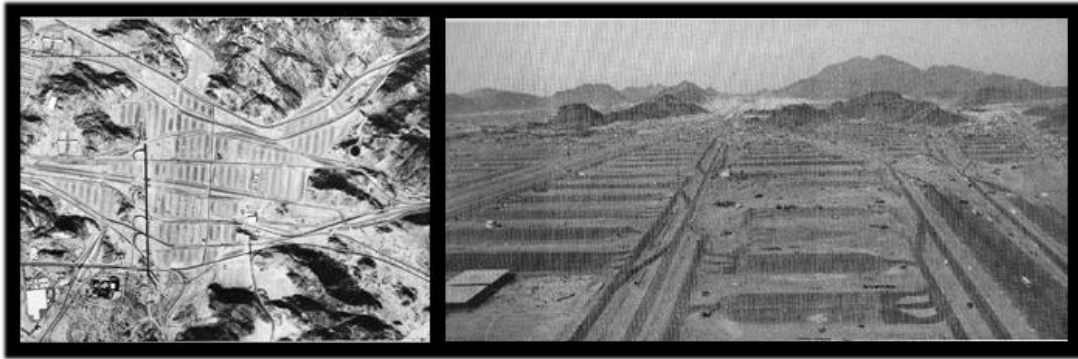
Figure 3.9: Muzdalifah after its areas were asphalted.
Source: Rasch, B. (1980). *Tent Cities.* Stuttgart: Redaktion.

In the following years, the sites continued adding further fixed, permanent facilities and buildings. More asphalted roads have been added, more toilets units have been constructed, most of the mosques have been renovated and extended and some healthcare centres have been established on a minor scale. During these changes, the population of the city of Mecca has also increased, resulting in increased urban growth around the city centre, where the holy mosque is located (Al_harthy, 2007). However, the HS were still far from the centre and the concept of reusing the sites when the Hajj wasn't occurring did not hold much promise, as most of the facilities were small and basic, and only designed to serve the five-day event (Rasch, 1980). At that time, the HS were similar to the campsites[31], with merely some necessary facilities and small buildings to serve people during their temporary stay.

The last twenty years of development can be considered to be the turning point, where the HS have developed general urban characteristics, thanks to the new facilities that have been added and the huge renovation process that has occurred in terms of most of the existing facilities. These developments have taken place in response to the numerous accidents and deaths caused by overcrowding due to the huge increase in people who have decided to make the pilgrimage in this period. The problems and tragedies that have occurred

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[31] A campsite or camping pitch is a place used for overnight stay in the outdoors. In UK English, a *campsite* is an area, usually divided into a number of pitches, where people can camp overnight using tents, campervans or caravans. This UK English use of the word is synonymous with the US English expression *campground*. In American English the term *campsite* generally means an area where an individual, family, group, or military unit can pitch a tent or park a camper, whereas a campground contains many campsites.

increased awareness in relation to specific infrastructure needs, thus infrastructure and facilities have been built in order to prevent unsafe conditions and to control the crowd (Al Arabiya, 2014).

The most remarkable projects that have occurred in the last 20 years are the tent improvement project of 1997, in response to a fire that broke out that year, the new pillars bridge; "*Jamarat Bridge";* developed in response to a stampede that occurred in 2006, and the HS monorail project, which was launched in 2010. In addition to these mega projects, many hospitals and first-aid centres have been built within the HS and the road networks have been expanded and linked to the main road networks of Mecca (King Abdul Aziz Public Library, 2015). All these projects and facilities have changed the HS completely, from areas in the desert to urban areas that offer all of the urban facilities and services that the normal cities do. That is to say, the HS have been transformed from resembling campsites into entire cities, similar to exhibition cities, with enormous infrastructure and facilities.

During the same period, Mecca has experienced radical urban growth, due to the demands of an increasing population and huge development projects dedicated to improving the quality-of-life around the holy mosque. These projects have caused a displacement of people from the centre of Mecca to the adjacent areas, causing noticeable growth in Mecca's urban areas, meaning the HS are now closer to the outskirts of Mecca (Ascoura, 2013). Recently, they have come to be considered to be a part of Mecca and the expanded road networks in Mecca have been connected to the HS road networks as a result.

The following section will discuss the current urban characteristics of the HS, along with their relationship to the city of Mecca, so an appropriate framework for measuring the effectiveness of reusing the HS when the Hajj is not occurring can be developed.

3.3   Hajj sites current urban characteristics

3.3.1   Existing facilities

The current availability of facilities and buildings within the three HS have meant that the HS are now comparable to normally-inhabited cities. That is to say, the sites have a complete asphalted road network that connects the three sites to one another, as well as connecting the sites to the rest of the city of Mecca. There is also a monorail line between the sites, fully equipped hospitals, mosques and many other public services and facilities.

The three HS are different from one another in terms of their urban characteristics due to the different rituals that are performed at each site. As previously mentioned, pilgrims in Arafat only stay there for one day, and at sunset, they move to Muzdalifa to spend the night. On the next day, at sunrise, they move to Mina in order to spend the next three days and nights. These differences have resulted in each site having its own make up and individual characteristics.

Thus, Arafat has huge areas covered with trees and plants to provide a comfortable atmosphere for pilgrims, Muzdalifa has similar areas but they are asphalted and there are no trees as pilgrims only stay at night and leave before sunrise, while Mina contains tents that are used by pilgrims during the three days and nights they spend there. Below, some of the general characteristics of each site will be highlighted, in order to understand which facilities and buildings could potentially be reused when the Hajj is not taking place.

- *Arafat*

Arafat is about 20 km southeast of the heart of Mecca (Figure 3.10), and is built on flat land. The total area of Arafat measures around 1218.8 Ha. This area is divided into different plots of land for different uses. 165.5 Ha (13.6%) is used for road networks (for both pedestrians and vehicles), 846 Ha (69.4%) is used for the pilgrims there and it is normally covered with portable tents or trees, and the remaining area, amounting to approximately

207.2 Ha (17%), is used for general services, such as toilets, healthcare and fire services (Development Authority of Makkah and Holy Sites, 2009). The following figure shows the most notable buildings and facilities, which could be reused when the Hajj is not in progress
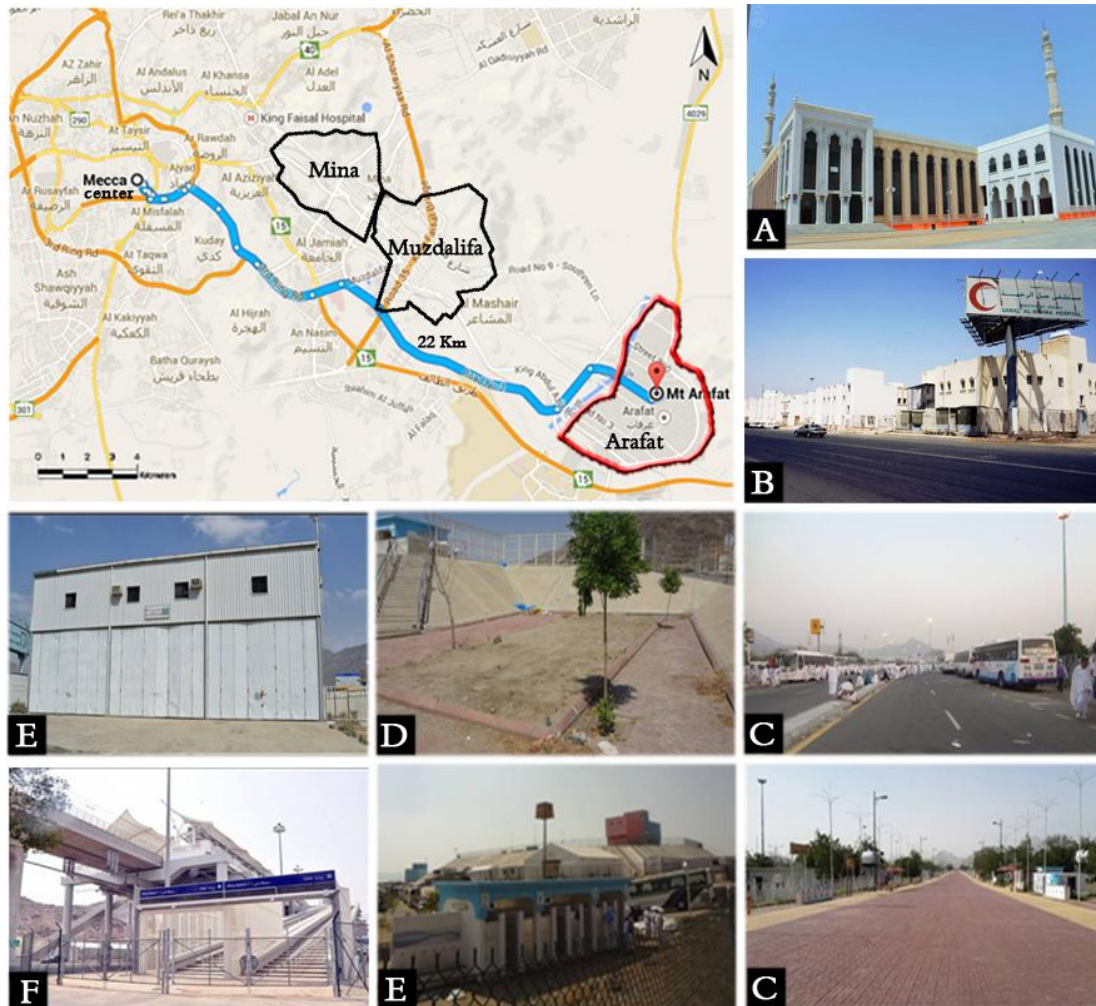
Figure 3.10: Arafat's urban characteristics
Source: Author's collected images.

A. The Mosque of Arafat, called Namerah Mosque. It occupies about 13 Ha and is large enough to hold up to 400,000 worshippers at any one time (Alriyadh, 2011). It is only used for the Hajj.

B. The three hospitals are known as Arafat General Hospital, Jabal al-Rahma Hospital and Namerah Mosque Hospital. All these hospitals are in permanent concrete buildings and are fully equipped, with a total capacity of 577 beds (alhayat, 2015).

C. The road networks that serve pilgrims' buses, officials' cars, emergency vehicles and food supply trucks. The network also includes some paths dedicated to pedestrian movement during the day of Arafat. These serve the purpose of allowing pilgrims to move from Arafat to Muzdalifah. The paths are paved, lit and have benches and drinking water units for the comfort of the pilgrims.

D. The open spaces, which have trees and plants, as well as some toilet complexes, pedestrian paths, and lights.

E. Permanent buildings, used as fire stations, public toilet units and for other services.

F. The monorail line that transports pilgrims from Arafat to the other sites, which in Arafat departs from three fully equipped stations.

- *Muzdalifah*

Muzdalifah is about 14 km southeast of the heart of Mecca and lies around 6 km northwest of Arafat (Figure 3.11). Its geographical coordinates are 21° 24' 33" North, 39° 54' 11" East and it is flat land surrounded by mountains. The total area of Muzdalifah is approximately 930 Ha, but only 640 Ha is used and it is divided into 152.8 Ha (23.9%) for road networks, 402.7 Ha (63%) for pilgrims to stay in, and 83 Ha (13.1%) for general services (Development Authority of Makkah and Holy Sites, 2009).
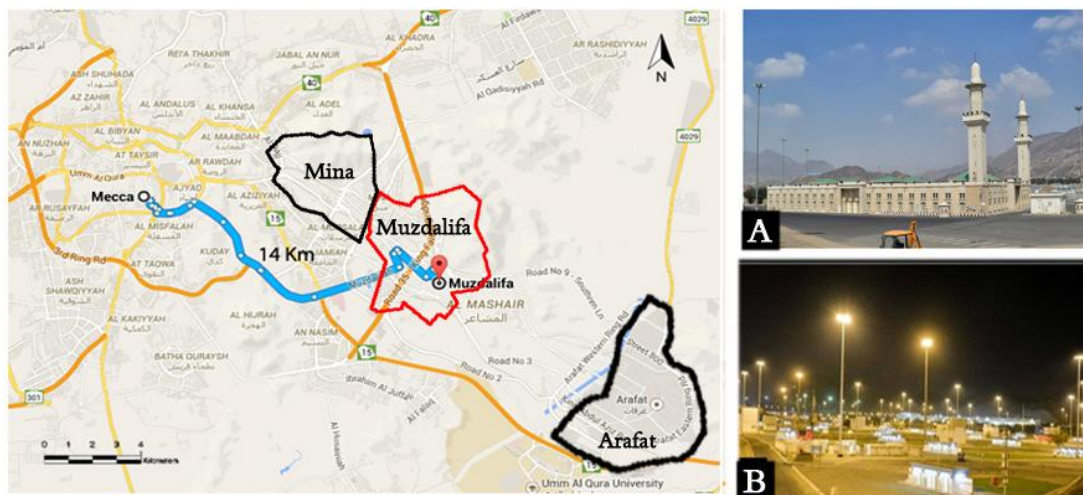
Figure 3.11: Muzdalifa's urban characteristics
Source: Author's collected images.

A. The mosque of Muzdalifa. It is fully equipped with toilet complexes for men and women. This mosque is only used during the days of the Hajj, similar to the one in Arafat.

B. The general view of Muzdalifa. This shows that the site is a large area, complete with lights, toilet complexes, and roads for pedestrians and vehicles.

Muzdalifah is less complicated in nature than Arafat or Mina in terms of the urban characteristics that exist there. The reasons for this are; firstly, the short duration of its use (only ten hours), which is even shorter than in Arafat. Secondly, pilgrims need no protection from the sun during the night. Most of the pilgrims spend the night lying on the ground, covered only by their white sheets. Thus, besides the facilities that already exist in Arafat, such as the toilet complexes, the health centres, and the monorail stations, Muzdalifa also has a main mosque known as al-Mash'ar al-Haram with an area of 0.5 Ha and capacity for up to twelve thousand worshipers (Alriyadh, 2011).

- *Mina*

The most complex of the HS is the narrow valley of Mina. Pilgrims sleep here for the last three or four days of the Hajj. It is about 7 km east of the heart of Mecca (Figure 3.12), and is surrounded by steep mountain slopes. The total area of Mina is about 650 Ha. Around 178 Ha (20%) of this is on mountain slopes, but for the most part, they are not intensively utilised at present. The flat area is mostly used and is approximately 472 Ha. 135.5 Ha (28.7%) is used for the road networks, 271.9 Ha (57.6%) is used for pilgrims' accommodation, and the remaining 64.6 Ha (13.1%) is used for general services (Development Authority of Makkah and Holy Sites, 2009).

Mina is widely known as the tents' city, as it has permanent fabric tents that cover most of the site. These provide temporary accommodation for pilgrims. Next to the tents there are many buildings and facilities that have the opportunity to be reused. The following figure shows some of these facilities, in order to demonstrate the general urban characteristics of Mina.

Figure 3.12: Mina's urban characteristics

Source: Author's collected images.

A. The mosque of Mina, known as Al Kheif Mosque, is over 2.5 Ha, and accommodates approximately forty-five thousand worshipers (Alriyadh, 2011). In addition to that, a new toilets complex has been built beside the mosque, containing more than two thousand toilet units.

B. There are four main hospitals, fully equipped and dedicated to visiting pilgrims. They have a total capacity of 569 beds. In addition, there are almost 20 health centre units dedicated to providing treatment to pilgrims (alhayat, 2015).

C. The road networks have a total length of almost 70 km, more than 41 bridges and almost 25 tunnels to facilitate the movement of different kinds of vehicles (Sabq, 2015). These vehicles include the pilgrims' buses, the officials' cars, the food supply trucks and emergency vehicles.

This network includes two main pedestrian paths crossing Mina, coming from Muzdalifah and going directly to the pillar bridge. The paths are covered and fully equipped with toilet complexes, drinking water taps, kiosks for different services and benches for resting.

D. There are six 13-storey buildings, with a capacity for 19,200 pilgrims.

E. There are more than 100,000 permanent air-conditioned tents that provide temporary accommodation to 3 million pilgrims (King Abdul Aziz Public Library, 2015).

F. There is a pedestrian bridge, which, including its entrance and exit ramps, is about 56 Ha. The bridge is called Jamarat Bridge and contains the three stone pillars dedicated to the stoning ritual. The bridge also includes an air conditioning system with water sprinklers, which together can lower the air temperature to around 29 degrees Celsius (King Abdul Aziz Public Library, 2015).

All the facilities in Arafat, Muzdalifa and Mina only operate during the season of the Hajj and are unused from the end of the season until the next season. According to Almudhwahi (2014), the HS and their facilities stand empty for almost 280 days with no official use, while the remaining 80 days at the sites are used for preparing for the Hajj. (More images of the different HS facilities are provided within appendix B).

3.3.2 The location in regards to Mecca

As previously discussed in this chapter, the city of Mecca has been developed in response to an increase in the population over the last few decades. This extension has resulted in the HS becoming important features of Mecca. This makes the idea of reusing the sites more appropriate and possibly more efficient than it would have been previously, when the sites were more like camping sites and were a good distance from Mecca's urban boundary. In recent times, the road networks of the HS have come to form a part of the road networks of Mecca. Thus, the following map (Figure 3.13) will demonstrate the potential of the HS locations, by illustrating their relationship with many important components, such as the main roads, their

proximity to central Mecca, the surrounding built-up areas and the important highways that lead to nearby cities. (Figure 3.14) shows a zoomed-out image of the HS locations, in order to show their proximity to the nearest city to Mecca, the nearest airport, and the nearest railway stations.
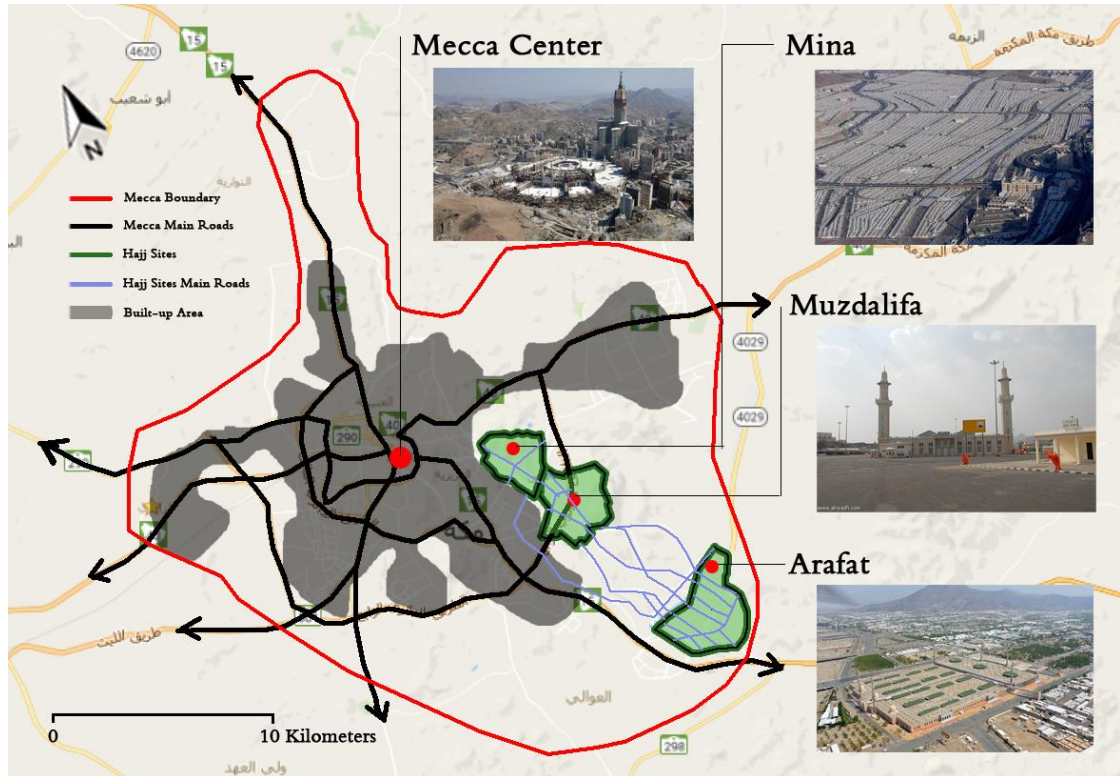
Figure 3.13 The HS and the city of Mecca
Source: Edited by author.
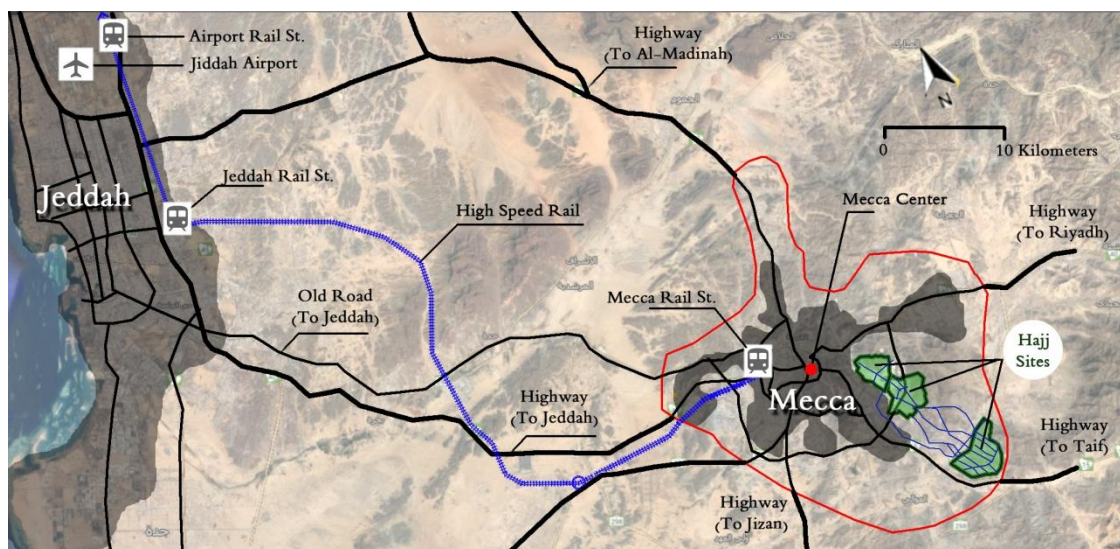
Figure 3.14 The HS, Mecca and their surroundings
Source: Edited by author.

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As demonstrated by the maps, the location that the HS occupy are within an important area inside the official boundary of Mecca. Mina and Muzdalifa are about only 10 km from Mecca's centre, where the holy mosque is located. While Arafat is further from the centre, it is still within Mecca's boundary. The most noticeable aspect demonstrated by the first map is that part of the main roads of Mecca cross the road networks of the HS. This indicates that some of Mecca's citizens pass the HS when they use the roads during their day-to-day travel. The second map shows that the city of Mecca is well connected to the city of Jeddah (the second largest city in Saudi Arabia), and that there are three highways next to the new high-speed rail that was recently constructed between the two cities. The importance of this connection is that Jeddah is considered to be the main gate to Mecca, and the good connectivity among them means that there is a higher possibility of visitors coming to Mecca and the HS on a more regular basis.

3.4 Conclusion

As has been highlighted here, in the past, the HS were simply areas of desert land outside the city of Mecca, without proper facilities nor buildings during Islam's early age. Instead, the areas were similar to mere campsites, where people install temporary tents for their relaxing vacation. Due to the introduction of modern modes of transport, such as cars, there has been an increase in the number of pilgrims and therefore, an establishment of dedicated road networks, in addition to connections to the main road networks of Mecca being constructed.

As explained in this chapter, due to the continually increasing number of pilgrims, the HS have also been developed further by adding more facilities, expanding mosque buildings and establishing new roads and bridges. Nowadays, the HS are complete with facilities and many buildings, that this means the possibility of reusing the HS when the Hajj is not in progress is even more plausible than ever before. Reusing the HS would mainly be focused on reusing the following facilities:

- The three main mosques within the three HS
- All of the hospitals and healthcare centres
- The permanent tents in Mina
- The pedestrian paths that connect the three sites from Arafat to Mina
- The monorail project that connects the three sites and has many stations within each site
- The open spaces (large areas) in Arafat and Muzdalifa that are covered by trees and plants and which have light units
- The toilet complexes those are available in all of the sites.

These facilities represent the potential that the HS have, and on one hand, may provide an opportunity for the HS to fill some of the surrounding area's social needs. On the other hand, they could also offer an economic opportunity for local authorities as they could lease them out to cover maintenance expenses.

The analysis of the HS location in relation to the city of Mecca has shown that the sites also have potential due to their close proximity to Mecca's centre and the main roads of Mecca crossing the HS road networks. The other potential exists since Mecca is becoming increasingly connected to the second largest city in Saudi Arabia, "Jeddah". This gives the HS more of an opportunity to be visited by people from outside Mecca if the HS facilities were to be reused when the Hajj was not taking place.

Despite the importance of highlighting the potential that the HS hold as UUS, it is also very important to study the potential that UUS hold for the future development of the cities in which they are located (Nefs, 2006). According to Pagano & Bowman (2000), UUS can be a powerful tool for governments and investors to use during the growth of their cities. Therefore, after highlighting the existing facilities within the HS and their locations, chapter 4 will explore the potential that the HS hold for Mecca's future urban growth. Furthermore, the possibility of decision makers being able to include reusing HS within their urban development plans will be explored.

Chapter 4 Exploring the potential of the Hajj sites within the context of Mecca's future urban growth

4.1 Introduction

After highlighting the current potential that the HS have as a form of UUS, through discussing the existing facilities and their location in regards to Mecca, this chapter will further expand on this potential by discussing the expected future potential of the HS with regard to their surroundings from an urban perspective. This will be achieved through undertaking a study of the urban growth of Mecca, and by analysing the role that could be played by the HS and their facilities in relation to such growth.

Studying the concept of the urban growth surrounding a UUS has become a significant consideration in terms of urban planning, since it can offer alternative pathways with regard to the future growth of a city, especially in times of economic downturn (Pagano & Bowman, 2000). A UUS and the potential of its existing facilities can prove to be a powerful tool for governments to exploit during periods of formation and growth relating to a city, as well as when they are making decisions regarding a city's future, whether it be concerned with conservation or transformation. Moreover, it is important that such decisions always be made in a responsible and democratic way (Pagano & Bowman, 2000).

Therefore, the researcher here believes that a city growth analysis and the monitoring of a UUS can provide the necessary vital information that can support decision-making in relation to the future growth of a city. Consequently, providing information regarding Mecca's urban growth may enable local authorities and decision-makers to better understand how the growth of their city could be supported by the reuse of the HS and their facilities, as these sites could help to provide the additional facilities and open spaces necessary for such urban growth.

This chapter will highlight the importance of studying the urban growth around underused urban spaces in general, as well as the importance of

studying the urban growth of Mecca in relation to the HS in particular. Moreover, this chapter will discuss the use of remote sensing and GIS technologies as appropriate methods for studying urban growth and consider how the technologies can be adapted for this research's case-study. Finally, the chapter will present an analysis regarding the current urban pattern of Mecca and a future probability scenario in relation to urban patterns, in order to determine the relationship between the HS and the possible patterns of urban change for their surroundings.

4.2   *Underused urban spaces within urban growth analysis*

Overall, UUS are thought to offer ideal opportunities to manage growth within a community or region (Pagano & Bowman, 2000). Growth is always occurring in major metropolitan regions across the world, and even in areas with declining urban populations or around UUS, these metropolitan regions tend to continue to expand overall (Schilling, 2002). It is important to remember that cities have always faced challenges in terms of their urban growth, specifically due to the issue of population growth. These challenges include providing the appropriate infrastructure, public facilities and open spaces needed. Thus, the revitalisation of UUS could provide the raw materials that regions and cities require so as to accommodate evolving growth needs (Pagano and Bowman, 2000).

Physical urban growth rates and patterns can be used to help determine a space's degree of importance, alongside which revitalisation methods may be most suitable for it. The power and the necessity for an UUS within a city or community, first and foremost, originates from its location. As stated by Reynolds (2011), there is, or should be, a strong case for doing something rather than nothing. "Set-aside may be acceptable in the countryside, but is surely not in the middle of cities," (Reynolds, 2011).

Overall, the study of urban growth is considered a branch of urban geography. It concentrates on cities and town with regard to their physical expansion. It is also a form of urban development (Bhatta, 2010). In recent

decades, it has become a paramount concern for politicians, economists, administrators, planners, developers, sociologists, environmentalists and proponents from many other disciplines (Bhatta, 2012). Furthermore, analysis of urban growth from various perspectives has become an essential operation, for many numbers of reasons (Bhatta, 2010). Understanding and quantifying the spatiotemporal dynamics of urban growth and its drivers in developing countries is thought to be critical with regard to proposing appropriate policies and monitoring mechanisms for urban growth and is fundamental for the making of an informed decision (Abebe, 2013).

Urban growth analysis can be done in many different ways. The most common method is through monitoring growth by remotely observing it at different times (Trousdale, 2010). According to Pilon et al. (1988), monitoring urban growth can be achieved by determining and describing changes in the land-cover (LC) properties. This is because urban growth leads to changes in LC in many areas around the world, especially in developing countries (Belal and Moghanm, 2011).

LC changes have become a central consideration with regard to current strategies used for managing and monitoring urban growth changes (Sundarakumar et al., 2012). Thus, the analysis of LC changes in the surroundings near to vacant land or under-used parcels can aid decision-makers in understanding the importance of such spaces' location within the proposed change, and moreover, help decision-makers to take an informed decision with regard to the use of an UUS (Rahimi, 2016).

LC refers to the physical characteristics of the earth's surface, captured in the distribution of vegetation, water, soil and other physical features of the land, including those created solely by human activities (e.g. settlements) (Rawat, & Kumar, 2015). The term originally referred to the type of vegetation that covered an area of a land's surface, but has subsequently been broadened to include human structures, such as buildings and pavements, as well as other aspects of physical environments, such as soils, biodiversity, surfaces and groundwater," (Moser, 1996).

Understanding LC of a section of land provides a comprehensive picture of a particular area. Therefore, this data is a fundamental component of the planning and decision-making processes for many communities as it helps them to understand where to plan for different types of growth. Furthermore, it helps them to understand the connectedness or fragmentation of various features within their community (Coffey, 2013).

Therefore, in this research, the LC change analysis was adapted in order to understand the urban growth pattern of Mecca with regard to the HS locations. The reason for observing LC changes, particularly urban cover (UC) and for this case, is that the changes occurring around the HS can indicate the HS locations' level of significance. This will help to determine whether the facilities at a Hajj site could be exploited, specifically as an instrument to be used in urban strategies in the surrounding areas of the HS. In other words, the level and pattern of UC change in Mecca will define how much potential the HS have with regard to future UC changes. Therefore, below, the urban growth of Mecca will be studied and analysed through monitoring UC changes and patterns during a 15 year period from 1998 to 2013[32] Hence, this will help with determining the relationship between Mecca's urban growth and the HS locations.

4.3 The Hajj sites within Mecca's urban growth context: methods and data

Several different methods can be employed to analyse and quantify the dynamics of urban growth patterns and processes. However, the method that should be selected depends on the issue being studied. To choose the most suitable method, one needs a clear understanding of the various tools and techniques that can be utilised in analysing urban environments (Abebe, 2013). Key concerns here include the desired inputs, the strength of logistic support (including the software being employed), the availability of good

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[32] The reason for choosing 2013 as the last date of our period of study is that this research started during 2013 and the objective was to observe the changes that occurred every 5 years, starting from 1998 when the huge projects of the HS began, thus the next period will be between 2013 until 2018.

quality data, the researcher's experience and skills in terms of manipulating the data, and the necessary funds being allocated to the task (Abebe, 2013).

LC changes can be detected by identifying differences in land at different times (Singh, 1989). Remote sensing (RS) and geographic information system (GIS) tools have proven to be particularly advantageous in accomplishing this task in a simplistic manner, and with a great level of accuracy (Wakode et al., 2014). RS is the science of obtaining information regarding objects or areas from a distance, typically through using aircraft or satellites (Sabins, 2007) While GIS is a system designed to capture, store, manipulate, analyse, manage, and present spatial or geographic data (Maguire, 1991).

RS is employed by researchers to help them gain an understanding of spatiotemporal trends relating to urbanisation, as well as to monitor the spatial patterns of urban landscapes more effectively than if they were to use traditional socioeconomic indicators, such as population trends and employment shifts (Jun et al., 2009). Furthermore, RS provides a synoptic view of any large inaccessible areas, all at one time and is also very useful for analysing growth and changes over a large area (Lu et al., 2009, 2011; Wakode et al., 2011).

For developing countries in particular, remote sensing can provide fundamental observations of urban growth and environmental conditions that would not be available from other sources (Miller & Small, 2003). Usually, RS of LC and urban growth involves the analysis of two or more registered, aerial or satellite multi-spectral bands from the same geographical area, obtained at different times, thus allowing for a comparison between a geographical area at two different time periods (Radke et al., 2005).

On the other hand, GIS is an analysis tool that can facilitate urban planning decision-making (Jankowski, 1995). The use of GIS in urban growth research has become quite commonplace (Mundia & Aniya, 2005). Some researchers have used GIS as a tool for understanding patterns and the dynamics in relation to LC changes (Rawat, & Kumar, 2015). This is due to the fact that GIS is a useful tool in terms of quantifying and measuring changes in LC

areas between different dates. Furthermore, this aids in identifying the rates of change among different areas within a city (Sudhira et al., 2004).

For this research, both techniques have been adopted in order to quantify the LC changes of Mecca and moreover, to gain an understanding of its dynamic and patterns. This will help with defining the relationship between Mecca's urban growth and the locations of the HS.

RS was used to detect the LC of Mecca for different dates through utilising satellite images, while GIS was employed to quantify such detections and to establish the rate of change and patterns that were observed. The data obtained was analysed through the application of a morphological index (e.g. entropy) so as to obtain a greater understanding of the behaviour of current urban structures. The data was also put through a multiple regression analysis in order to predict the rate and pattern of future urban growth.

The following diagram (Figure 4.1), explains the phases and steps adapted in this chapter in order to achieve the formed goals of this section of the research. The phases included are; the preparation of the downloaded satellite data for processing by sub-setting the area of interest, filling the un-scan gaps and enhancing the images; all of which belonged to phase 1. While phase 2 involved generating land cover maps as vector data that could be analysed further, and finally, phase 3 involved the application of the different urban cover analyses in order to determine the importance of the HS location within Mecca's urban cover change patterns.
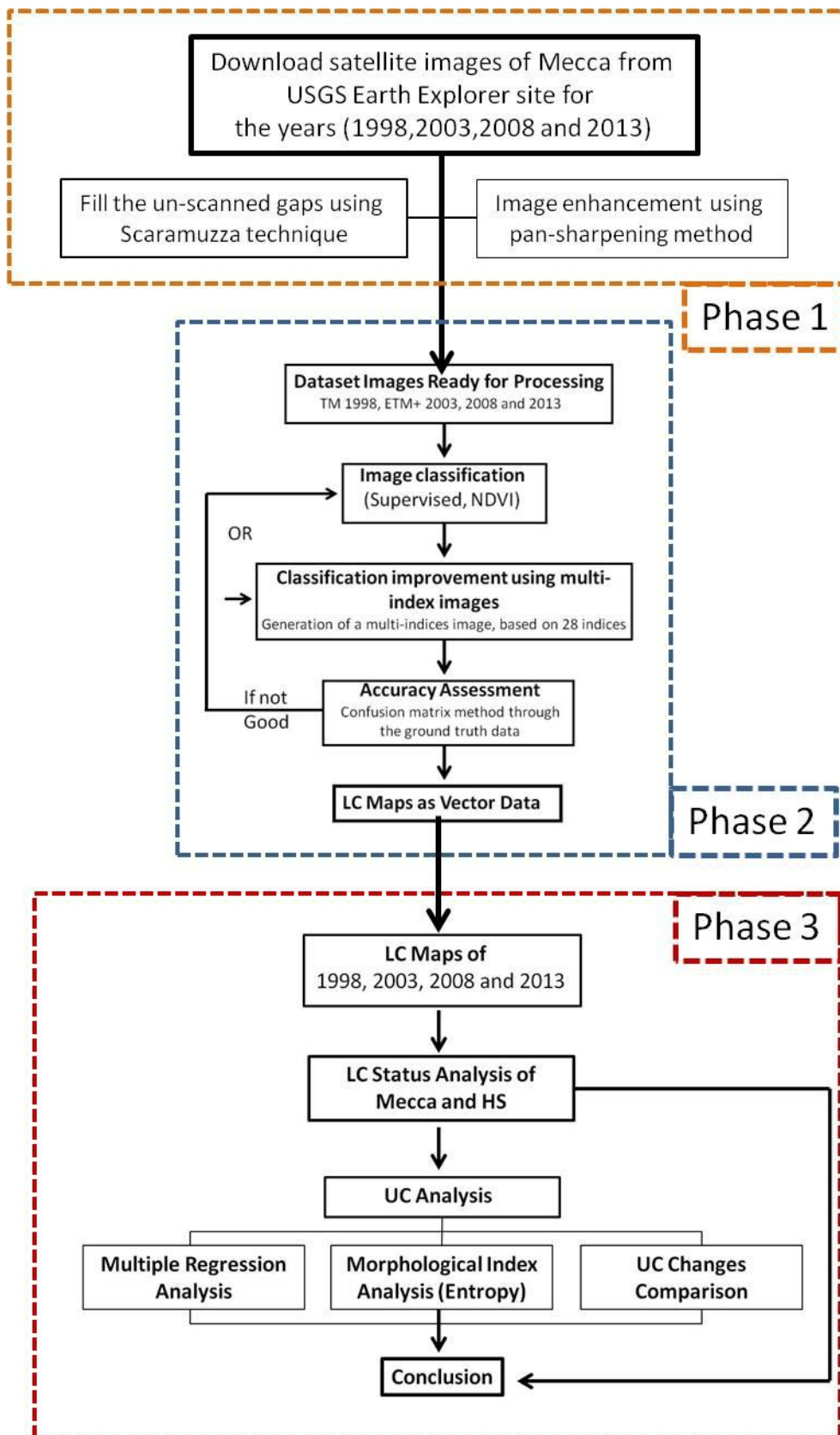
Figure 4.1: Flowchart of the phases adapted in this chapter

Source: Edited by author

4.3.1 Satellite data

The first step within phase 1 was to find the appropriate data that covered the specified area of study for the different periods. Traditionally, visual interpretations of high-resolution aerial photographs have been used to acquire comprehensive information relating to the mapping of urban areas, since this mapping technique is normally expensive and time consuming when used for the estimation of urban growth (Abebe, 2013). However, with the gradual advancement and availability of high temporal and spatial resolution remote sensing imagery, the possibility of accurately monitoring urban problems with aerial photos has become a more promising undertaking (Guindon & Zhang, 2009). Nowadays, there are several remote sensing satellite systems, such as Landsat (TM & ETM+), ASTER, IKONOS, GeoEye, Quick bird, RapidEye, and WorldView. Each of them can provide between medium to extremely high-resolution imagery (Abebe, 2013).

Furthermore, the availability of time-series dataset is essential for understanding and monitoring the urban expansion process, in order to characterise and locate the evolution trends at a detailed level (Ellul et al., 2013). In fact, during the last three decades, satellite time series as Landsat images have been exploited in several studies (Masek et al., 2000) Therefore, in order to characterise the dynamics of LC changes over the chosen period of 1998-2013, a multi-temporal set of RS data of the area of interest was used to study and classify the land cover. The set includes Landsat images (TM 1998, ETM+ 2003, 2008 and 2013), which were collected on 25 August 1998, 15 August 2003, 28 August 2008 and 26 August 2013 and downloaded from the USGS Earth Explorer site (Table 4.1). Furthermore, all images have been calibrated.

Respective year	Date acquired (day/month/year)	Sensor	Resolution
1998	25/08/1998	Landsat 5 TM	30 m
2003	15/08/2003	Landsat 7 ETM+	30 m
2008	28/08/2008	Landsat 7 ETM+	30 m
2013	26/08/2013	Landsat 7 ETM+	30 m

Table 4.1: Details of Landsat satellite images

Source: Edited by author

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The satellite images sub-settings were performed so as to extract an area covering approximately 12000 square meters. The area specified was studied by using images that were within the geo-referenced outline boundary for Mecca and the surrounding map was classified as an area of interest (AOI). This information was obtained from the Mecca municipality's official website (Figure 4.2). Moreover, the geospatial analysis and spectral image processing software; ENVI 5.1; in combination with GIS, was employed to enable the processing, analysis and integration of the spatial data and geographic information in order to achieve the aforementioned goals.
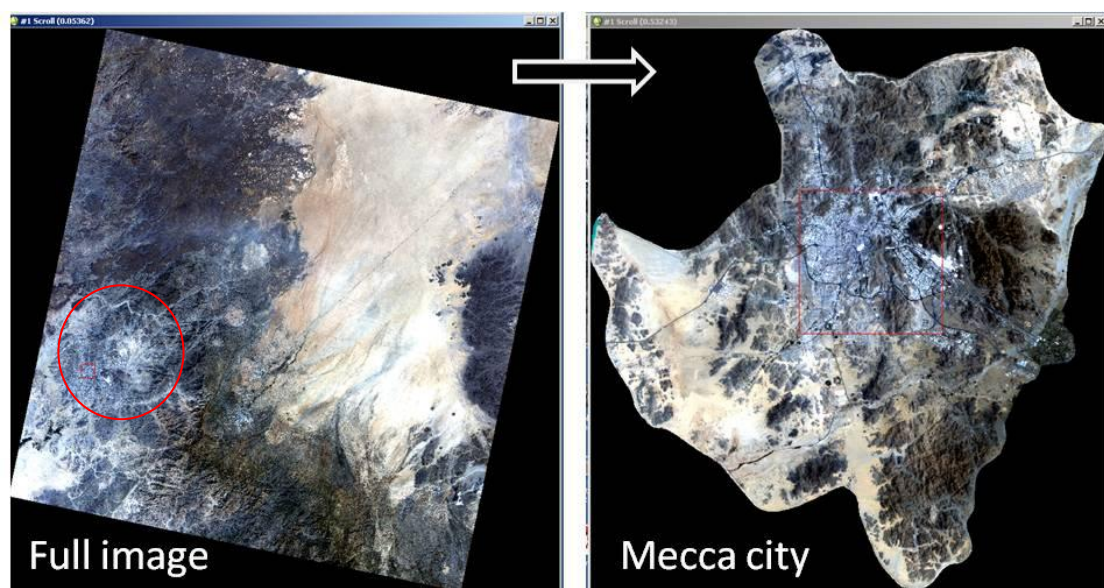
Figure 4.2: The area of interest (Mecca city)

Source: USGS Website edited by author

4.3.2 Dataset pre-preparation

To obtain the classified LC map, a number of pre-processing steps were undertaken to enhance the performance of the classification. For instance, image gaps were filled and a resolution enhancement was conducted on all of the images. This process was applied as the sensor of the Landsat 7 Enhanced Thematic Mapper's (ETM) Scan Line Corrector had experienced a failure in May 2003, therefore all images after that time have had wedge-shaped gaps on both sides of each scene. This resulted in a loss of approximately 22

percent of the data, which hugely limited the scientific applications of the ETM+ data (Chen et al., 2011).

A number of methods have been developed since that failure occurred in order to fill the un-scanned gaps in the ETM+ images (Maxwell, 2004). In this study, for the 2003, 2008 and 2013 satellite images, a technique developed by Scaramuzza, et al. (2004) was utilised, which can be used to fill gaps in one scene by employing the data from another Landsat scene (Figure 4.3) The technique applies a linear section of the alternate scene to the image needed "filling" and adjusts it based on the standard deviation and mean values of each band. This technique was developed to be used with the installation of the plug-in landsat_gapfill.sav in ENVI software.
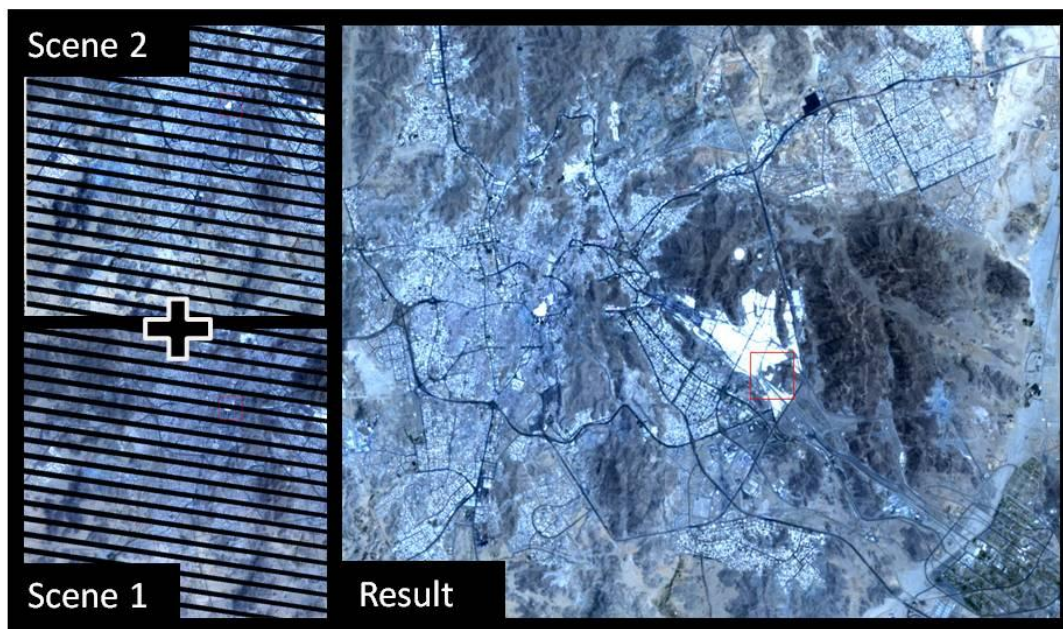
Figure 4.3: Gap filling

Source: USGS website, edited by author

Furthermore, the pan-sharping method was used in order to enhance the images resolution of Landsat 7 Thematic Mapper Plus (ETM+). This method merges multispectral bands with a 15-meter panchromatic band, yet doesn't lose the red, green and blue (RGB) information derived from the original multispectral three-band 30-meter composite. The objective of the sharpening process is to improve the spatial resolution of the multispectral imagery, while preserving the spectral information in homogeneous areas (King and

Jianwen, 2001). At the end of this dataset pre-preparation in this case, four images were ready to be processed (Figure 4.4).
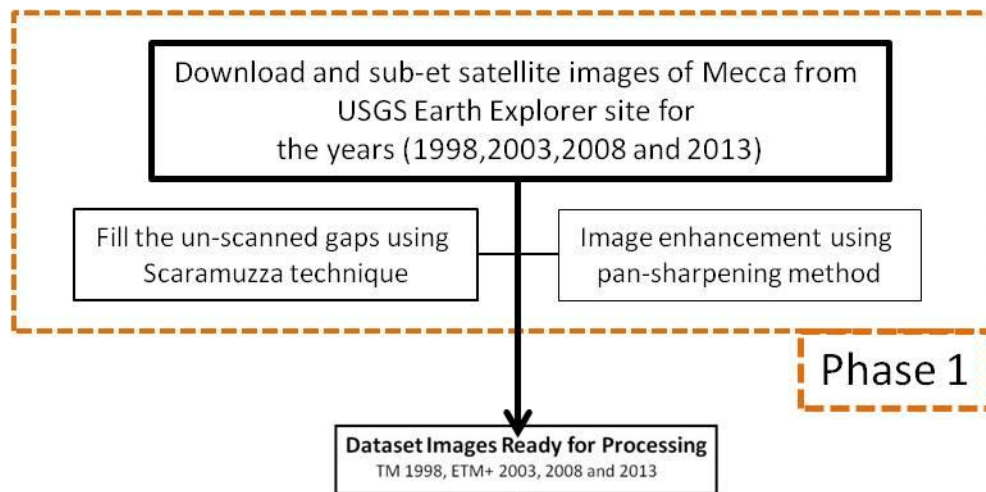
Figure 4.4: Dataset pre-preparation diagram

Source: Edited by author

4.3.3 Data processing

After having pre-processed the different datasets for all of the chosen years, there are some steps that had to be followed before the analysis could begin. These steps are all part of what is referred to as "data processing". During the data processing phase, as much information as possible needs to be obtained from the images. To do so, the images must thus be converted from raster to vector data in order to quantify the information for the analysis steps.

Many methods have been developed recently to achieve the best possible results from this, with the highest possible accuracy. Most of the methods include an image classification, classification enhancement and accuracy assessment test phase (Gao, 2008). Below, the methods will be explained, alongside the steps the researcher in this study adopted so as to convert the dataset images into maps that contained mathematical data (Figure 4.5).
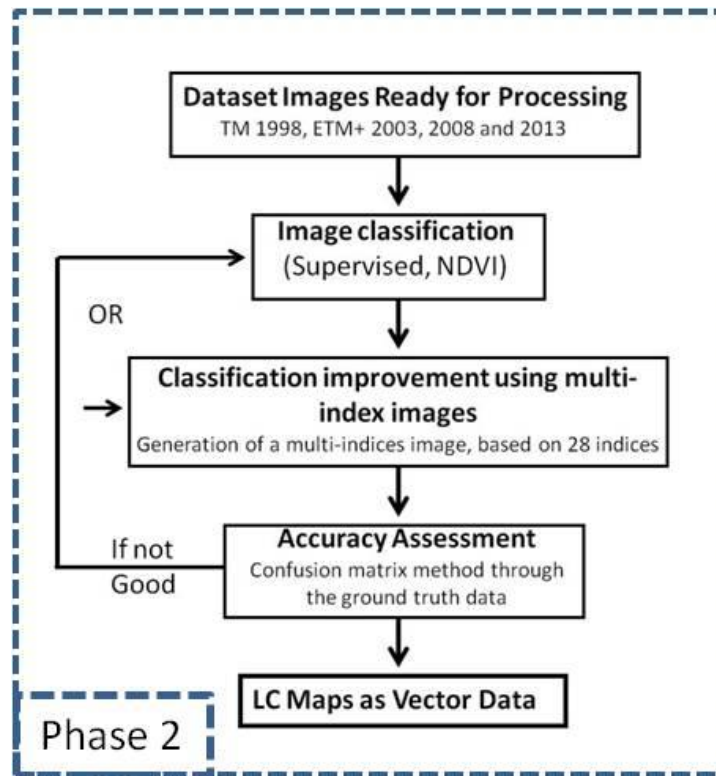
Figure 4.5: Chart of the steps taken to obtain land cover maps as vector data

Source: Edited by author

- *Image classification*

After preparing the dataset, the first key step was classifying each satellite image in the period of study. Image classification refers to grouping image pixels into categories or classes to produce a thematic representation (Canada Centre for Remote Sensing, 2010). Classification for remote sensing involves clustering the pixels of an image to a relatively small set of classes, so that the pixels in the same class have similar properties. Most image classifications are based on the detection of spectral response patterns of LC classes (Brito & Quintanilha, 2012).

In order to utilise remotely sensed images most effectively, several image classification methods have been suggested and developed over the past few decades. However, there is no single ideal classification method for each and every remote sensing image (Tso & Mather, 2009). The choice of image classification method mostly depends on the objectives of the research, the nature of the image, and the level of detail or accuracy required for specific

application (Lillesand et al., 2014). In recent years, many advanced methods have been applied, each of which has both strengths and limitations (Mustapha et al., 2011).

In this study, several approaches are applied to boost the classification accuracy, such as supervised technique to categorise our classes, normalised difference vegetation index (NDVI)[33] to extract the vegetation cover and finally the method of building a multi-index image applied to enhance the classification results.

To determine the LC classification, a minimum distance[34] and maximum likelihood[35] are applied in order to extract the most accurate class for each scene (Figure 4.6). The Normalised Difference Vegetation Index (NDVI) is applied to extract the Vegetation class, as it is one of the most widely used for vegetation indexes (Pirotti et al., 2014).In total, five classes were established, and they were; urban, street, soil, vegetation and mountain. Descriptions of these (LC) classes are presented in (Table 4.2).
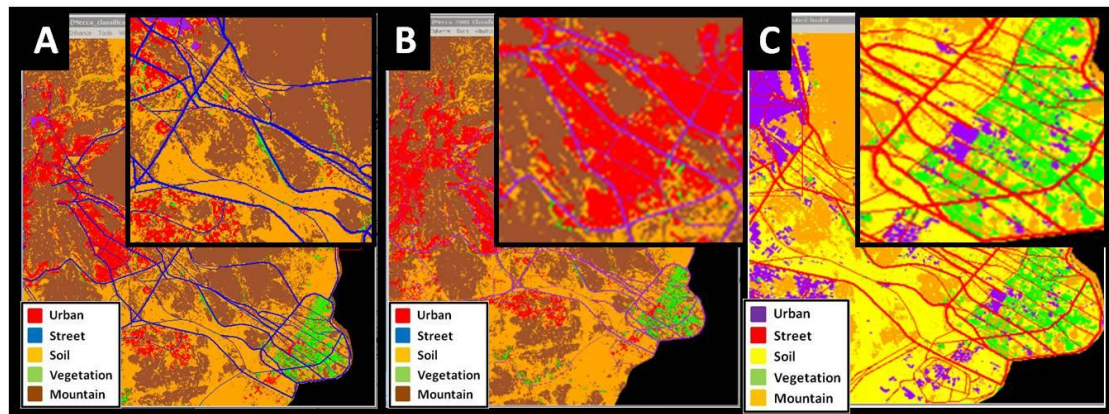
Figure 4.6: LC classification testing steps where A) Shows the results of the minimum distance approach from which the street and soil covers were extracted, B) Shows the results of the maximum distance approach from which the urban and mountain covers were extracted, and C) Shows the final results after grouping the extracted covers, in addition to the vegetation cover.

Source: Edited by author

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[33] **The normalized difference vegetation index (NDVI)** is a simple graphical indicator that can be used to analyze remote sensing measurements, typically but not necessarily from a space platform, and assess whether the target being observed contains live green vegetation or not.

[34] A **minimum distance** is used to classify unknown image data to classes which minimize the distance between the image data and the class in multi-feature space. The distance is defined as an index of similarity, so that the minimum distance is identical to the maximum similarity

[35] **Maximum likelihood** is one of the most popular methods of classification in remote sensing, in which a pixel with the maximum likelihood is classified into the corresponding class.

LC Classes	Description
Urban	Residential, commercial services, industrial, mixed urban or built-up land
Street	All road networks
Soil	Bare soil, sandy soil, desert, open land, non-built lands
Vegetation	Trees, agricultural areas, vegetated areas
Mountain	Hills, large rocks, rugged terrain

Table 4.2: Land cover classification scheme
Source: Edited by author

- *Classification improvement using multi index images*

The objective of this step is to enhance the spectral information through the generation of additional layers (in addition to the information provided by Landsat) in order to minimize the mistakes of classification processes, such as the effects of the environment and then the "noise" due to the mixture between different classes. This method generates a multi-indices image, based on 28 indices, including the Soil Adjusted Vegetation Index (SAVI), which is generally used to minimise the effects of the soil background; the Normalized Difference Soil Index (NDSI), which gives a more reliable estimation in a case of exposed soil conditions; the Tasseled Cap Vegetation Index, which is used to perform an orthogonal transformation of the original data into three factors, including Brightness, Greenness, and the third, which relates to the features of the soil; the Enhanced Vegetation Index (EVI), and so on. All of these indices were used in order to obtain a final set of 28 layers, while in addition, all the indices were stretched to a range from 0 to 255, so as to increase the divisibility between different groups of objects (Figure 4.7). Once the multi-index image is complete, the selection of pixels in the region of interest, which represent the peak of each band, is applied so as to test the supervised classification technique. This step is repeated for all the images to obtain the best possible classification result, with a view to comparing this with previous results to extract the best classes possible for each category. Finally, in this study, four different LC maps for all the periods of study were produced[36] (Figure 4.8).

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[36] This step is based on the published article "DEFINING DENSITIES FOR URBAN RESIDENTIAL TEXTURE, THROUGH LAND USE CLASSIFICATION, FROM LANDSAT TM IMAGERY: CASE STUDY OF SPANISH MEDITERRANEAN
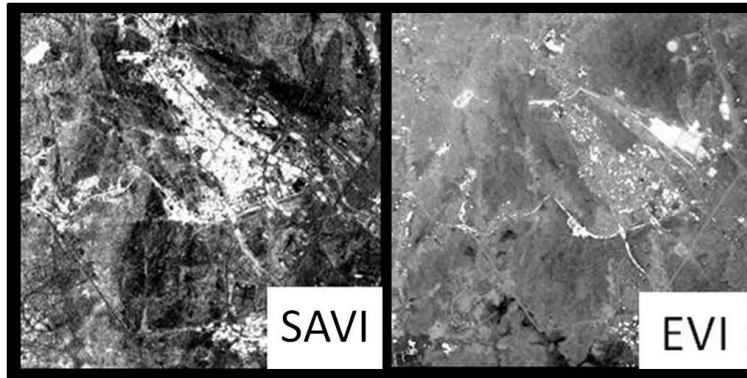
Figure 4.7: Images show the results after applying some of the indices, where the left shows the extracted layer applying the Soil Adjusted Vegetation Index, and the right shows the extracted layer after applying the Enhanced Vegetation Index.
Source: Edited by author
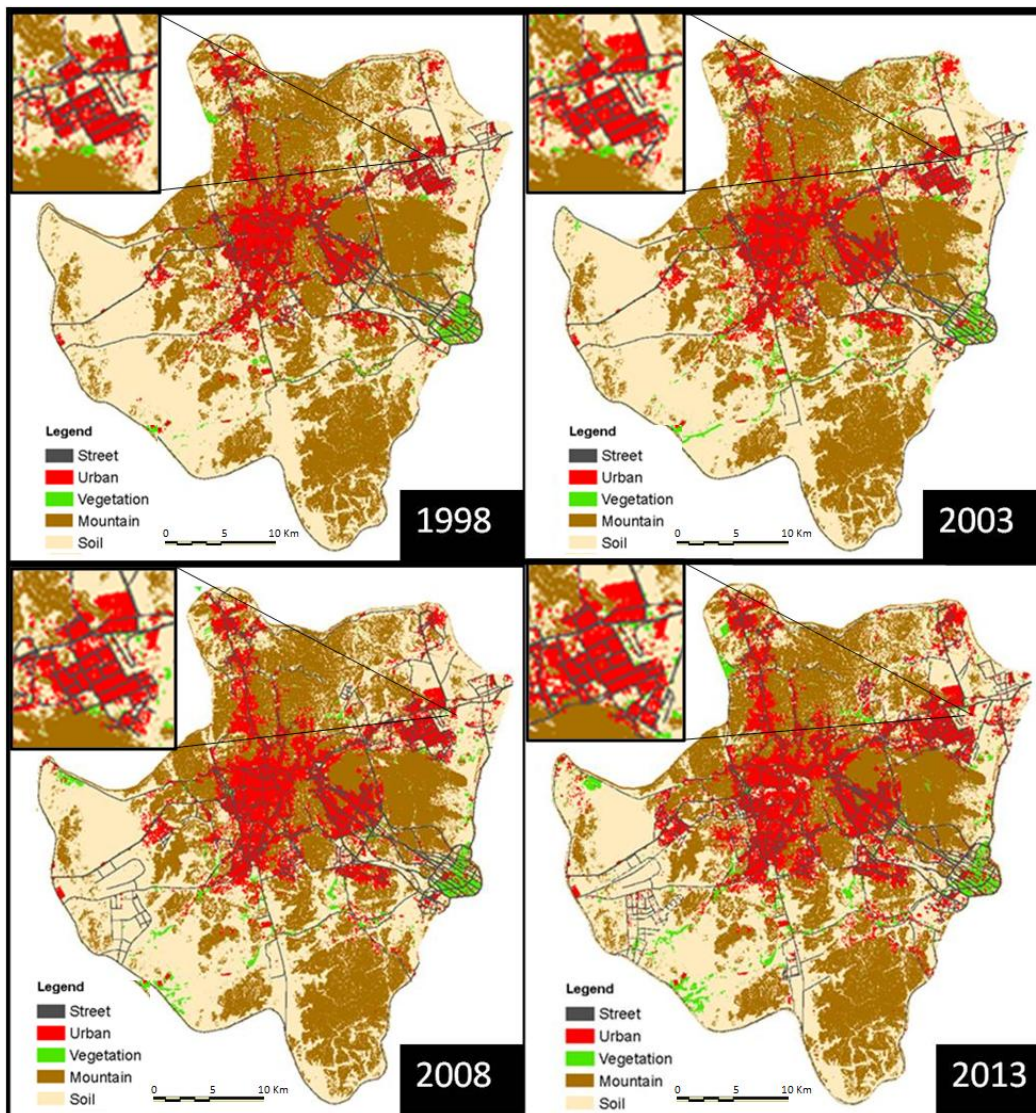
Figure 4.8 LC maps for all periods of study, where the up-left squares show some of the changes that occurred
Source: Edited by author

COAST" edited by (Colaninnoa et al., 2012), found on http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XXXIX-B7/179/2012/isprsarchives-XXXIX-B7-179-2012.pdf

- *Accuracy assessment*

For thematic mapping from remotely sensed data, the term 'accuracy' is typically used to express the degree of 'correctness' of a map or classification (Foody, 2002). The determination of the quality of the extracted information from the remotely sensed data is called an accuracy assessment (Congalton and Green, 2008). However, no LC assessment is complete without also checking the accuracy of the classified images generated by the classification process (Mustapha et al., 2011). Many methods for assessing this accuracy have been discussed in prior remote sensing literature.

However, the most widely promoted and utilised is derived from a confusion or error matrix (Foody, 2002). In this study, the confusion matrix method, via the ground truth data, was applied to the classified images in order to calculate and tabulate the overall classification accuracy and Kappa Coefficient. In addition, it evaluated the accuracy of the users and the producers simultaneously.

For each LC class, a validation dataset (about 500 pixels per class) was designated using a plenty of randomly sampled ground truth points obtained regarding the visual interpretation of the true colour composite of the Landsat images used. The results obtained exhibit an overall accuracy of 84.64 percent, 84.8 percent, 83.56 percent and 83.72 percent for 1998, 2003, 2008 and 2013 respectively (Table 4.3). Figure 4.5 summarises the steps taken to extract the LC maps as vector data.

Land Cover Category	1998 Accuracy		2003 Accuracy		2008 Accuracy		2013 Accuracy	
	Producer's	User's	Producer's	User's	Producer's	User's	Producer's	User's
Urban	90.2	87.91	95.6	89.01	98.6	89.15	97	96.81
Vegetation	70	99.72	75	100	67.2	100	83.2	99.76
Street	67	91.28	54.4	96.11	52.4	100	45.4	78.82
Soil	100	75.64	100	68.21	100	66.49	100	62.34
Mountain	96	78.95	99	86.54	99.6	83.42	93	94.51
Overall Accuracy	84.64		84.80%		83.56%		83.72%	
Kappa Coefficient	0.808		0.810		0.7945		0.7965	

Table 4.3: Summary of classification accuracies

Source: Edited by author

4.3.4 Results and analysis

For all of the periods of study, the LC maps were analysed from various different perspectives. The first analysis involved detecting changes in all of the LC categories. Hence, this provided the researcher with a general overview of Mecca's LC over the past 15 years, and the biophysical pattern of all LC categories for the whole of Mecca in general, and for the HS in particular. The second analysis focused on providing information regarding urban cover (UC), as it is considered to be the main cover, which can explain Mecca's urban growth pattern. This analysis was done by comparing the differences between UC areas for each of the years. This helped with identifying the parts of Mecca where the highest rate of urban growth has occurred. The analysis was supported by the application of a morphological index known as *Entropy*. This aided with explaining urban patterns of change, while, simultaneously, estimating the parts of Mecca with a higher chance of experiencing change. Moreover, a multiple regression analysis was used at the end to provide some insight into the future probability of urban change patterns in Mecca and insight into how the HS locations could play a role in terms of these patterns (Figure 4.9).
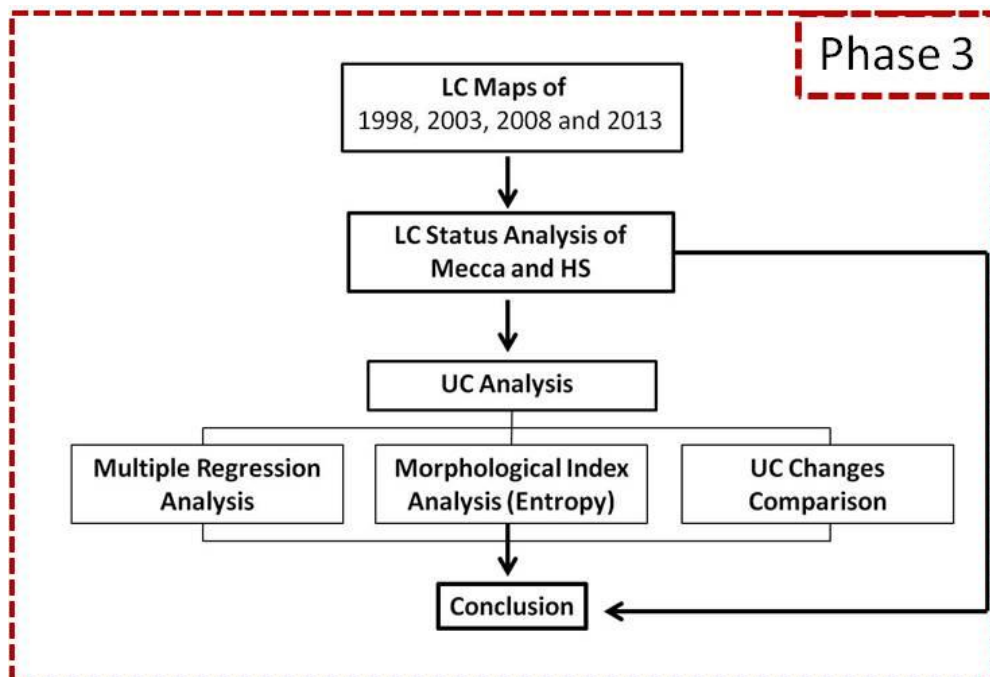
Figure 4.9: Data analysis steps
Source: Edited by author

- *Land cover status of Mecca and hajj sites*

Despite this research's analysis focus being on attempting to comprehend the patterns and rates of change in UC "built-up areas" in order to gain an understanding of urban growth in Mecca, especially around the HS, it is also useful to highlight the general status of all LC and their patterns in Mecca. Additionally, it is vital to consider the LC patterns of the HS during the period of study. This will help with clarifying the geography of Mecca and the HS, along with providing insight into whether the LC of the HS have changed during the past 15 years or not.

In other words, changes in the LC of the HS also indicates changes in their facilities, and the changes in the Hajj sites' facilities impacts upon whether or not they have the potential to be reused. Further, increases in UC cover of HS can increase the potential of reusing the HS and decreased cover can decrease this potential. A post-classification comparison method using GIS was applied to determine differences between independently classified images. This was done by comparing the thematic classifications produced for each date. This method overlays two independently produced classified images in ARC GIS 10.1 (Alpha et al., 2009), from different periods. The resulting LC maps are then visually compared and the areas that have changed are simply those areas that are not classified in the same way. This analysis helps to identify changes occurring in different classes of LC, such as an increase in urban areas or a decrease in vegetation cover (Hegazy et al., 2015). The individual class areas, the change statistics, and percentages of LC change from the total LC areas for all of the four years for Mecca are shown in Table 4.4 below.

LC Categoriy	1998 Area		2003 Area		2008 Area		2013 Area		1998-2013 Total ch. Out of 1206.83		% of ch. For each class seperatly
	(Km²)	%	(Km²)	%	(Km²)	%	(Km²)	%	(Km²)	%	
Vegetation	8.13	0.67	12.75	1.06	13.22	1.10	18.45	1.53	10.32	0.86	127.04
Street	26.43	2.19	27.21	2.26	33.06	2.74	34.40	2.85	7.97	0.66	30.14
Mountain	496.70	41.16	496.68	41.16	488.73	40.50	465.20	38.55	-31.51	-2.61	-6.34
Soil	598.27	49.57	579.56	48.02	565.25	46.84	567.62	47.03	-30.65	-2.54	-5.12
Urban	77.29	6.40	90.61	7.51	106.57	8.83	121.16	10.04	43.86	3.63	56.75
Total	1206.83	100.00	1206.83	100.00	1206.83	100.00	1206.83	100.00	0.00	0.00	

Table 4.4: Results of the land cover classifications for 1998, 2003, 2008 and 2013 for Mecca, with area changes and percentage changes.

Source: Edited by author

It is clear from the table that there has been considerable change in LC in Mecca over the 15-years period of study. It is observed that urban areas increased by approximately 43.86 km² (56.76%). There was also an increase in both vegetation and street cover by approximately 10.32 km² (126.94 %) and 7.97 km² (30.16 %) respectively. The mountain cover is the dominant LC class in Mecca, and the soil class forms another major class of LC. However, both the mountains and soil cover shows a decrease, with -31.51km² (-6.34%) and -30.65% (-6.34%) respectively, which is as a result of the increase in the other classes. In order to map the LC of the HS, the HS areas were extracted from the Mecca LC classification map shown in the previous step by using the official outline boundary, downloaded from Mecca Municipality's website (Figure 4.10).
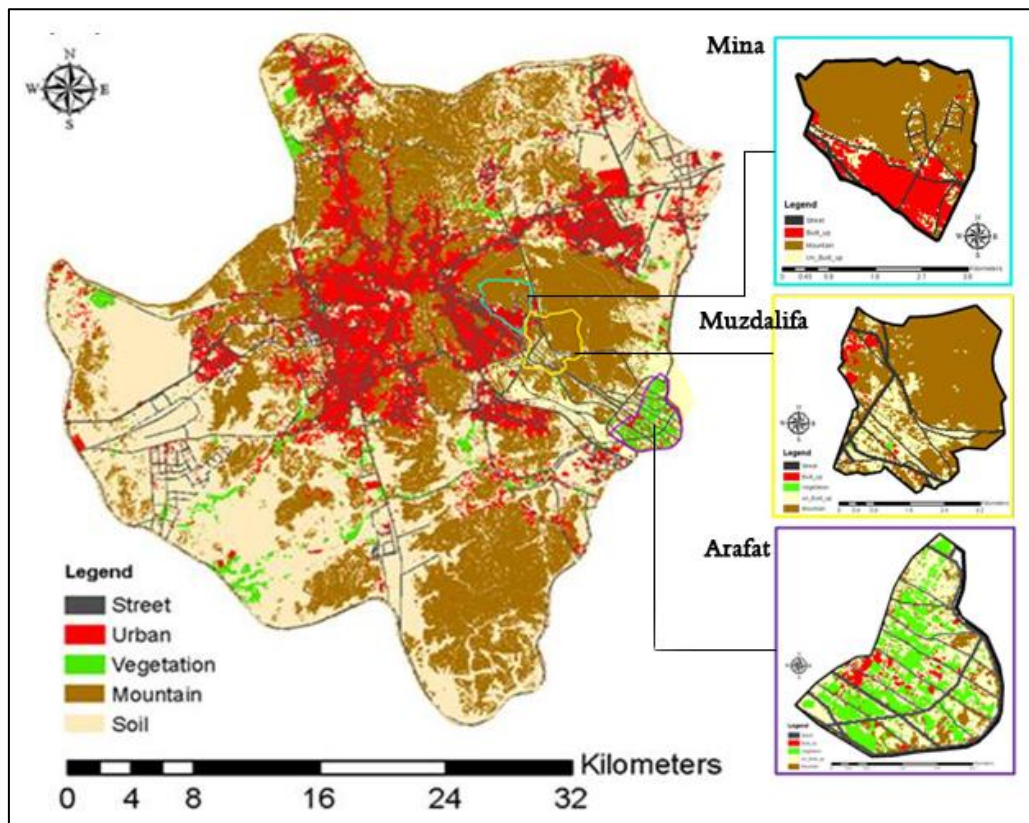
Figure 4.10 Extracted HS from the Mecca LC map
Source: Edited by author

As mentioned above, the HS includes three places; Mina, Arafat and Muzdalifa. Each places' LC characteristics were dependent on the ritual performed there. Mina has the highest rate of urban (Built-up) cover as the

pilgrims spend most of their Hajj time there, while Muzdalifa and Arafat have more open spaces as the pilgrims only spend half a day there. Moreover, a post-classification comparison method was applied to determine the difference between independently classified images for each site and for each year of the period of study.

The results show that most of the changes in Mina, Muzdalifa and Arafat were an increase in the urban cover, with increases of approximately 1.83 km² (104.01%), 0.82 km² (273.88%) and 0.38 km² (107.68%) respectively. The highest change was between 1998 and 2003, as a result of the tent project, which was discussed previously. Moreover, vegetation cover has increased in Muzdalifa by approximately 0.02 km² (65.97%), yet in Arafat, the vegetation cover has fluctuated over the period of study. Further, road networks have also increased as a result of the increase in the HS facilities. This investigation demonstrates that even though the Hajj is a temporary event, lasting for just five days a year, the LC is continuing to increasingly change. This strengthens the potential of the HS, which was discussed in more detail in chapter 3. The results of the study, alongside the statistics and the percentages of LC changes, are shown in Figure 4.11 , Figure 4.12 and Figure 4.13 below.

Land cover	1998		2003		change98-03		2008		Change03-08		2013		Change08-13		Change98-13	
	km2	%	km2	%	km2	%	km2	%	km2	%	km2	%	km2	%	km2	%
Urban	1.76	22.54	3.36	43.01	1.60	90.83	3.53	45.27	0.18	5.26	3.59	45.98	0.06	1.56	1.83	104.01
Soil	0.75	9.64	0.17	2.13	-0.59	-77.89	0.13	1.61	-0.04	-24.41	0.12	1.52	-0.01	-5.71	-0.63	-84.24
Vegetation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street	0.41	5.26	0.41	5.26	0.00	0.00	0.43	5.49	0.02	4.39	0.46	5.84	0.03	6.26	0.04	10.93
Mountain	4.88	62.56	3.87	49.59	-1.01	-20.72	3.71	47.54	-0.16	-4.14	3.64	46.62	-0.07	-1.94	-1.24	-25.47
Total Area								7.81								

Figure 4.11: Mina LC changes
Source: Edited by author

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Land cover	1998 km2	1998 %	2003 km2	2003 %	change98-03 km2	change98-03 %	2008 km2	2008 %	Change03-08 km2	Change03-08 %	2013 km2	2013 %	Change08-13 km2	Change08-13 %	Change98-13 km2	Change98-13 %
Urban	0.30	2.56	0.76	6.51	0.46	153.88	0.81	6.94	0.05	6.58	1.12	9.59	0.31	38.17	0.82	273.88
Soil	2.22	18.99	2.04	17.44	-0.18	-8.19	2.00	17.14	-0.03	-1.71	1.72	14.72	-0.28	-14.10	-0.50	-22.49
Vegetation	0.04	0.32	0.06	0.54	0.03	66.67	0.10	0.87	0.04	61.30	0.06	0.54	-0.04	-38.26	0.02	65.97
Street	0.89	7.64	0.89	7.64	0.00	0.00	0.90	7.66	0.00	0.20	0.93	7.99	0.04	4.32	0.04	4.53
Mountain	8.23	70.48	7.93	67.87	-0.30	-3.70	7.87	67.40	-0.06	-0.70	7.85	67.16	-0.03	-0.36	-0.39	-4.71
Total area								11.68								

Figure 4.12: Muzdalifah LC changes

Source: Edited by author

Land cover	1998 km2	1998 %	2003 km2	2003 %	change98-03 km2	change98-03 %	2008 km2	2008 %	Change03-08 km2	Change03-08 %	2013 km2	2013 %	Change08-13 km2	Change08-13 %	Change98-13 km2	Change98-13 %
Urban	0.35	3.29	0.43	4.14	0.09	25.78	0.57	5.47	0.14	32.05	0.72	6.84	0.14	25.04	0.37	107.68
Soil	2.87	27.39	3.69	35.22	0.82	28.61	2.89	27.53	-0.81	-21.83	2.64	25.15	-0.25	-8.64	-0.23	-8.16
Vegetation	2.76	26.31	2.26	21.58	-0.50	-17.99	3.22	30.73	0.96	42.44	2.62	25.03	-0.60	-18.55	-0.13	0.00
Street	1.02	9.72	1.05	10.06	0.04	3.51	1.07	10.25	0.02	1.90	1.90	18.12	0.82	76.79	0.88	86.46
Mountain	3.49	33.29	3.04	29.00	-0.45	-12.89	2.73	26.04	-0.31	-10.20	2.61	24.90	-0.12	-4.40	-0.88	-25.21
Total area								10.48								

Figure 4.13: Arafat LC changes

Source: Edited by author

4.3.5 The Hajj sites in terms of Mecca's urban changes pattern

The focus for this part of the study is on that changes that have occurred in terms of UC. In other words, the built-up area, which represents the pattern of

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urban growth of Mecca. This type of study and analysis is important for gaining an understanding of how important the location of the underused HS is. Below, Figure 4.14 shows the changes in UC that occurred between 1998 to 2013, by km² and by percentage. As can be observed, UC increased by 56.76% from 1998 to 2013. The highest rate of changes was between 2003 and 2008, at a rate of 17.61%.
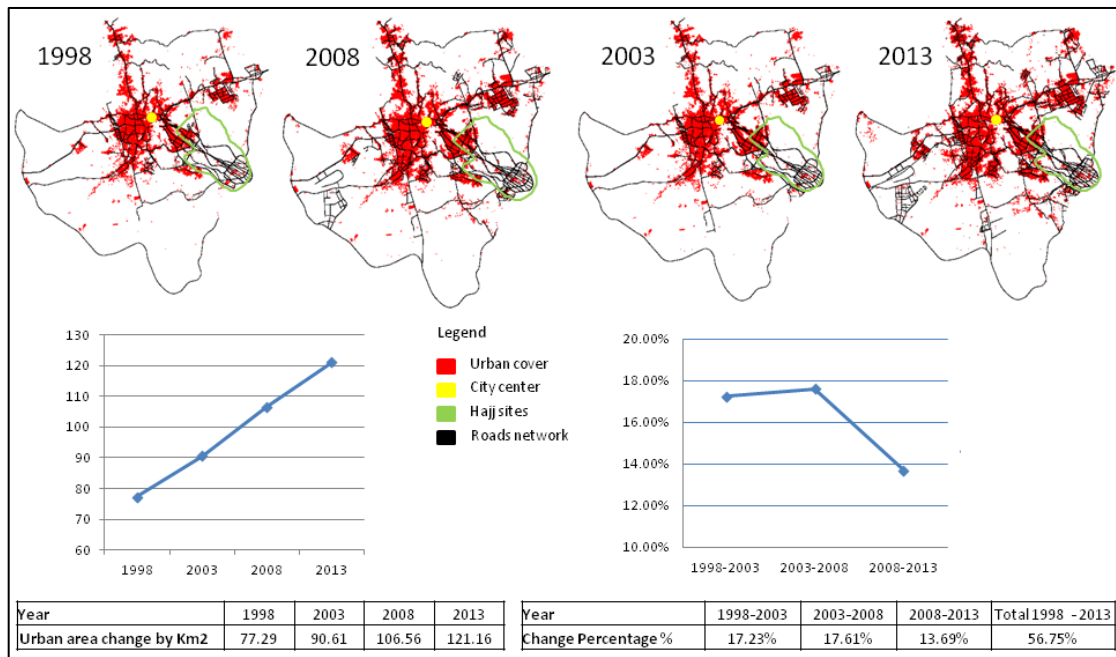
Figure 4.14: Maps of urban cover changes between 1998 and 2013

Source: Edited by author

However, it is more important to observe the patterns and dynamics of UC changes in terms of Mecca's urban growth and the HS. Therefore, to gain a better understanding of urban growth and its behaviours, the UC maps obtained from the classification of the four years were divided into five main parts (namely, Northeast (NEP), Southeast (SEP), Southwest (SWP), West (WP), and Northwest (NWP)), in order to calculate the percentage of change for each part, as well as to discover which part exhibited the highest percentage of change. This was essential for determining the importance of the location of the HS.

The parts were divided according to directions of urban change, which were influenced by the surrounding mountains and the highways that connect

Mecca with the five important cities of Jeddah, Al-madinah, Riyadh, Taif and Jizan (Figure 4.15).
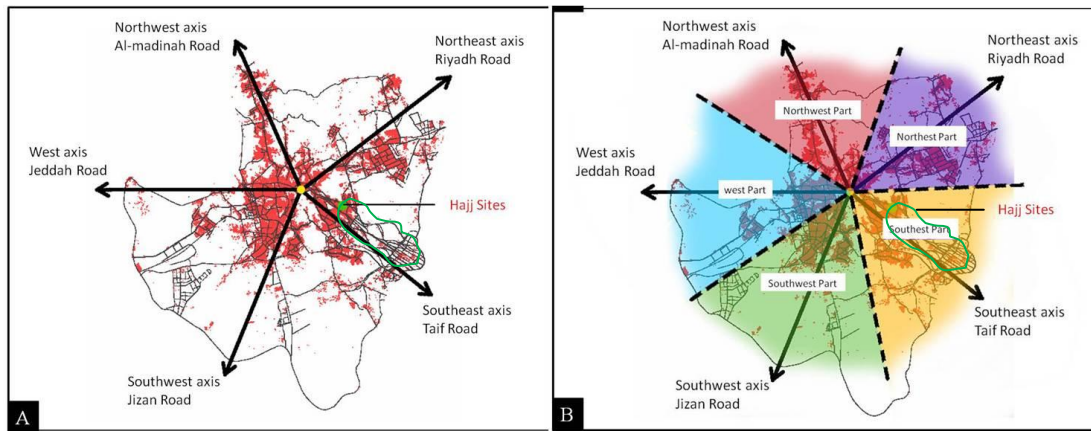
Figure 4.15: Urban growth direction whereby: A) the main axis and B) the separate parts

Source: Edited by author

The HS are located within the SEP, as shown in the Figure 4.15. The following figures; Figure 4.16, Figure 4.17, Figure 4.18, Figure 4.19, Figure 4.20 and Figure 4.21; show the change in UC for each part. Although, all land cover data for each part is provided in appendix C.
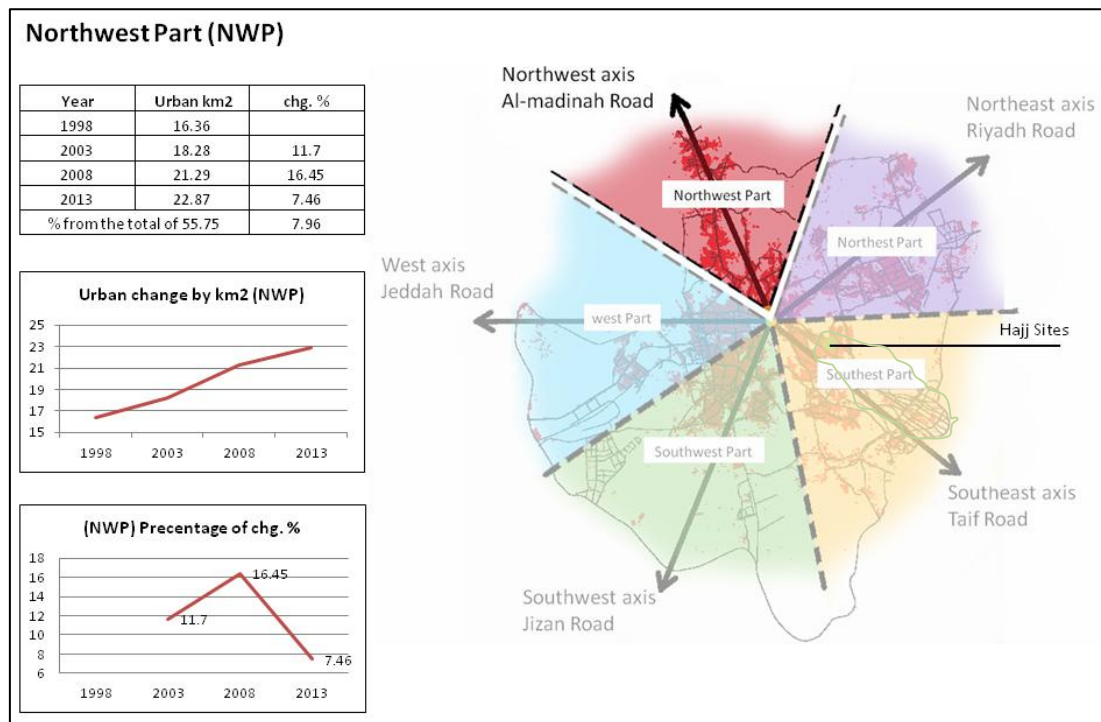
Figure 4.16: Urban cover changes for the Northwest part

Source: Edited by author

Northeast Part (NWP)

Year	Urban km2	Chg. %
1998	16.02	
2003	19.22	19.96
2008	23.9	24.34
2013	30.3	26.78
% from the total of 55.75		17.82

Urban change by km2 (NWP)

(NWP) Precentage of chg. %

Northwest axis
Al-madinah Road

Northeast axis
Riyadh Road

Northwest Part

Northest Part

West axis
Jeddah Road

west Part

Hajj Sites

Southest Part

Southwest Part

Southeast axis
Taif Road

Southwest axis
Jizan Road
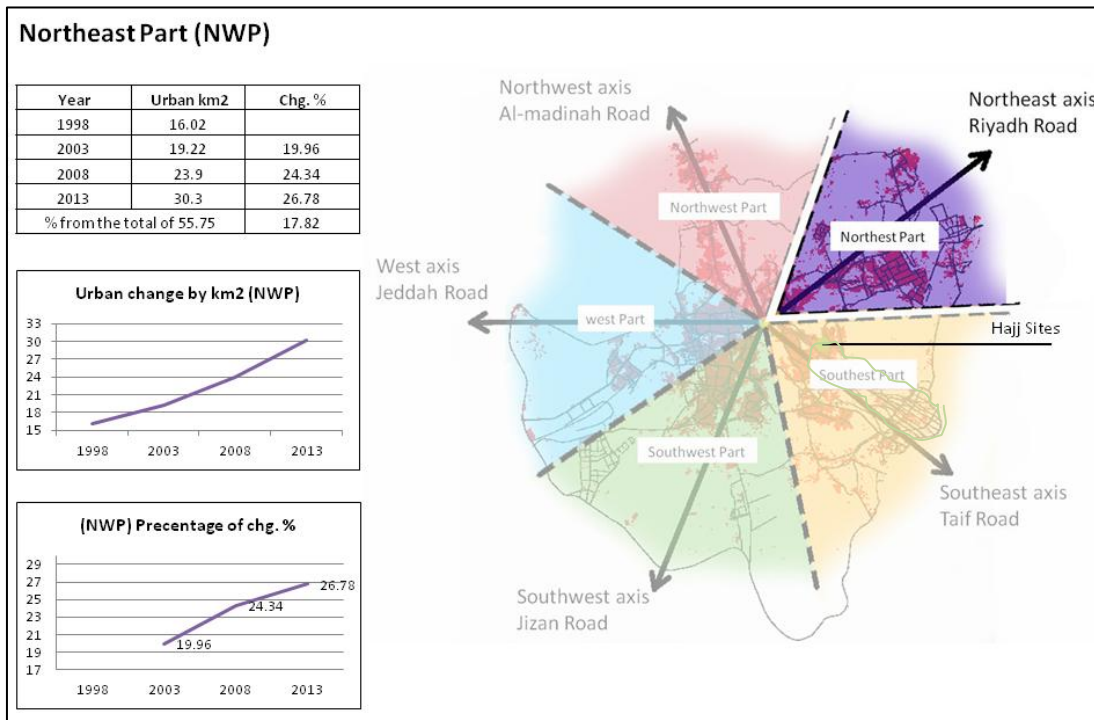
Figure 4.17: Urban cover changes for the Northeast part

Source: Edited by author

Southeast Part (SEP)

Year	Urban km2	chg. %
1998	13.17	
2003	16.16	22.69
2008	19.26	19.14
2013	22.55	17.1
% from the total of 55.75		14.23

Urban change by km2 (SWP)

(NWP) Precentage of chg. %

Northwest axis
Al-madinah Road

Northeast axis
Riyadh Road

Northwest Part

Northest Part

West axis
Jeddah Road

west Part

Hajj Sites

Southest Part

Southwest Part

Southeast axis
Taif Road

Southwest axis
Jizan Road
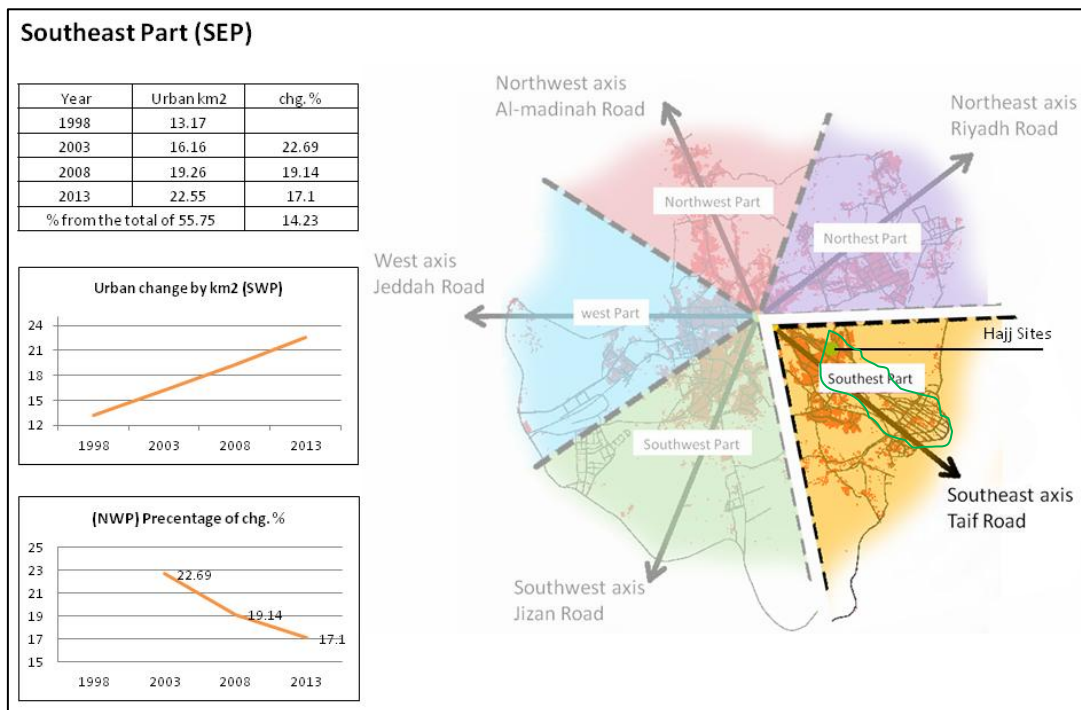
Figure 4.18: Urban cover changes for the Southeast part

Source: Edited by author
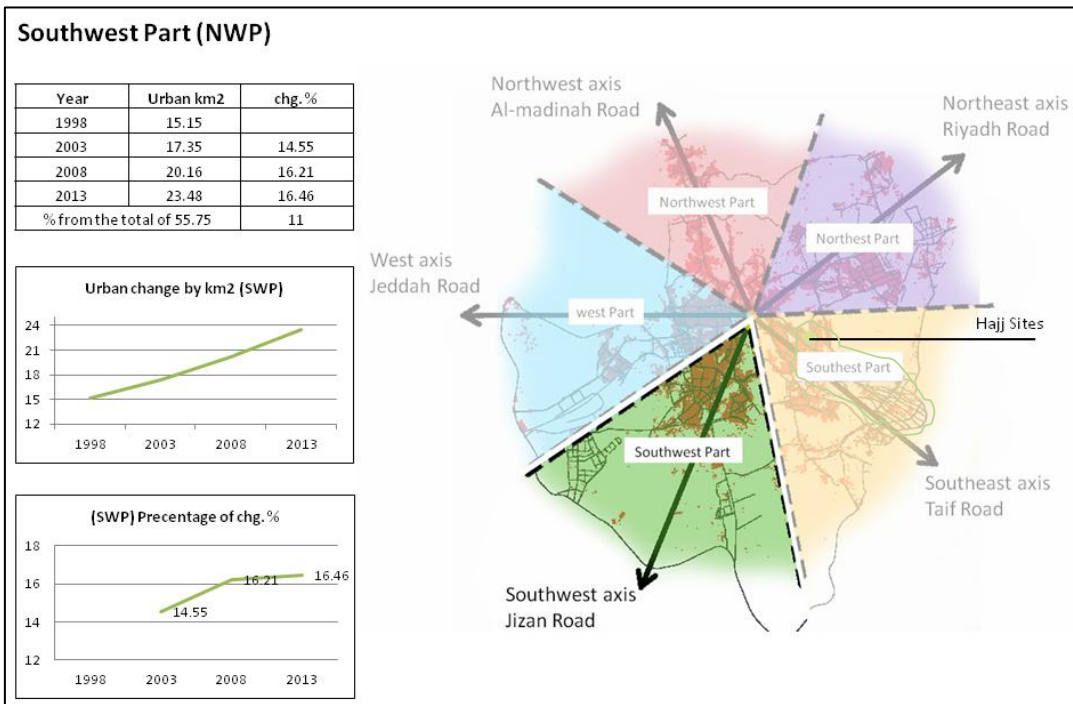
Figure 4.19: Urban cover changes for the Southwest part

Source: Edited by author
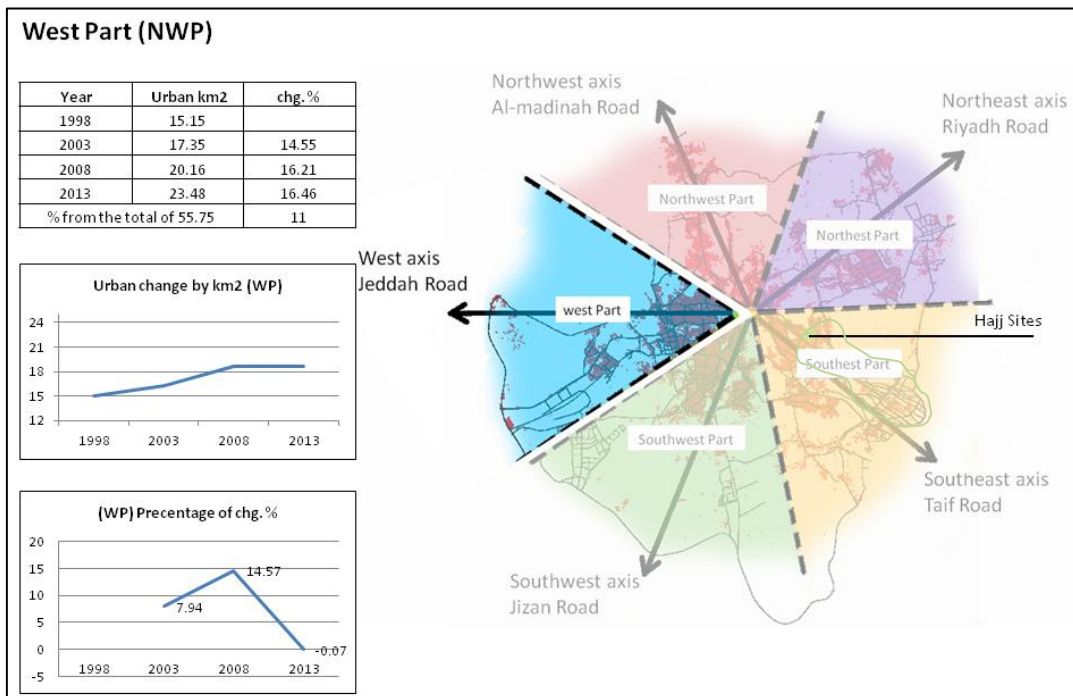
Figure 4.20: Urban cover changes for the West part

Source: Edited by author

Urban cover area change by km2

Year	NWP	NEP	SEP	SWP	WP
1998	16.36	16.02	13.17	15.15	15.04
2003	18.28	19.22	16.16	17.35	16.24
2008	21.29	23.9	19.26	20.16	18.6
2013	22.87	30.3	22.55	23.48	18.59

Percentages of change %

Year	NWP	NEP	SEP	SWP	WP
1998-2003	11.7	19.96	22.69	14.55	7.94
2003-2008	16.45	24.34	19.14	16.21	14.57
2008-2013	7.46	26.78	17.1	16.46	-0.07
Total chg.	39.78	89.1	71.18	55.03	23.58
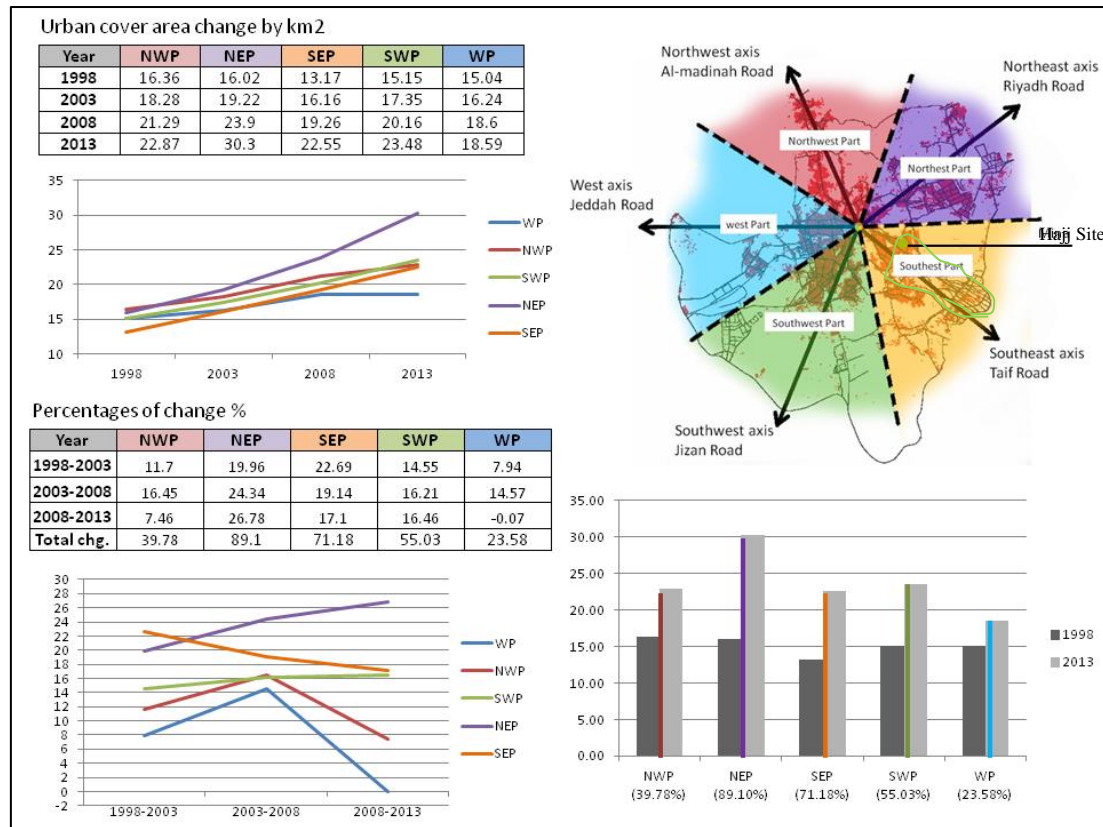
Figure 4.21: Urban cover changes for all of the parts
Source: Edited by author

These results demonstrate that a high percentage of change occurred for the NEP and the SEP between 1998 and 2013, which increased by 14.27 km² (89.1%) and 11.20 km² (71.18%) respectively (Table 4.5). This represents approximately 58.2% of the total UC change in Mecca, and could be a result of the impact that the HS located there have had on the surrounding areas. This is due to the fact that urban development is likely to have been affected by the pilgrims' activities (Ascoura, 2013). These findings also indicate that the HS are located in the parts where the highest UC growth has occurred. Again, this increases the potential for the HS due to the nature of Mecca's urban growth.

On the other hand, the lowest percentage of change was in the WP. It increased by just 3.55 km² (23.58%). This is probably due to the fact that the city centre is located in this part, which has not changed considerably over time, and this is consistent with other city centres worldwide. In general, the distribution of urban areas in Mecca has been influenced by topography, which controls the trend of urbanisation (Alqurashi et al., 2014).

The main parts of urban cover growth	1998		2003		Change between 1998-2003 by %	2008		Change between 2003-2008 by %	2013		Change between 2008-2013 by %	1998-2013 Total change		Percentage of the total change of 56.75%
	Area		Area			Area			Area					
	Km²	%	Km²	%		Km²	%		Km²	%		Km²	%	
NWP	16.36	21.17	18.28	20.17	11.70	21.29	19.97	16.45	22.87	18.88	7.46	6.51	39.78	14.02
NEP	16.02	20.73	19.22	21.21	19.96	23.90	22.42	24.34	30.30	25.00	26.78	14.27	89.10	31.40
SEP	14.72	19.05	19.53	21.56	32.66	22.63	21.23	15.84	25.92	21.40	14.56	11.20	76.04	26.80
SWP	15.15	19.60	17.35	19.15	14.55	20.16	18.92	16.21	23.48	19.38	16.46	8.33	55.02	19.39
WP	15.04	19.46	16.24	17.92	7.94	18.60	17.45	14.57	18.59	15.34	-0.07	3.55	23.58	8.31
Total	77.30	100	90.62	100	17.23	106.58	100.01	17.61	121.16	100.00	13.69	43.86	56.75	56.75

Table 4.5: Urban cover changes for each part

Source: Edited by author

Moreover, it can be observed that the WP saw a lower percentage of change than the NEP, although it was expected to have the highest percentage of change due to the connectivity and proximity analysis undertaken in chapter 3, which showed in figure 3.14 that Mecca has more connection with the city of Jeddah that is located west of Mecca, while the NEP is located within the part where there is the road that leads to Riyadh (the capital city of Saudi Arabia). There could be many reasons behind this; the first one being that WP has the lowest percentage of street cover, while the NEP and the SEP had the highest percentage of street cover in 1998 (Table 4.6) and as mentioned previously, the street cover (the road networks), as well as the topography, has controlled the trend of urbanisation in Mecca,

Porcentages of each LC per each part	WEP		NEP		NWP		SEP		SWP	
	%		%		%		%		%	
	1998	2013	1998	2013	1998	2013	1998	2013	1998	2013
Street	1.09	2.67	2.40	2.93	1.77	2.50	3.56	4.37	1.20	1.81
Urban	7.91	9.77	6.79	12.84	11.25	15.73	5.02	8.83	4.32	6.97
Vegetation	0.16	0.87	0.27	0.79	0.62	1.41	1.79	2.35	0.30	1.75
Soil	61.90	59.32	54.35	48.70	27.16	24.50	37.43	34.69	59.94	57.32
Mountain	28.94	27.36	36.18	34.74	59.19	55.85	52.21	49.76	34.24	32.16
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 4.6 The percentages of each land cover class for each part, where it can be observed that the WP had the lowest percentage of street cover in 1998

Source: Edited by author

On the other hand, the second reason that the WP saw the lowest urban cover changes is that during the years after 2008 and before 2013, there were many development projects in Mecca regarding the expansion of the holy mosque and it surrounding areas in order to increase its capacity, and to do so, the local authorities had to undertake some demolition works within the built-up

area that surrounded the holy mosque, which affected the total percentage of urban cover within the WP area (Figure 4.22) (Okaz news, 2011).
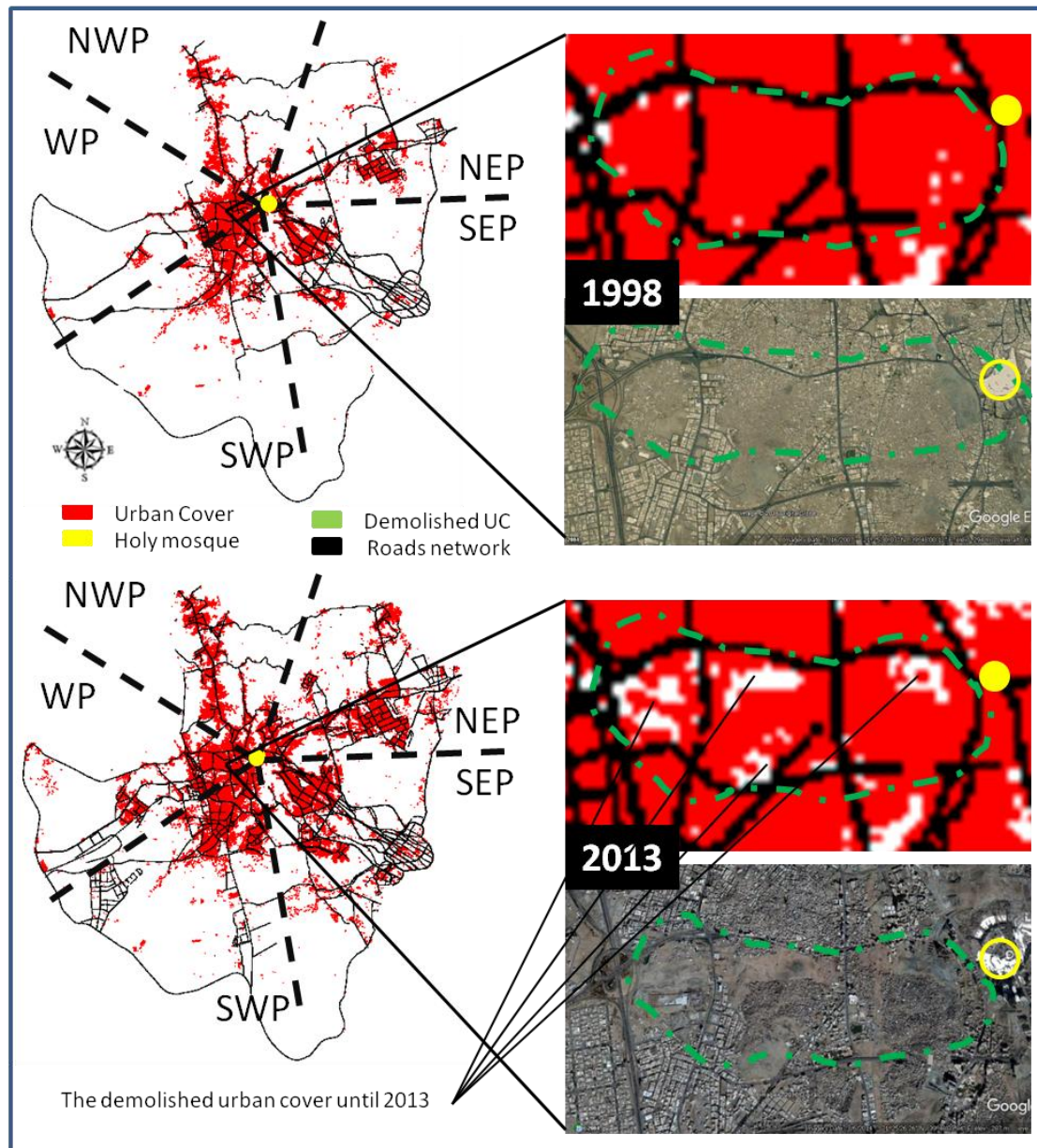
Figure 4.22 LC maps of Mecca for 1998 and 2013, where the zones where some demolition works occurred can be seen, which helps to explain the reason behind the lowest UC percentage of change within the WP

Source: Google earth manipulated by author

Moreover, the third reason is that during the same period, the government launched a high-speed rail project that linked Mecca with Jeddah and Al-Madinah, as shown in Figure 3.14 in chapter 3. Therefore, the impact of this project on the urban cover of Mecca, especially within the WP, was that a rail

station was planned to be built within a location that belonged to WP area, and as a result of that, some further demolition works needed to be done in order to build the new rail station and its facilities, thus such demolition has affected the total percentage of urban cover within the WP. As shown in the previous Table 4.11, between 2008 and 2013, the urban cover in WP decreased instead of increasing as expected (Figure 4.22).

Furthermore, to gain a better understanding of the urban structure behaviour of Mecca in terms of the HS, an urban morphology analysis was applied. This was considered essential in relation to urban development, since it helps in identifying and determining the resilience of the whole urban system. Besides that, urban morphology analyses help to identify the transformation and evolution of urban forms and structures (Cheng, 2011).

In this study, the morphology index known as *entropy* was employed, which has recently been used to describe the structure and behaviour of different systems, such as with regard to LC changes (Cabral, 2013). The advantage of entropy is that it's simple to use and easy to integrate with GIS (Yeh et al., 2001). The application of this index was done by subdividing windows of 1887.18 square kilometres. This covered all of Mecca, including the HS, and divided it into a grid composed of cells of .01 sq. km, thus enabling the entropy value (high/low) for each cell to be calculated.

The highest cell value was 1 and the lowest was 0. Cell values close to one indicate that there is more chance of change, and cell values close to zero indicate that change is less likely. Urban development often requires high values (Cabral, 2013), therefore in this study, the parts with higher entropy values indicate greater opportunities for change and growth, and vice versa (Figure 4.23).

Results from the entropy index show that the total number of calculated cells increased by approximately 54.33 percent, from 16,968 cells in 1998 to 26,187 cells in 2013. The number of high-value cells also increased by 51.97%, from 10,021 cells in 1998 to 15,229 in 2013. The change statistics for the four years and for each part are shown in Figure 4.24.
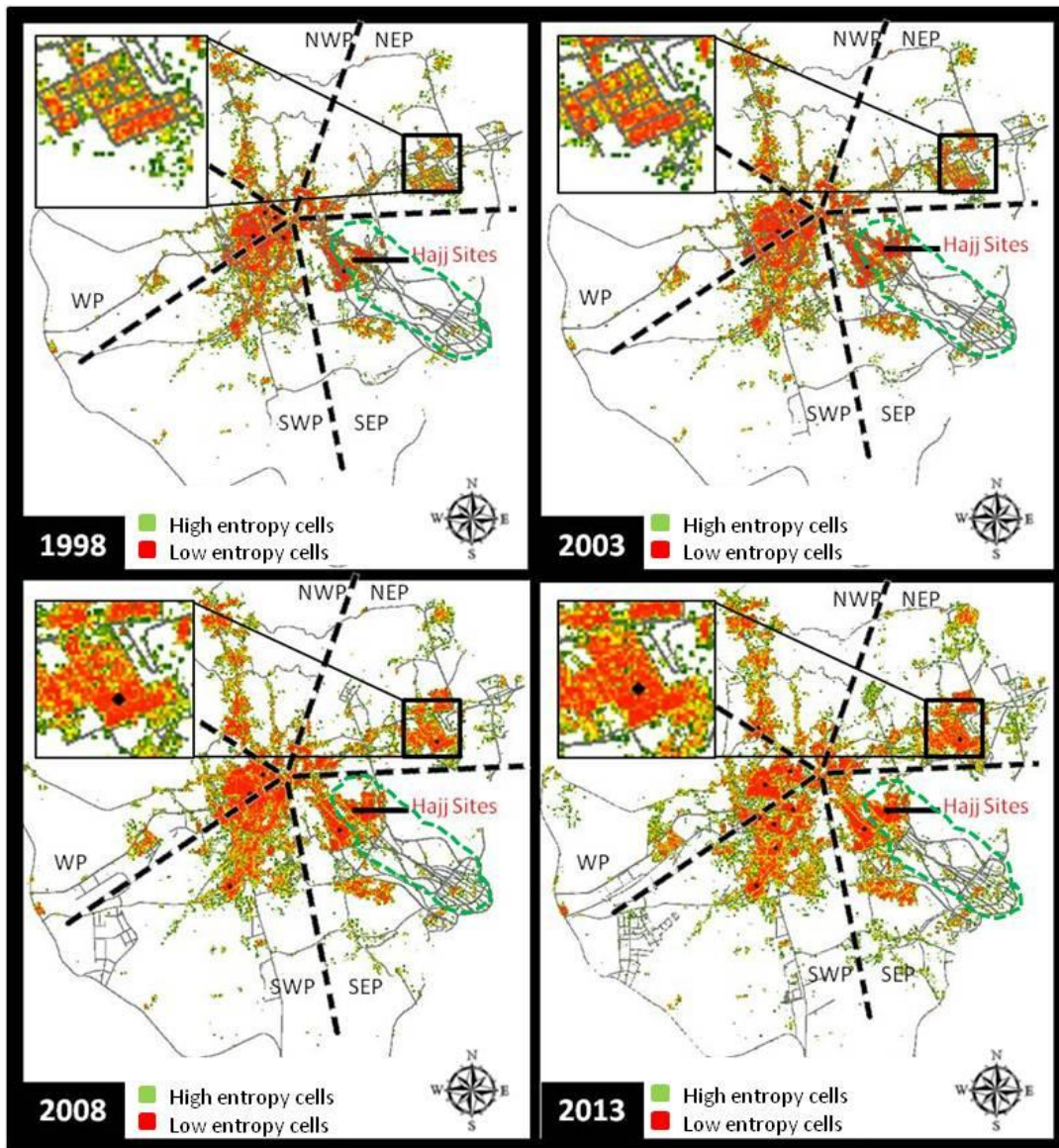
Figure 4.23: the entropy cells for all years of study

Source: Edited by author

	NEP	NWP	SEP	SWP	WP
High Ent. 1998	2499	2075	2006	2467	1115
High Ent. 2003	2670	2184	2261	2565	1171
High Ent. 2008	3170	2254	2700	2741	1502
High Ent. 2013	4118	2524	3561	2960	2280
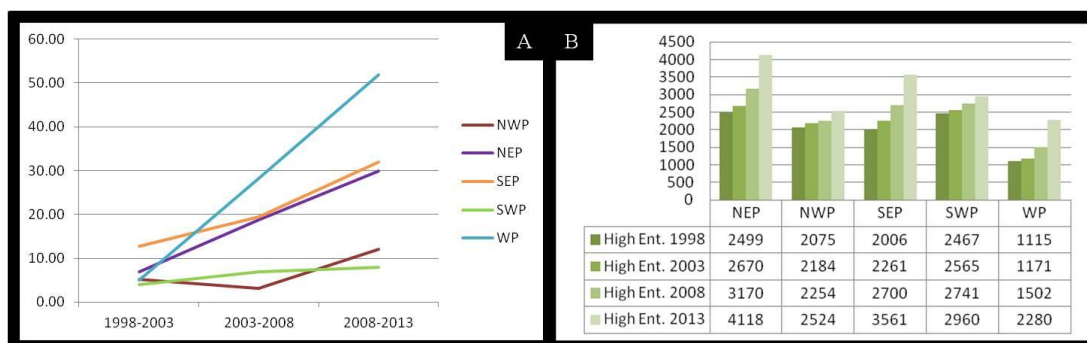
Figure 4.24: Charts showing the entropy changes: A) The percentage of high entropy change for all parts and B) The number of high entropy cells

Source: Edited by author

Moreover, this table shows that the NEP and SEP had the highest values in 2013 and that the NEP had the highest values during all the years of study. In contrast, the WP has the lowest number of high values, indicating that the NEP and SEP have greater opportunities for growth and expansion than other parts studied, due to the increases in public services, buildings and road networks connecting the different pilgrimage site facilities located there.

However, the WP has the lowest number of high values, and has the highest percentage of change during the 15 years of study. This is due to demolition work and development in the central part of Mecca, where the holy mosque is located. These findings give the HS location more potential within the scope of future urban growth of Mecca, which supports the researcher's previous findings indicating that the parts where the HS are located are the parts that have experienced the highest rates of UC changes over the last 15 years. The application of the entropy index indicates that the same parts also have a higher potential for change.

4.3.6 The Hajj sites in terms of Mecca's urban growth prediction

Predicting future urban growth for a city helps decision-makers and urban planners to evaluate different planning scenarios (Ebrahimipour et al., 2016). Nowadays, remote sensing technologies and GIS, as well as modeling and simulation, are efficient tools for urban management as they can be used for detecting and predicting changes, as well as influencing the measures and policies affecting the future of urban growth planning (Ebrahimipour,. et al, 2016). Scenario-based modeling approaches to UC changes allow researchers to establish a more purposeful understanding of future urban changes (Vliet et al., 2009).

Moreover, the scientific community has developed numerous urban growth prediction models over the past few decades in order to study UC dynamics and to simulate urban growth (Triantakonstantis & Mountrakis, 2012). Modeling urban growth also helps researchers to assess the extent of previous and current urban development processes, and enables them to predict the

potential consequences of spatiotemporal dynamics in an urban environment (Atak et al., 2014).

Additionally, we believe that understanding the relationship between the location of UUS spaces and the location's predicted urban growth areas can allow for the making of appropriate decisions regarding the reuse of UUS. This is particularly significant as these spaces have the potential to play a powerful role in accommodating new growth needs (Pagano and Bowman, 2000). Therefore, understanding the relationship between the HS locations and the predicted urban growth areas of Mecca can help decision-makers and local authorities in Mecca to consider the potential of the HS and help them decide whether the facilities will be able to cope with the new possible growth needs within those areas.

There are two broad categories of LC change models that have been used over the past several decades (Hu & Lo, 2007). These are dynamic, simulation-based models and statistical estimation models. Simulation-based models, such as cellular automata (CA), attempt to capture the spatiotemporal pattern of urban change by incorporating spatial interaction effects into the model, while statistical estimation models use statistical analysis to reveal the interaction between LC changes and explanatory variables (Abebe, 2013).

The appropriate method to use varies, based on the desired information one wishes to find, the availability of data and the time available, whilst also taking into consideration the many factors that seem to be responsible for changes in urban growth. These factors can be categorised into four categories: biophysical, socio-economic, cultural and institutional. It is impossible to include them all in a model, as the less complex a model is, the faster and more understandable the processes become (Triantakonstantis & Stathakis, 2015).

In this study, a multiple regression method was used, in order to explore the major determinants of change in urban patterns in Mecca. This method is an empirical estimation model that uses statistical techniques to model relationships between UC changes and biophysical factors. The advantage of using statistical models is their simplicity of construction and interpretation

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and their capacity for correlating spatial patterns of urban growth with driving forces mathematically (Abebe, 2013).

Therefore, for modelling the urban growth of Mecca, for each part, the different LC change values in Mecca between 1998 and 2013 (Table 4.7) were initially considered. This was done so as to examine whether there is any coefficient correlation between the values and the UC change value, and was undertaken by using a data analysis tool in Excel 2007.

Total changes from 98-13 by %					
	Street	Vegetation	Soil	Mountain	Urban
WP	27.29	443.49	-2.23	-1.82	23.58
NEP	43.76	191.40	-9.43	-2.54	89.10
NWP	41.27	126.90	-2.95	-2.50	39.78
SEP	22.56	31.29	-5.30	-3.24	76.04
SWP	65.41	484.68	-4.38	-19.40	55.08

Table 4.7: Land cover change values between 1998 and 2013
Source: Edited by author

When values are from 0 to 0.25 or from 0 to -0.25, this indicates the absence of correlation. While values from 0.25 to 0.50 or from -0.25 to -0.50 point to a poor correlation between variables. Values ranging from 0.50 to 0.75 or -0.50 to -0.75 indicate a moderate to good correlation, and values from 0.75 to 1 or from -0.75 to -1 point to a very good to excellent correlation among the variables (Dawson et al., 2001).

This can be understood logically. If large values of one variable tend to be associated with large values of the other, this is a positive correlation. If small values of one variable tend to be associated with large values of the other, this will indicate a negative correlation. Further, if the values of both variables tend to be unrelated, this indicates a correlation near zero

As the objective here was to identify any correlation between the UC and another category, it can be clearly observed in Table 4.8 that there is a strong negative correlation between changes in the UC and changes in vegetation and soil covers (SC). Thus, the increase of the UC can be seen to be correlated with the decrease of SC and vegetation cover, and vice versa.

	Street	Vegetation	Soil	Mountain	Urban
Street	1				
Vegetation	0.518816396	1			
Soil	-0.148923174	0.333771103	1		
Mountain	-0.835464405	-0.593066809	-0.068001502	1	
Urban	0.080253002	-0.512979047	-0.924886828	-0.013267078	1

Table 4.8: Correlation results for LC changes between 1998 and 2013

Source: Edited by author

Moreover, in order to find out whether the coefficient correlation was significant, a multiple regression calculation was applied through using an analysis tool in Excel. If the coefficient of correlation is significant in regards to the set limit of significance (commonly $P < 0.05$), it can be concluded that the coefficient of correlation is significant and may be interpreted. If the value is $P > 0.05$, it may be concluded that the coefficient of correlation is not significant and it should not be interpreted, regardless of its value (Dawson et al., 2001).

To estimate relationships among variables, a regression analysis was applied. It only focused on the relationship between a dependent variable (UC) and the independent variables (vegetation and soil covers), and thus ignored the other values, which had no correlation with UC changes (Table 4.9).

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.949935269
R Square	0.902377015
Adjusted R Square	0.80475403
Standard Error	11.71117031
Observations	5

ANOVA

	df	SS	MS	F	Significance F
Regression	2	2535.51702	1267.75851	9.243489263	0.097622985
Residual	2	274.30302	137.15151		
Total	4	2809.82004			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	25.82052827	16.19381533	1.594468489	0.25187079	-43.85583547	95.496892	-43.85583547	95.496892
Vegetation	-0.030581641	0.031178229	-0.980865227	0.430085469	-0.164730735	0.103567453	-0.164730735	0.103567453
Soil	-7.964712357	2.200912268	-3.618823192	0.068595935	-17.43447353	1.505048819	-17.43447353	1.505048819

Table 4.9: Regression analysis of LC changes between 1998 and 2013

Source: Edited by author

If the P-Value is less than .05, this means that there is at least a 95% chance that there is a true relationship between these variables, thus it can be calculated that the exact percent of chance is (1-"sig")100. However, the P-value of SC is 0.069, as shown in the table. As it very close to 0.05, it may be assumed that there might be a significant correlation between UC changes and SC changes. This means that the change in the variable of the SC area can predict changes in UC. Thus, a multiple regression analyses was applied once again, using only the significant predictors from the previous table, so as to obtain a regression equation for these significant predictors and to then predict the percentage of UC (Table 4.10).

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.924886828
R Square	0.855415644
Adjusted R Square	0.807220859
Standard Error	11.63695293
Observations	5

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2403.564019	2403.564019	17.74913279	0.024431682
Residual	3	406.2560207	135.4186736		
Total	4	2809.82004			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	14.503260	11.290787	1.284522	0.289163	-21.429064	50.435585	-21.429064	50.435585
Soil	-8.685257	2.061551	-4.212972	0.024432	-15.246032	-2.124481	-15.246032	-2.124481

Table 4.10: Regression analysis of significance values
Source: Edited by author

The results show that the P-Value is .024. This is lower than .05. Therefore, the probability that the relationship between urban change and (SC) change is not true is 0.024, and the calculation (1-".024")100 = 96.4% shows that there is a 96.4 percent probability of a relationship existing between UC and SC. The regression equation is:

$$Y = a + bX,$$

Where *X* is the explanatory variable, *Y* is the dependent variable, *a* represents the intercept coefficient and *b* represents the variable coefficient. Therefore, the equation will be:

Predicted urban change percentage = -8.685(Percentage of (SC) area change) + 14.503.

In order to examine the accuracy of the equation, the percentage of UC change of the WP was recalculated using the values shown in the previous Table 4.7 and the equation below:

WP urban change = -8.685(-2.23) + 14.501 = 33.87, which is 30.38 % more than the real value

If one wants to use this equation to predict the future percentage of UC change for any area, the result having an error of +30.38 % must be taken into account.

On the other hand, in order to enhance the equation's accuracy, another two biophysical variables were added. These were the distance of each part from the city centre, known as the CBD, and the distance of each part from the centre of the HS, as the case study is concerned with determining whether the locations of the HS have a significant correlation with UC changes. The correlation analysis was applied again using the same tool, as mentioned in the previous step, through using the values of LC change between 1998 and 2013, in addition to the two new distances variables mentioned above and shown in Figure 4.25 and Table 4.11.
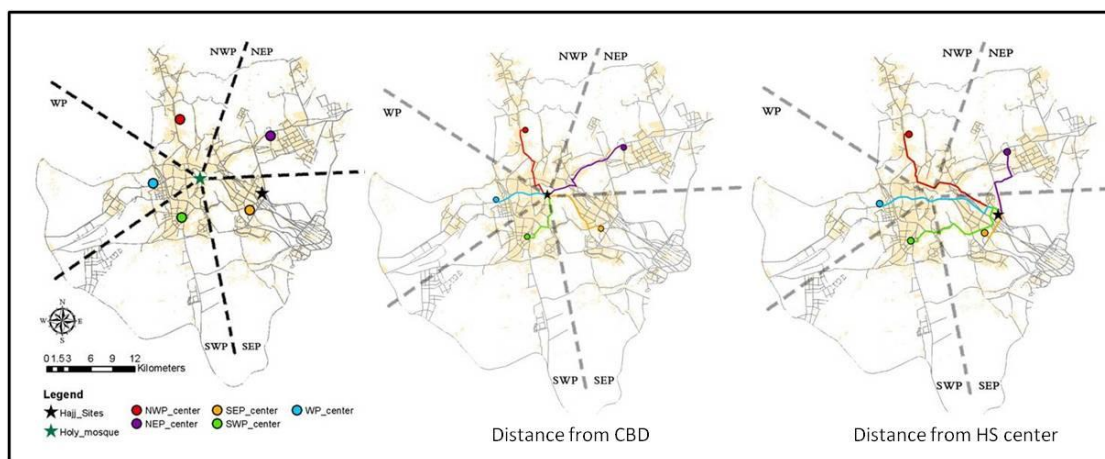
Figure 4.25: Calculation of the distance of each part from the centre of Mecca and the centre of the HS

Source: Edited by author

The official centre of Mecca, where the holy mosque is located, was considered to be the CBD, while the centre of the HS and the centres of each part were selected with regard to their UC mass centriod since there were no official centres defined. The distance values were calculated based on the real

road networks' distance and were converted into percentages in order for them to be included with the LC changes' percentages (Table 4.11).

Total LC Changes 98-13 + distances values (%)							
	Street	Vegetation	Soil	Mountain	Urban	Dis.CBD	Dis.HS
WP	27.29	443.49	-2.23	-1.82	23.58	14.18	25.32
NEP	43.76	191.40	-9.43	-2.54	89.10	18.53	23.84
NWP	41.27	126.90	-2.95	-2.50	39.78	18.95	6.02
SEP	22.56	31.29	-5.30	-3.24	76.04	27.03	14.69
SWP	65.41	484.68	-4.38	-19.40	55.08	21.31	30.13

Table 4.11: Percentage of each LC change for each part and the distance from Mecca centre and the HS parts as a percentage

Source: Edited by author

The correlations in Table 4.12 show that there are still negative correlations between UC change, vegetation and SC change. However, there is a positive correlation with the distance from the city centre, meaning that there are increased changes in UC when further from the centre.

	Street	Vegetation	Soil	Mountain	Dis.CBD	Dis.HS	Urban
Street	1						
Vegetation	0.518816396	1					
Soil	-0.148923174	0.333771103	1				
Mountain	-0.835464405	-0.593066809	-0.068001502	1			
Dis.CBD	-0.070290191	-0.571740324	-0.245784823	-0.220271784	1		
Dis.HS	0.432649487	0.792006067	-0.212263438	-0.563438106	-0.255025676	1	
Urban	0.080253002	-0.512979047	-0.924886828	-0.013267078	0.595521021	0.064259259	1

Table 4.12: Correlation results of LC changes between 1998 and 2013 and distance from Mecca centre and the HS area

Source: Edited by author

Therefore, when the regression analysis was run again, using the percentage of SC changes, in addition to the variable of the distances from CBD for each part, the following results were determined from the analysis:

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.999850821							
R Square	0.999701665							
Adjusted R Square	0.999403329							
Standard Error	0.647405981							
Observations	5							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	2	2808.981771	1404.490886	3350.931201	0.000298335			
Residual	2	0.838269007	0.419134504					
Total	4	2809.82004						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-25.31335516	1.426033226	-17.75088735	0.003158627	-31.44908091	-19.17762941	-31.44908091	-19.17762941
Soil	-7.780791133	0.118321148	-65.7599361	0.000231167	-8.289885943	-7.271696322	-8.289885943	-7.271696322
Dis.CBD	2.21063238	0.071079089	31.10102293	0.001032233	1.904803744	2.516461017	1.904803744	2.516461017

Table 4.13: Regression results of the correlated variables

Source: Edited by author

The regression (Table 4.13) shows that there is a high probability of a significant relationship between UC and the SC, as well as UC and the distance from central Mecca. However, the problem here is that the R Square shows a very high value of around 0.99. This is statistically rare when compared to the sample size that was analysed, while UC change is not totally based on geographical issues yet is also affected by many other economic and social issues.

For this reason, it was decided to enhance the analysis by increasing the sample size, and by adding more variables that could have a possible correlation with urban cover (UC) changes in Mecca. Coolley and Lohnes (1971) recommended a minimum of 200 subjects for any regression analysis. Therefore, in place of dividing the land cover (LC) maps into five parts, as was done before, it was decided to divide the LC maps into small cells of (1*1) Km (Figure 4.26).

For each cell, the areas of urban, Soil, street and mountains cover were counted. The vegetation cover was ignored since there is no significant cover in Mecca as shown in the previous analysis (Figure 4.27).
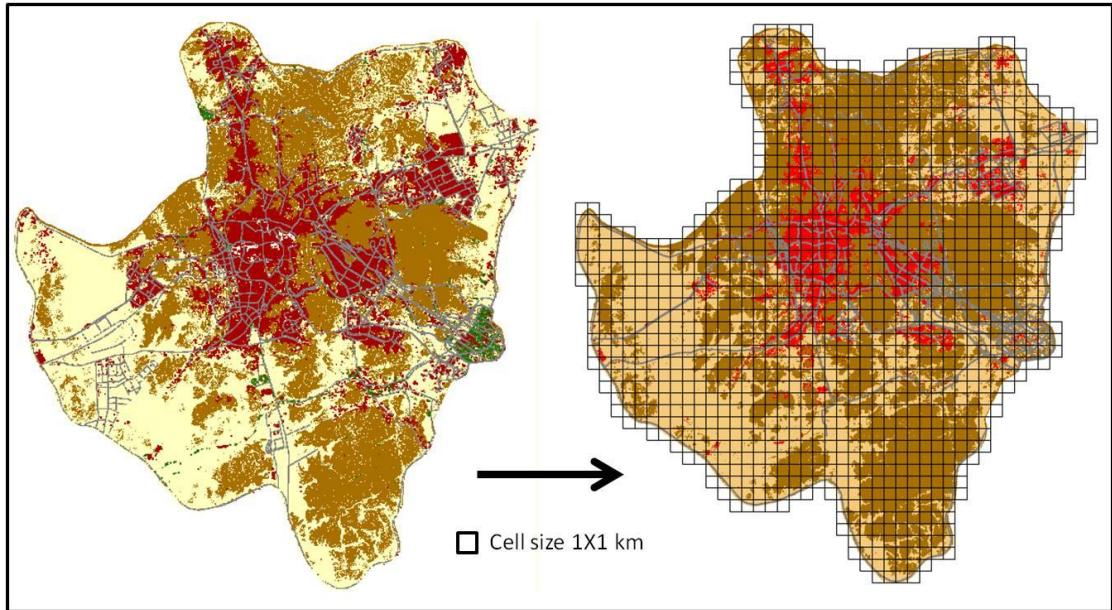
Figure 4.26 LC maps divided into cells

Source: Edited by author
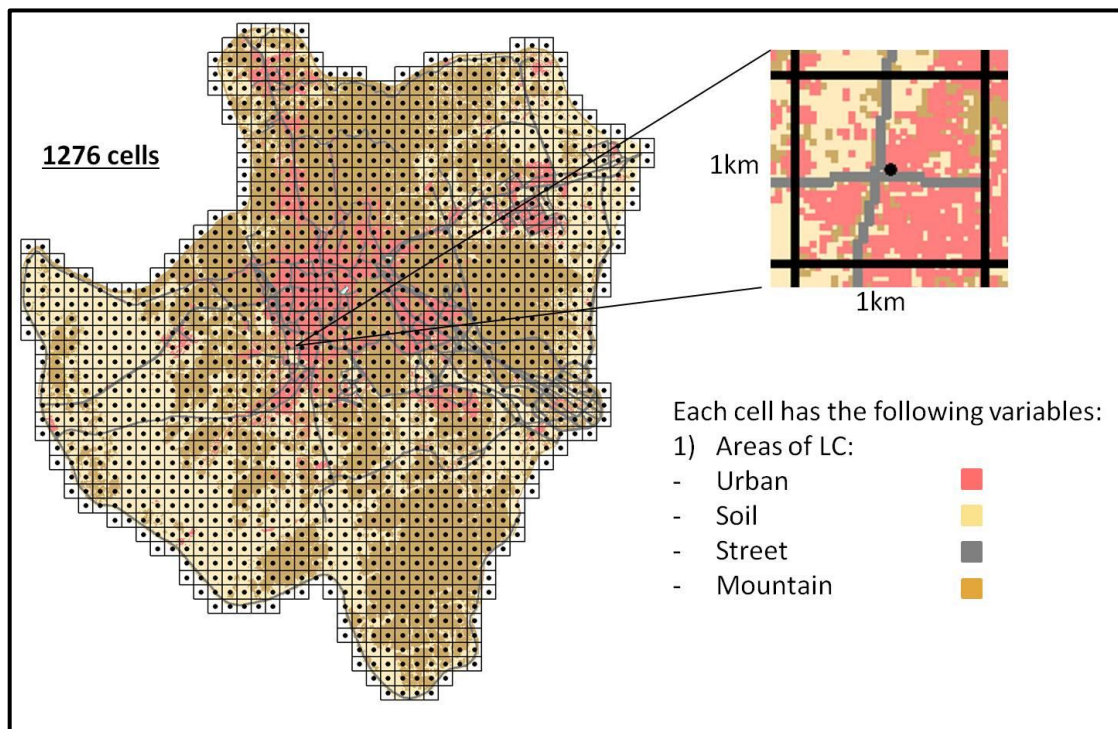
Figure 4.27 Calculated LC for each cell

Source: Edited by author

In addition to the LC areas for each cell, other distance variables were also calculated, including the distance from each cell to the centre of Mecca

(CBD), the centre of the Hajj sites (HS), the boundaries of the HS, to each of the HS areas (known as Mina, Muzdalifa and Arafat), and to main roads and road networks (Figure 4.28)
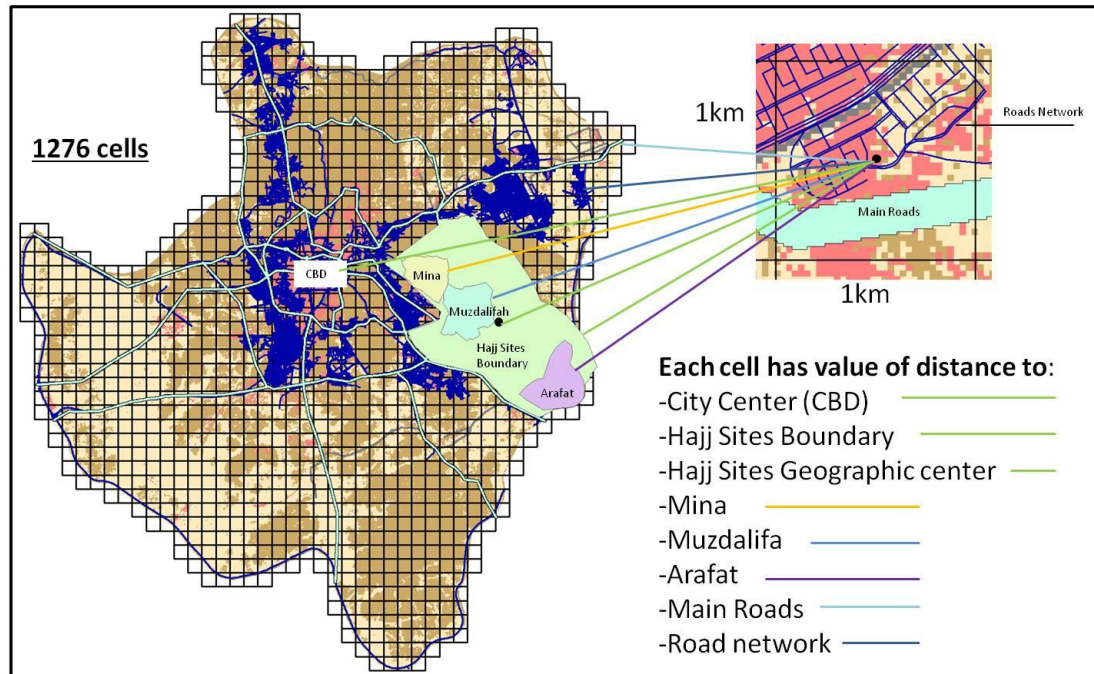
Figure 4.28 Distance variables for each cell
Source: Edited by author

These distances values were calculated based on a straight line between the centre point of each cell and each of the identified locations. The reason behind using the straight line in place of using the real road networks' distance was that not all of the cells contained street cover that could be used to calculate the distance, besides that, there are some cells which are all covered by UC, with no clear roads that can be used to calculate the distance. In addition to that, the high number of cells makes calculating the real distance quite complicated, while in the previous analysis, the real roads' distance was used as there were only five parts and each part had a clear road network, thus it was not complicated to calculate the real distances.

In total, there were 1276 cells and 12 variables that had potential correlations with UC changes. This process was applied for the 1998 and 2013 LC maps. Subsequently, the change in LC for each cell was calculated between the specified years.

The correlation test was the first step in analysing the newly obtained data. The correlation test was ran, however this time, IBM SPSS statistics 22 software was employed, in order to have a better comprehension of the result. For each cell, the correlation with the distance variables was calculated for LC changes between 1998 and 2013 as shown in Table 4.14 (a bigger copy is provided in appendix C).

		Changes in Urban Cover Between 1998 and 2013 by Km2	Changes in Street Cover Between 1998 and 2013 by Km2	Changes in Soil Cover Between 1998 and 2013 by Km2	Changes in DEM Cover Between 1998 and 2013 by Km2	Distance from City Center by Km	Distance from Hajj Sites Boundry by Km	Distance from Mina by Km	Distance from Muzdalifa by Km	Distance from Arafat by Km	Distance from Hajj Sites Center by Km	Distance from Main Roads by Km	Distance from Street Network by Km
Correlations													
Changes in Urban Cover Between 1998 and 2013 by Km2	Pearson Correlation	1	.223**	-.722**	-.201**	-.250**	-.241**	-.301**	-.249**	-.126**	-.221**	-.206**	-.316**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
Changes in Street Cover Between 1998 and 2013 by Km2	Pearson Correlation	.223**	1	-.376**	.016	-.127**	-.077**	-.104**	-.081**	-.039	-.070*	-.158**	-.057*
	Sig. (2-tailed)	.000		.000	.561	.000	.006	.000	.004	.168	.012	.000	.042
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
Changes in Soil Cover Between 1998 and 2013 by Km2	Pearson Correlation	-.722**	-.376**	1	.225**	.140**	.128**	.177**	.149**	.076**	.132**	.140**	.289**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.006	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
Changes in DEM Cover Between 1998 and 2013 by Km2	Pearson Correlation	-.201**	.016	.225**	1	.372**	.317**	.340**	.274**	.151**	.245**	.196**	.079**
	Sig. (2-tailed)	.000	.561	.000		.000	.000	.000	.000	.000	.000	.000	.005
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.14: Correlations between the variables of LC changes from 1998 to 2013, in addition to distance values
Source: Edited by author

As shown above, there is a significant correlation between UC change and all the other introduced variables. Moreover, there are also some variables with higher values of correlation than others. The highest correlation value is between the change in UC and the change in SC, which confirms the previous analysis that identified that increasing UC areas will logically decrease SC areas. This is due to the fact that it is normal to convert SC areas into built-up (UC) cover. The distance from Mina and the distance from the road network also have higher values of correlation than the rest of variables. The other variables have similar values of correlation and the lowest correlation value is between the UC and the distance from Arafat. This can be observed clearly within the previous LC maps (Figure 4.8), where the areas surrounding Arafat are less covered by UC, which demonstrates that the UC becomes lower as the distance to Arafat reduces.

After the correlation tests, it was important to run a multiple regressions test in order to obtain the most important variables, which could help with predicting changes in UC after 2013. All the variables were introduced in this test to see how likely each variable is to affect the prediction of UC change (Table 4.15)

| | | Change 1998-2013 | | |
| | | **Model Summary** | | |
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.722[a]	.521	.520	.05262
2	.743[b]	.552	.551	.05090
3	.747[c]	.559	.557	.05054
4	.750[d]	.563	.561	.05031
5	.752[e]	.566	.564	.05014
6	.754[f]	.569	.566	.05002
7	.759[g]	.576	.573	.04963
8	.760[i]	.578	.575	.04951

a. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2

b. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km

c. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km

d. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km

e. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2

f. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2, Distance from City Center by Km

g. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2, Distance from City Center by Km, Distance from Muzdalifa by Km

h. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2, Distance from City Center by Km, Distance from Muzdalifa by Km, Distance from Hajj Sites Boundry by Km

Table 4.15: Results of the multiple regressions test for all variables

Source: Edited by author

The table shows that there are eight predictor models. For all of the models, the R Square is higher than 0.5. This means that the model can only predict about 50 percent of UC changes after 2013. The *h* model indicates that the UC changes will have a 50 percent dependency on independent variables. These variables are changes in SC (No-Built) areas, distances from Mina, distances from street networks, distances from the HS centres, changes in street cover, distances from the CBD, distances from Muzdalifa and distances from the HS sites' boundaries.

Moreover, while there are a large number of predictor variables, it was observed that some of those variables have the same meaning. The distances from the HS centres, the HS boundaries, and Mina and Muzdalifa can be considered to be the distance from the HS centres. Furthermore, changes in street cover areas can represent the distance from the street network. Thus, the regression test was applied again using four variables. These variables included changes in no-built cover (SC), changes in street cover, distance from the HS centres and distance from CBD (Table 4.16)

Reduced Data				
Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.722ᵃ	.521	.520	.05262
2	.737ᵇ	.543	.542	.05139
3	.740ᶜ	.547	.546	.05117
4	.743ᵈ	.551	.550	.05096

a. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2

b. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from City Center by Km

c. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from City Center by Km, Distance from Hajj Sites Center by Km

d. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from City Center by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2

Table 4.16: Regression model for the reduced data
Source: Edited by author

After reducing the variables, the R Square was still at 0.55, meaning the model is still able to predict almost 50% of the future changes in UC. That is to say, future UC changes in Mecca can be predicted by identifying the cells that have a higher percentage of SC, a higher percentage of street cover and those which are close to Mecca's city centre and the HS centres. These findings demonstrate that the locations of the HS play an important role within Mecca's UC growth, as the locations form part of the previous model.

Furthermore, to gain a better understanding of the probability of the urban growth surface, a predicted probability map was generated. It provided a comprehensive scenario of urban growth patterns in order to demonstrate the relationship between the probability of growth and the location of the HS. This map shows the cells where the four independent variables cross. To do so, four different maps were first created, with each one representing a variable, as shown in Figure 4.29.

Map of closest cells to CBD

Map of closest cells to Hajj Sites

Map of Street cover cells 2013

Map of soil cover cells 2013
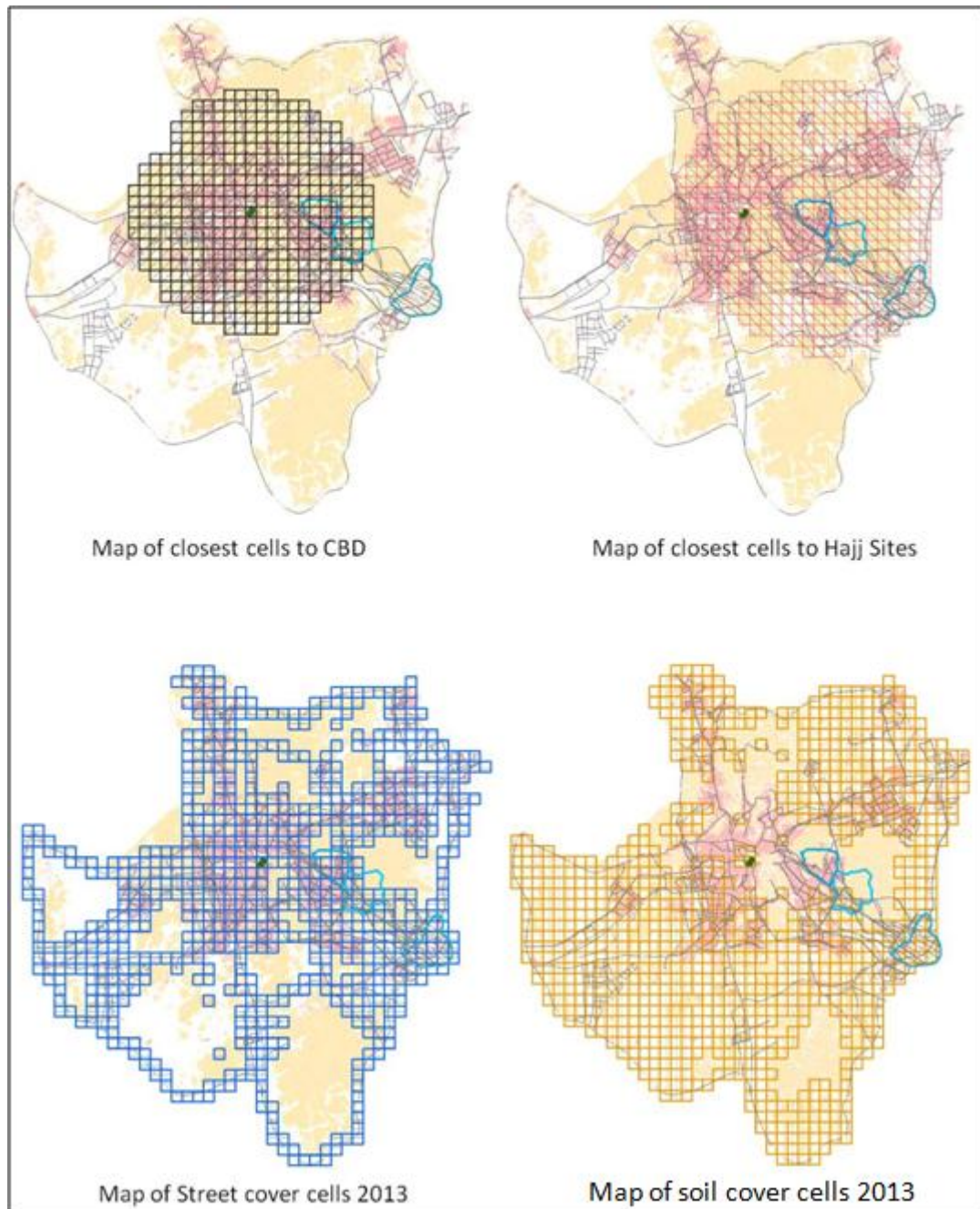
Figure 4.29 Maps representing the four predictor variables
Source: Edited by author

By overlapping the four maps, the predicted cells to be changed in UC after 2013 will be identified. The following (Figure 4.30) illustrates the cells where the four variables cross, while at the same time, the cells with higher percentage of SC (30% or more) were extracted as they will have a higher opportunity than the other cells due to the availability of SC surfaces that will probably be converted into built-up areas.
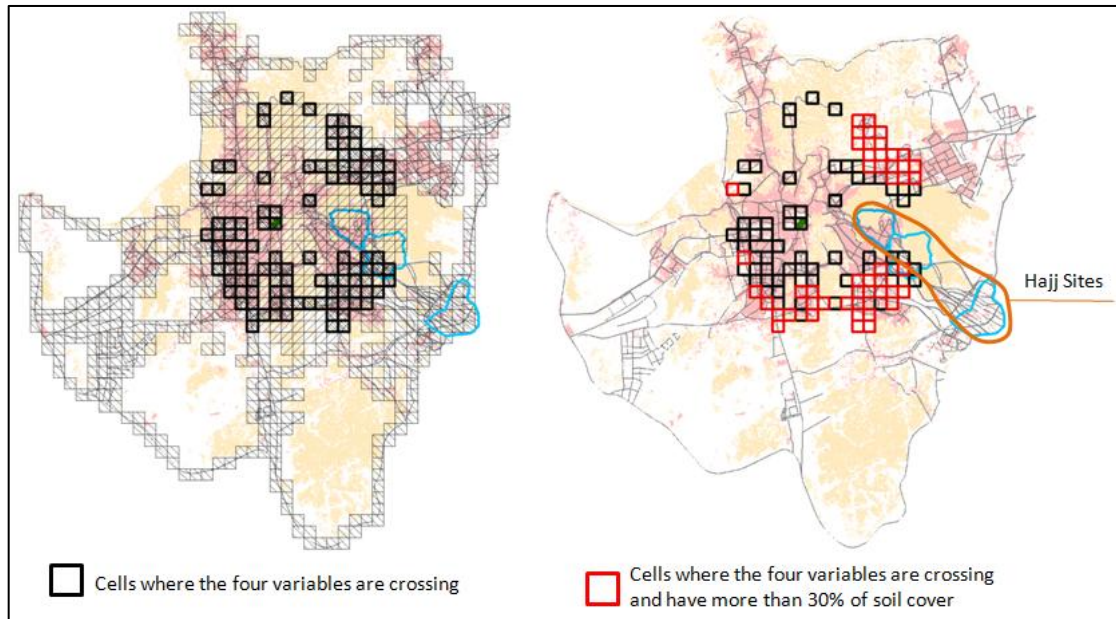
Figure 4.30 Maps of the probability of urban growth surfaces after 2013

Source: Edited by author

Additionally, Figure 4.30, above demonstrates the probability that urban growth changes will be within the cells that are close to the HS. In some part, this could confirm the previous analysis' results, which indicated that most of Mecca's UC changes have occurred within the areas where the HS are located. The same areas are areas with a higher possibility of growing, as the *entropy* index has shown.

Subsequently, the following Figure 4.31 demonstrates the high expansion possibilities cells (HEPC) and their relationship with the HS locations in order to provide a better visualisation and understanding of how the predicted urban growth can enhance the potential usage of the HS. The proximity and connectivity between the HEPC and the three HS is illustrated in this figure also.
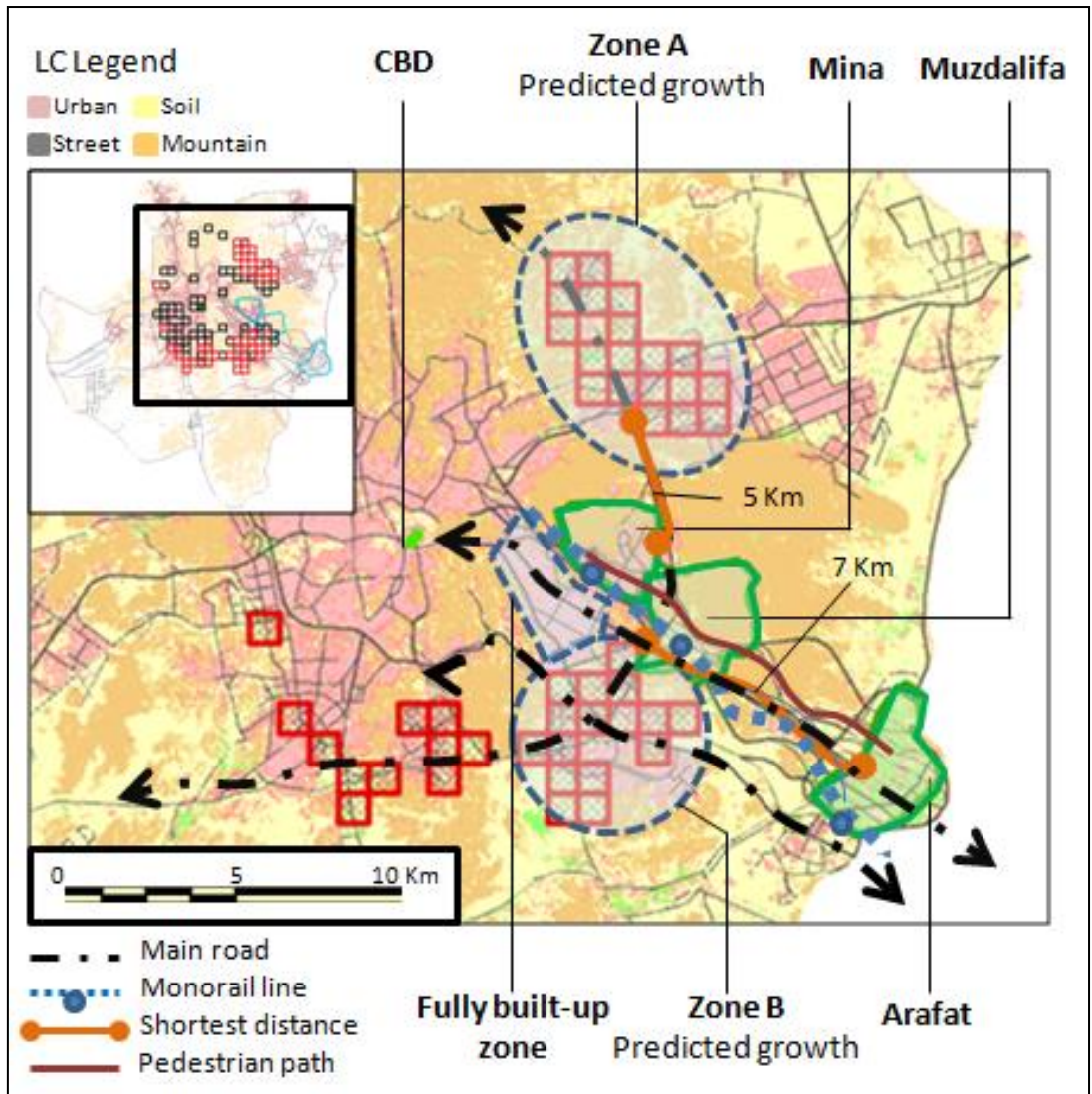
Figure 4.31 Map shows the relationship between HPEC and HS

Source: Edited by author

The map shows that there are two zones (zone A, zone B) of the HPEC that can have a direct impact on the HS in terms of the potential usages when the Hajj is not occurring; that is zone A, which would enhance the potential usage of Mina, while zone B would most likely enhance the potential usage of Muzdalifa. However, Mina already has potential usages during the non-Hajj time as it is located next to a fully built-up area, thus the urban growth that would happen within zone A would give more enhancements to that potential.

Moreover, it is observed that zone B would have a direct impact on Muzdalifa and an indirect impact on Mina and Arafat, whereas the predicted urban growth within that zone would remain mostly within Muzdalifa as

there is less than one kilometre of distance between them and this would offer more potential for Muzdalifa and its facilities to be used during the non-Hajj by the people from that zone. Furthermore, there are three main roads, a monorail line and pedestrian paths that connect the three HS on one hand, and further, between the HS and the different zones and areas in Mecca on the other hand Therefore, such connections facilitate the accessibility to the HS from the two HPEC zones, which indirectly enhances the potential usages of the HS when the Hajj is not occurring. However, Arafat demonstrates a weak relation with the HPEC zones, yet the aforementioned routes of connection between the sites means that Arafat also has the same potential usage as Mina and Muzdalifa.

Finally, in order to give some validation to this research's findings, the cells that represent the four variables have been highlighted by using the 1998 LC maps and comparing them with the cells that have changed between 1998 and 2013 (Figure 4.32 & Figure 4.33).
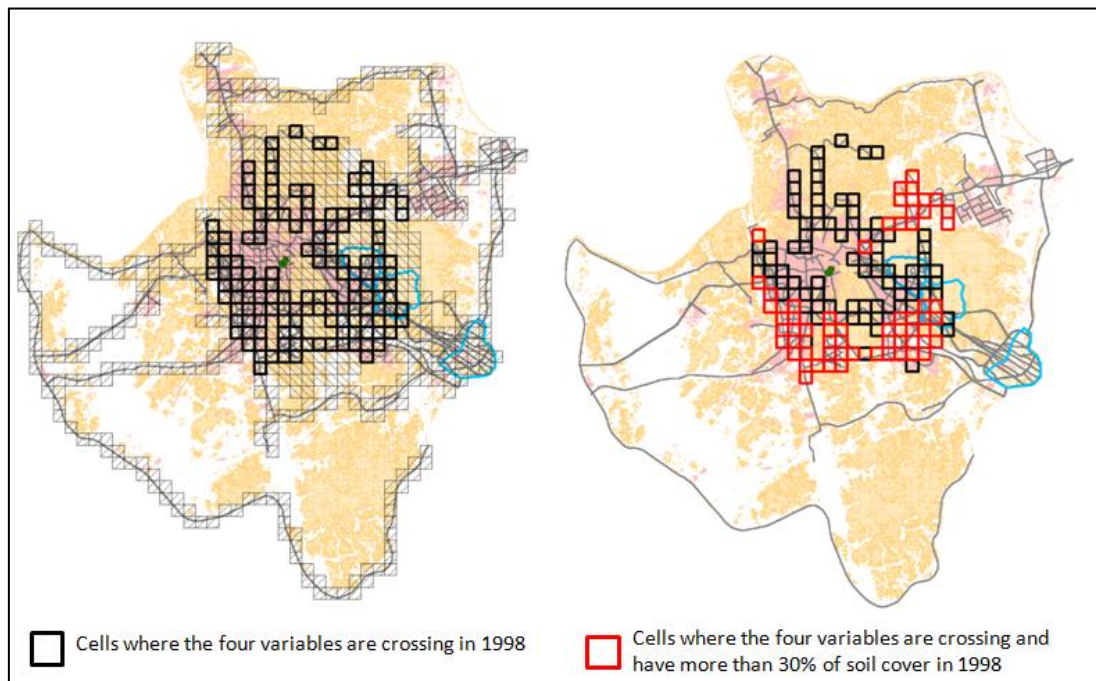
Figure 4.32 Maps of the probability of urban growth surfaces after 1998
Source: Edited by author

The validation maps within Figure 4.33 illustrate that by applying the same urban growth model and using the data of the LC map from 1998, 62 cells were predicted to have the highest rate of urban change after 1998. However,

the real changes in UC until 2013 show that only 33 cells have changed as they were predicted to. Therefore, the prediction model was able to predict almost 53% of the real changes. This is the same probability percentage that the model could predict for the period after 2013.
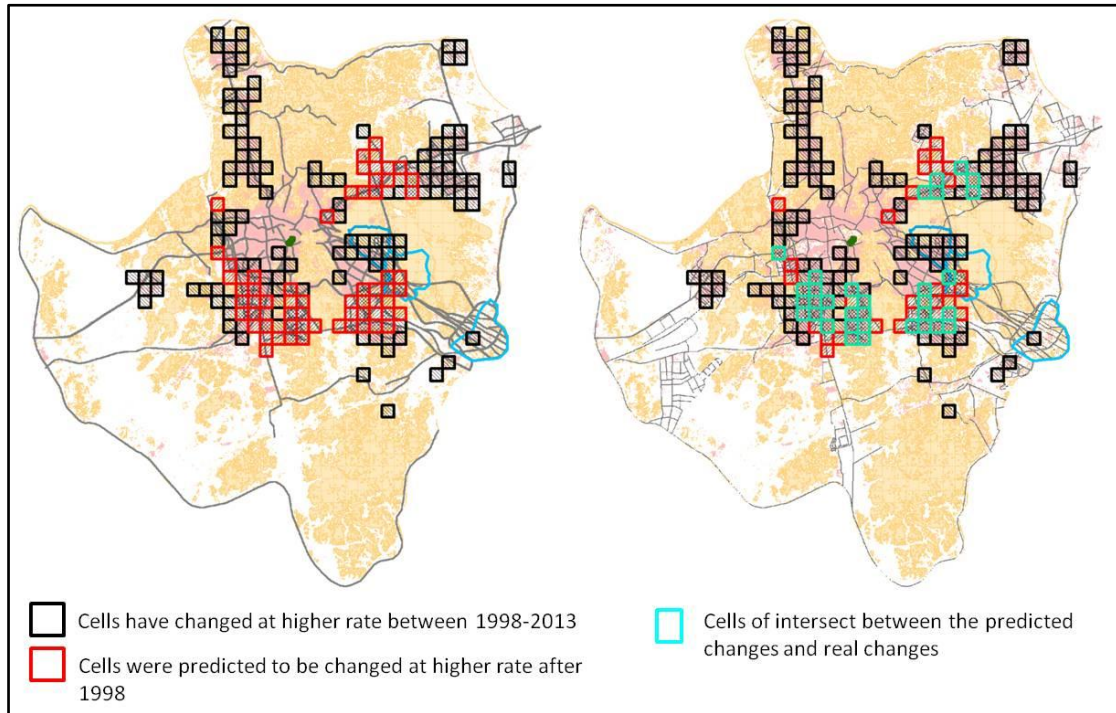
Figure 4.33 Comparison between predicted urban cover changes after 1998 and the real changes of 2013

Source: Edited by author

4.4 Conclusion

The previous chapter 3 demonstrated the potential the HS have due to their facilities, connectivity, and proximity to their surroundings, which were considered to be internal potentials. While, this chapter aimed to support the external potential of the HS through providing information regarding their relationships with their surroundings from a spatial perspective. As mentioned at the beginning of this chapter, studying the urban growth surroundings of any UUS has become an important issue for urban planning. This is due to the fact that UUS can provide alternative paths towards the

future growth of a city and studies allow decision-makers to make an informed decision with regard to the future of UUS.

Therefore, it is very important to determine information in terms of the urban growth of Mecca, where the HS are located, in order to understand the importance of their location within their surrounding urban patterns. In addition, it is important to provide information to city authorities, managers and decision-makers so they can effectively evaluate future management decisions and gain insight into the possible effects of their decisions.

The use of remote sensing, in combination with GIS technologies, was an appropriate method to help analyse and characterise urban growth, since they are considered to be fast techniques that allow researchers to acquire quantitative information relating to urban growth processes and patterns. In this case, remote sensing has provided fundamental observations about urban growth and environmental conditions that would otherwise not have been available. In addition, the availability of time-series datasets facilitated the researcher's understanding of the urban expansion process.

The first analysis successfully detected the LC changes of Mecca between 1998 until 2013 and concluded that areas of urban and vegetation cover have increased, whereas areas of mountain and soil cover have decreased. The analysis of patterns in UC changes demonstrated that the urban pattern of Mecca is influenced by the surrounding mountains and the highways. The HS LC was also found to have increased during the period of study, which indicates that the sites are growing, even though their status is considered to be underused.

Moreover, it was found that the NEP had more UC change than the other parts and the NEP and SEP parts, where the HS are located, have seen a higher percentage of change than the other parts over the last 15 years. Therefore, their location is also becoming more important due to the urban growth of Mecca. The SEP and NEP also have greater opportunities for faster growth, as indicated by the entropy analysis.

The results of the multiple regression analysis showed that there are four main independent variables that have played an important role within UC change over the past 15 years. These variables are; distance from Mecca's centre, distance from the HS centres, changes in SC and changes in street cover. Mapping these variables helped to identify zones where urban growth will probably take place after 2013. This probability has an accuracy of approximately 51%, as the validation test maps have shown. The probability urban growth map after 2013 illustrated that an important proportion of that growth will be close to the HS, meaning the idea of exploiting the existing facilities for future growth needs more consideration.

Overall, the analysis and the methods used within the chapter have added a new perspective to dealing with UUS by providing spatial information regarding their relationship with their surrounding area. Although the analysis was concentrated on the HS and Mecca's urban growth analysis, the same kind of analysis could be useful for similar UUS cases.

Chapter 5 Exploring the social acceptance and perceptions around using the Hajj sites when the Hajj is not occurring

5.1 Introduction

Individuals' perceptions in relation to urban issues are becoming more important than ever, since there is an ever-increasing need to make fast and appropriate planning process decisions. Hence, understanding the public's perceptions of urban issues is an essential component of any urban planning process or intervention (Bassett, 2014). The public includes anyone who resides, works, has an interest in, or does business in a given area, who will be potentially affected by planning decisions, and this can include organised groups (US Dot, 2002). A wide variety of information assists decision-makers with understanding the interlinked nature of problems that a city can face (Jinfu, 2000). It is therefore vital that collaboration occurs between the public, researchers, and decision-makers in order for planning interventions to be successful and efficient.

Thus, providing information with regard to the public's perceptions and opinions regarding the underused status of the Hajj sites (HS) can be fundamental in the decision making process concerning the effectiveness of reusing the sites when the Hajj is not in progress. According to Hentilä and Timo (2003), this information is crucial as the process of gaining social acceptance in terms of the alternative usage of underused urban spaces (UUS) is one of the key ways in which to ensure the spaces are reused successfully.

This chapter discusses public perceptions and opinions with regard to reusing the HS when the Hajj is not taking place. In this research's case, the public are defined as the citizens of Mecca since they live near to the HS and they will be the first to be affected (positively or negatively) by any decision that is made regarding the reuse of the HS. As Hentilä and Timo (2003) argued, the people surrounding the UUS are also the primary expected users who

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may frequent the underused urban spaces (RUUS) projects. Moreover, in many situations, they are often the catalysts of such initiatives. Due to this, being aware of their perceptions will help decision-makers to understand what the wider public reaction may be.

The first section of this chapter discusses the survey methods that were used for this study and identifies why they were the most appropriate methods for collecting the necessary data. The second section provides an analysis of the obtained data. The results indicate that the idea of reusing the HS facilities when the Hajj is not occurring is accepted by most respondents, with respondents who live or work closer to the sites being more in favour of reusing the HS than other respondents.

5.2 Methods and data

There are many methods that can be used for measuring the public's perceptions regarding planning issues (Droba, 1931). Surveys are believed to be a useful tool for assessing the perceptions and experiences of individuals within a particular area (Sureshchandar et al., 2001). Furthermore, Kumar and Promma (2005) acknowledged survey research to be useful for collecting data from a wide variety of respondents and for representing the characteristics of a large population. A survey is a form of planned collection for data. The most common purpose of a survey is to aid in the description, prediction, decision-making, or analyses of relationships between variables (Fagence, 1974).

Moreover, according to Sahu (2015), a survey is any activity that collects information in an organised and methodical manner with regard to characteristics of interest from some, or all, units of a population, employing well-defined concepts, methods, and procedures, as well as compiling that information into a useful summary form. A survey can be thought of as consisting of several interconnected steps, including defining the objectives, selecting a survey framework, determining the sample design, designing the

questionnaire, collecting and processing the data, analysing and disseminating the data and lastly, documenting the survey (Fink, 2003).

Therefore, in this part of the study, survey research was used, primarily as it is the most appropriate measurement technique to discover the opinions that people in Mecca hold in terms of using the HS when the Hajj is not in progress. However, if the results of a survey are to yield accurate and meaningful information, the survey must be carried out step-by-step, following precise procedures and formulas. These steps include sample design determination, questionnaire design, and data collection and analysis (Figure 5.1).
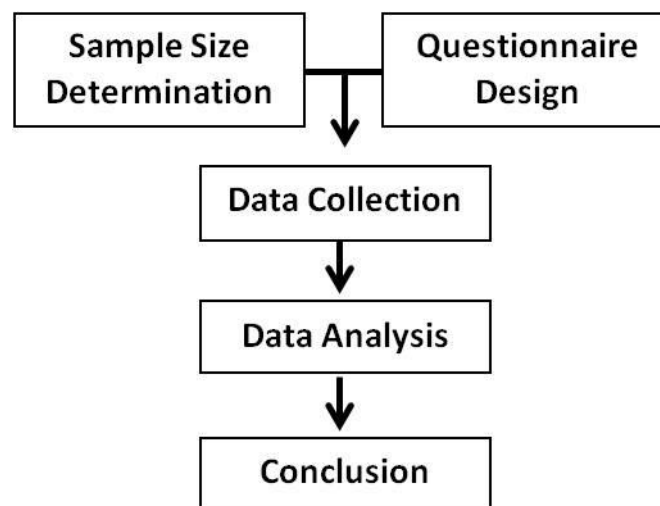
Figure 5.1: Survey structure
Source: Edited by author

5.2.1   Determining the sampling design

Sampling is a means of selecting a subset of units from a target population for the purpose of collecting information. This information is used to draw inferences relating to the population as a whole (Levy and Stanley 2013). Sampling methods are generally divided into two categories - probability sampling and non-probability sampling. In the first case, each member has a fixed, known opportunity of belonging to the sample, whereas in the second case, there is no specific probability of an individual being included in the

sample. For a layman, these two concepts are the same, yet in reality, they differ greatly in the sense that in probability sampling, every member of the population gets a fair chance of being selected, which is not the case for non-probability sampling (Surbhi, 2016). The ability to make reliable inferences about the entire population and to quantify likely errors in the estimates makes probability sampling the best choice for most statistical analysis (Statistics Canada, 2003)

There are four types of probability sampling methods; namely, simple random sampling, stratified sampling, systematic sampling, and cluster sampling (Levy and Stanley, 2013). Simple random sampling is a random sampling method that gives all respondents an equal chance of being selected (Cochran, 2007). Stratified sampling is another random sampling method, in which the target respondents are separated into segments, and then a simple random sample is selected from each segment (Sudman, 1976).

While systematic sampling is also random, in which a random selection is made of the first elements of the sample, and then subsequent elements are selected using a fixed or systematic interval until the desired sample size is reached (Kothari, 2004). Moreover, cluster sampling is similarly random, whereby elements of the population are randomly selected in naturally occurring groupings (Thompson, 1990). For this research's purposes, simple random sampling was selected as this process of random sampling means that every person in Mecca's population will have an equal probability of participating in the research.

The increasing need for a sample that represents an entire population in empirical research has led to demand for an effective method of determining a sample size (Malhotra, 2007). Black (1993) pointed out that a research report should always describe the size of the sample. He also noted that there will undoubtedly be some errors, which will be dependent upon the size of the sample. The smaller the sample size, the greater the chance of error and vice versa, so it is to the researcher's benefit to have as large a sample size as their resources will allow.

However, the decision lies with the researcher in terms of deciding their confidence level in the generalisation of the sample to the population. Thus, the sampling error and confidence intervals are very helpful in relation to the researcher's ability to generalise. Yet, these are not the only factors that can affect the sample size. Cost, time and access to respondents must also be considered (De Vaus, 2001).

For today's researchers, there is a useful website now available, which deals with the issue of surveying and sampling called 'surveysystem.com', which offers a 'determine sample size' calculator. The calculator specifies how large a sample size should be, taking into account the confidence level a researcher wishes to have (either 95 percent or 99 percent) and based on confidence intervals (2 percent, 4 percent, and 6 percent). A confidence level of 95 percent is conventionally accepted for most research and is most commonly denoted as p<= .05 (Sekaran, 2003). Thus, for Mecca's population of 1,534,731[37], the calculated sample size for a 95 percent confidence level and a margin of error of 5+/- is 384 (Figure 5.2). However, the website also points out that:

'The larger your sample, the more sure you can be that their answers truly reflect the population. This indicates that for a given confidence level, the larger your sample size, the smaller your confidence interval. However, relationship is not linear,' (www.surveysystem.com/sscalc.htm, 28-June-2016).

Figure 5.2: Sample size calculation
Source: www.surveysystem.com

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[37] *Central Department of Statistics & Information. http://www.cdsi.gov.sa/ar/14. accessed 15 November 2013.*

5.2.2 Questionnaire design and data

The major instrument used for the data collection within this research was a questionnaire, which was designed in order to gather the required data from people living in Mecca. The questionnaire was divided into four sections. Section one contained eight items measuring the demographic background of the respondent. This consisted of determining their gender, citizenship, marital status, age, level of education, the part of Mecca they live in, how long they have lived there, and their reason for living there.

The second section consisted of seven questions that measured the respondents' level of knowledge about the HS. Questions included asking respondents about whether they had ever participated in the Hajj or if they had worked during the season inside the sites, and asked them to self-determine their degree of knowledge about the HS and the connected facilities.

The third section measured the relationship between respondents and the HS when the Hajj is not taking place. This was done by asking respondents questions related to whether they use the HS road networks while travelling in Mecca, whether they have been to the HS when the Hajj is not in progress, and if they had, they were then asked to explain their reasons for visiting the HS.

The fourth section was dedicated to quantifying the respondents' level of agreement with the idea of using the HS facilities when the Hajj is not occurring. They were asked to determine whether they strongly agreed, agreed, were uncertain, disagreed or strongly disagreed with different facilities in the HS being used when the Hajj is not taking place. Finally, they were asked to determine their ability to participate in using the HS facilities if they were to be used in the off-season (Figure 5.3).
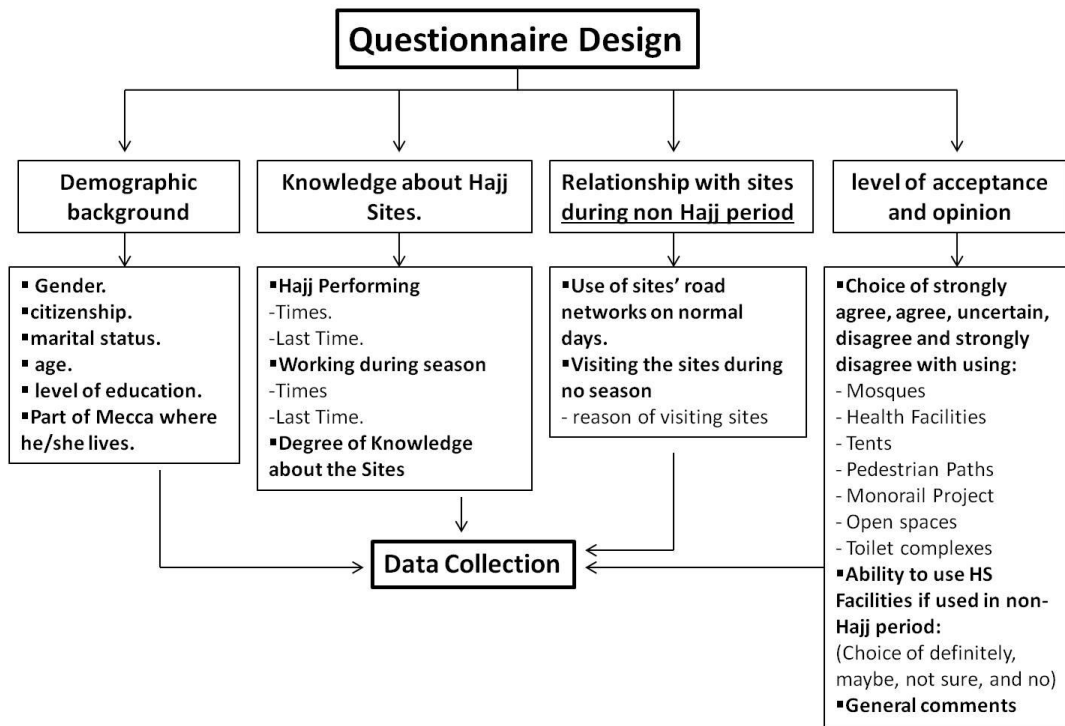
Figure 5.3: The questionnaire sections
Source: Edited by author

Lastly, at the end of the questionnaire, a space was left in case the respondents wished to make any further comments in relation to the issues in the questionnaire or make any comment in terms of using the HS facilities in the off-season. Some of this additional information was subsequently used as evidence of all the pertinent issues included in other chapters and to support the arguments presented here. Moreover, some of these comments were interpreted in order to help address the questions asked in the first chapter.

Additionally, some comments were very valuable and provided strong evidence for proving the hypothesis of the research. Despite the comments originating from only public observations, the observations can still offer useful solutions for Mecca's issues, particularly as they were suggested by people living in Mecca.

After the questionnaire was designed and completed in Arabic, it was translated into English. A very basic pilot study was conducted with relatives and friends who were not informed with regard to the field of planning. Their comments, which related to spelling, editing and the process of questioning,

were subsequently taken into consideration, resulting in the questionnaires being updated. It was estimated a time between 5 to 10 minutes to complete the questionnaire. All this was done before starting the field work. A typical copy of a questionnaire in Arabic and a plain copy in English are enclosed within the appendix D.

5.2.3 Data collection

Data collection is the process of gathering the required information for each selected unit in a survey (De Vaus, 2013). The basic methods to collect data are self-enumeration, where the respondent completes the questionnaire without the assistance of an interviewer, and interviewer-assisted (done either face-to-face or via telephone). Other methods of data collection include direct observation, electronic data reporting and compiling administrative data (Ott & Longnecker, 2015).

Data collection can be either paper-based or computer-assisted. With paper-based methods, answers are recorded on printed questionnaires. While, with computer-assisted methods, the questionnaire appears on a computer screen and the answers are entered directly into the computer (Baker, 1998). One benefit of computer-assisted methods is that the data capture – the transformation of responses into a machine-readable format – occurs during collection. This eliminates the need for post-collection processing. Another benefit is that invalid or inconsistent data can be identified more easily than with a paper-based data collection (Franklin and Walker, 2003).

In order to collect data effectively, there is a need to identify the most appropriate method for data collection. Online surveys have many advantages, particularly as they offer unique capabilities. One is able to attach multi-media graphics and sounds to the survey instrument for example, while they are also cheaper, faster, and easier to set up and use, along with them yielding a higher response rate than conventional survey methods (Fricker and Schonlau, 2002). Online surveys have become very popular over time and have been used in a wide range of dissertations (Evans and Mathur,

2005). Therefore, this study opted to use an online survey for distributing the questionnaire.

Another consideration was social media, which offers a huge variety of shared and used platforms in the world that are used in numerous fields. This study therefore used social media to spread the survey among people in Mecca. The reason for using social media as a digital online tool was that, according to Statista (2016)[38], in the 4Q/2015, Saudi Arabia's social media had become increasingly popular, mostly due to the youthfulness of the country's population. According to the Economist, Saudi Arabia has the world's highest percentage of Twitter users for instance. The most popular social network in Saudi Arabia, as of 2015, is WhatsApp, with a 27 percent penetration rate.

Thus, in this part of the study, Google Forms was used to build the online questionnaire. Using Google Forms allowed the researcher to create completely customised surveys and forms, which could be sent to anyone, alongside responses all being recorded in one place. After creating the questionnaire, it was sent via WhatsApp, Twitter and Facebook applications to friends and family members who lived in Mecca, asking them to resend it to anyone they knew who lived in Mecca, in order to reach the minimum sample size of 384 respondents. After one week, responses from 805 respondents had been received, thanks to the use of social media.

However, there were some limitations to using this data collection method, such as the fact that the questionnaires were dedicated only to a specific segment of people who have access to computers/smart phones and the internet. In addition to that, there was no guarantee in terms of the respondents being comprised of government sector workers, lower waged citizens, immigrants or foreign visitors in Mecca. Yet, even if these limitations have an effect on the final results, the researcher believes that the output data of these online methods also can give a good indication with

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[38] Available at: http://www.statista.com/statistics/284451/saudi-arabia-social-network-penetration

regard to the perceptions and opinions of individuals who would be the most likely potential users.

Additionally, in order to minimise these limitations, some respondents were specifically selected as they represented some of the authority departments, such as the Hajj research centre, the Mecca municipality and Mecca and the Hajj sites' development authority, in order to guarantee the participation of some of the government sector. Moreover, some respondents were asked personally (face-to-face) as they could then represent the people who didn't have access to the internet. While the foreign visitors were also asked about the HS situation in relation to the press reports mentioned in chapter 1.

The following diagram summarizes the steps conducted for data collection methods used in this part of the research. (Figure 5.4).
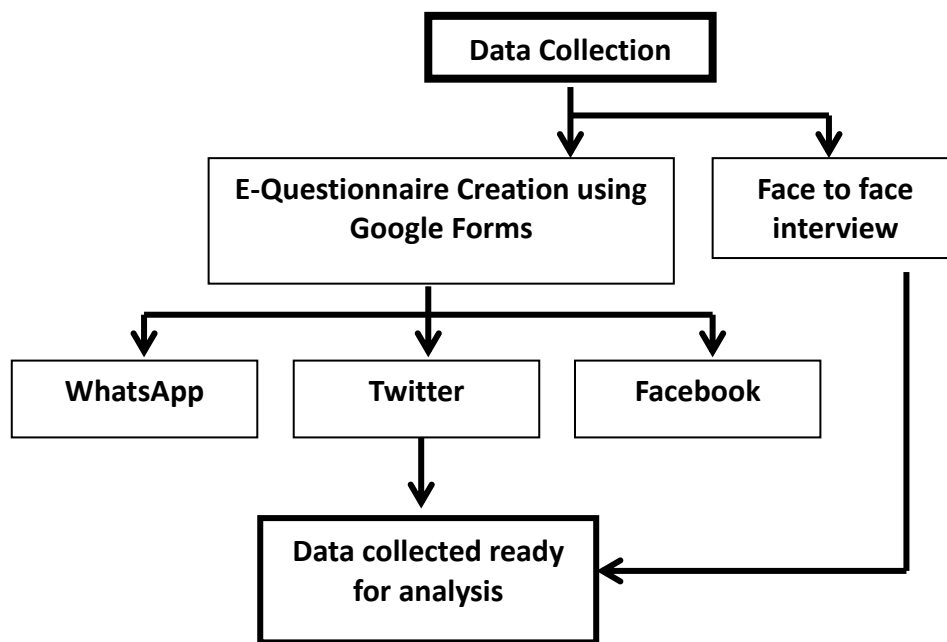
Figure 5.4: Data collection steps
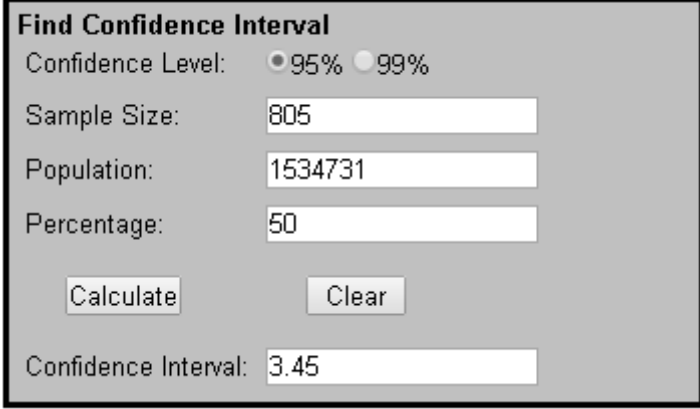
Source: Edited by author

5.3   Results and discussion

5.3.1   Sampling size obtained

It was suggested by the *surveysystem* website that the target size of the sample for this study should be approximately 384 respondents. That number was calculated using a confidence level of 95 percent and a margin of error of 5. However, after distributing the questionnaires via different social media platforms, such as WhatsApp, Twitter and Facebook, 805 respondents were received in a very short space of time. There were 56.6 percent respondents from WhatsApp, 30.8 percent from Twitter and 11.8 percent from Facebook.

Therefore, the new sample size was entered into the *surveysystem* website in order to calculate the margin of error for this number. The calculation showed that with the sample size of 805 respondents, the margin of error was decreased to 3.45. This means that for any result illustrated in this chapter there will be a margin of error of -/+3.45 that must be considered (Figure 5.5).

Find Confidence Interval

Confidence Level:	● 95% ○ 99%
Sample Size:	805
Population:	1534731
Percentage:	50
Calculate	Clear
Confidence Interval:	3.45

Figure 5.5: Margin of error for the obtained sample size

Source: www.surveysystem.com

3.1.2   Data processing

- *Data coding*

The step that follows data collection is data coding. In this research, the data collected was coded into SPSS software version 22, and this data was later

re-checked to ensure that it was ready for further analysis. Coding data is the process of assigning numeric or alpha information to responses that do not ordinarily appear to the researcher in that format. Coding typically assigns a number (although sometimes a letter) to answers that do not already have them so that statistical techniques can be applied (Bourque and Clark, 1992).

The items in the questionnaire were measured using a five point Likert scale[39], except for the demographic variables. All items measured on the Likert scale were based on the perceptions of the respondents. Likert items are normally used to measure respondents' attitudes to a particular question or statement (Clason and Thomas, 1994). The data is usually coded as follows: 1 = strongly agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = strongly disagree.

- *Reliability test*

A reliability analysis must be undertaken after the coding process. This analysis is a measurement of the internal consistency of indicators for a construct (Hair et al., 1998). The purpose of the reliability analysis is to determine how well a set of items tap into some common sources of variance (Statistics Canada, 2003). It is frequently measured using Cronbach's coefficient alpha[40].

The reliability analysis for this study was conducted by using Cronbach's Alpha to check the level of agreement between the questionnaire items that were being used to measure target variables. Moore and Benbasat (1991) indicated that the reliability levels are acceptable values for Cronbach's Alpha when they are equal to, or greater than, 0.7. Cronbach's Alpha reliability coefficient (r) normally ranges between 0 and 1.0. Further, George and Mallery (2003) provide the following rules of thumb (Table 5.1):

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[39] A set of items, composed of approximately an equal number of favorable and unfavorable statements concerning the attitude object, is given to a group of subjects. They are asked to respond to each statement in terms of their own degree of agreement or disagreement. Typically, they are instructed to select one of five responses: strongly agree, agree undecided, disagree, or strongly disagree. In its final form, the Likert Scale is a five (or seven) point scale which is used to allow the individual to express how much they agree or disagree with a particular statement.

[40] Cronbach's alpha (or coefficient alpha), developed by Lee Cronbach in 1951, is a way to measure reliability, or the internal consistency of a psychometric instrument. "Reliability" is how well a test consistently measures what it is supposed to measure. Reliability tests, like Cronbach's alpha, are most commonly used to assess whether questionnaires with multiple Likert scale questions are reliable.

Coefficient	Description
$r < .5$	Unacceptable
$r >= .5$	Poor
$r >= .6$	Questionable
$r >= .7$	Acceptable
$r >= .8$	Good
$r >= .9$	Excellent

Table 5.1: Cronbach's Alpha reliability coefficient rules

Source: George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Boston: Allyn & Bacon.

In the questionnaire for this research, eight items were measured in order to assess their reliability coefficient. These items included questions concerning the respondents' perceptions of using the HS facilities when the Hajj is not taking place. The facilities included were the mosques, the hospitals and healthcare centres, the permanent tents in Mina, the pedestrian paths, the monorail and the open spaces.

In addition, a question relating to whether the respondents would potentially use the HS facilities in the off-season if they were able to. The result in Table 5.2 demonstrates that the coefficient for the measured items is .828. This is close to 1 and can be considered to be good, according to the scale mentioned above. It suggests that the items have a relatively high internal consistency.

Cronbach's Alpha	Cronbach's Alpha based on standardised items	No of Items
.828	.835	8

Table 5.2: Result of Cronbach's Alpha
Source: Edited by author

3.1.3 Data analysis

Data analysis involves the summarising of data and the interpretation of its meaning in a way that provides clear answers to the questions that are featured in the survey. Data analysis should therefore relate the survey results to the questions and issues identified by the statement of objectives. It is one of the most crucial steps of a survey, since the quality of the analysis can substantially affect the usefulness of the whole survey.

However, data analysis may be restricted to the survey data alone or it may compare the survey's estimates with results obtained from other surveys or data sources. Often, it consists of examining tables, charts and various summary measures, such as frequency distributions and averages in order to summarise the data. Additionally, statistical inferences can be used to verify hypotheses and to study the relationships between characteristics, for instance by using regression, analysis of variance or chi-square tests (Statistics Canada, 2003).

The analysis conducted in this chapter consists of two main components. The first part provides a general description of the collected data for each section of the questionnaire and includes tables, charts and frequency distributions. The second part analyses the respondents' answers based on where they live in Mecca, in order to evaluate whether their proximity to the HS has any relationship with their perceptions and opinions with regard to using the HS in the off-season.

- *Demographic data description*

The general information relating to the respondents, known as demographic data, was obtained in order to categorise the respondents in term of their socio-economic data. The first piece of data concerned gender. The results (shown in Table 5.3) indicated that 472 (58.7 percent) of respondents were male and 332 (41.3 percent) were females.

In addition, 731 (90.9 percent) respondents were of Saudi nationality and 73 (9.1 percent) were non-Saudi (Table 5.4). This could indicate that the local

community demonstrated more of an interest in responding to the questionnaire than other nationalities, or may be due to the questionnaire only being offered in Arabic, thus limiting the respondents to only those who speak Arabic.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Male	472	58.7	58.7	58.7
	Female	332	41.3	41.3	100.0
	Total	804	100.0	100.0	

Table 5.3: Respondents by gender

Source: Edited by author

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Saudi	731	90.9	90.9	90.9
	Non-Saudi	73	9.1	9.1	100.0
	Total	804	100.0	100.0	

Table 5.4: Respondents by nationality

Source: Edited by author

A simple validation test was also conducted by comparing the percentage of male and female respondents with the official percentages, detailed in the general 2010 census of Saudi Arabia. This information was found on the Saudi General Authority for Statistics' website[41].

In 2010, there were approximately 945,900 males (61.6 percent) and approximately 729,500 females (47.5 percent) living in Mecca. By considering the (3.45) calculated margin of error, we can assume that the collected data represents a fair proportion of Mecca's citizens.

Moreover, the results show that more than 65 percent of the respondents were between 25 and 45 years old and almost 18 percent were between 45 and 55

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[41] https://www.stats.gov.sa/sites/default/files/ar-dmaps2010_0.pdf

years old. The rest of the respondents were less than 25 years old or more than 55, as shown in Table 5.5 and Figure 5.6.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Less than 25	57	7.1	7.1	7.1
	25-35	313	38.9	38.9	46.0
	36-45	213	26.5	26.5	72.5
	46-55	145	18.0	18.0	90.5
	More than 55	76	9.5	9.5	100.0
	Total	804	100.0	100.0	

Table 5.5: Respondents' ages

Source: Edited by author
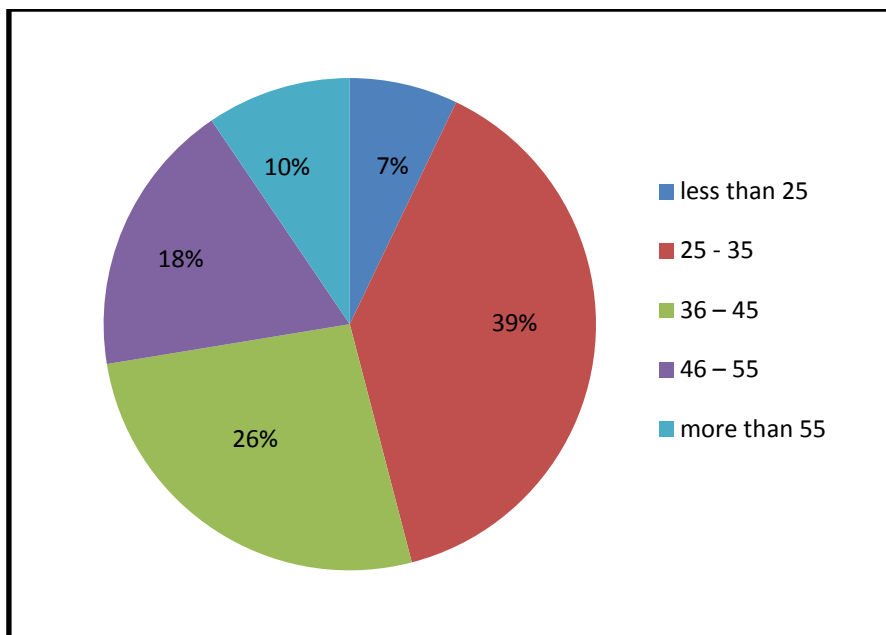
Figure 5.6: Pie chart of respondents' ages

Source: Edited by author

With regard to the education level of the respondents, the results show that more than 75 percent of respondents have a Bachelor's degree or higher, while only 8 percent of respondents have a high school education or less. This indicates that most respondent's opinions are based on a high level of education (Table 5.6 & Figure 5.7).

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	High school or less	64	8.0	8.0	8.0
	Diploma	107	13.3	13.3	21.3
	Bachelor	450	56.0	56.0	77.2
	Postgraduate	183	22.8	22.8	100.0
	Total	804	100.0	100.0	

Table 5.6: Level of education for respondents
Source: Edited by author
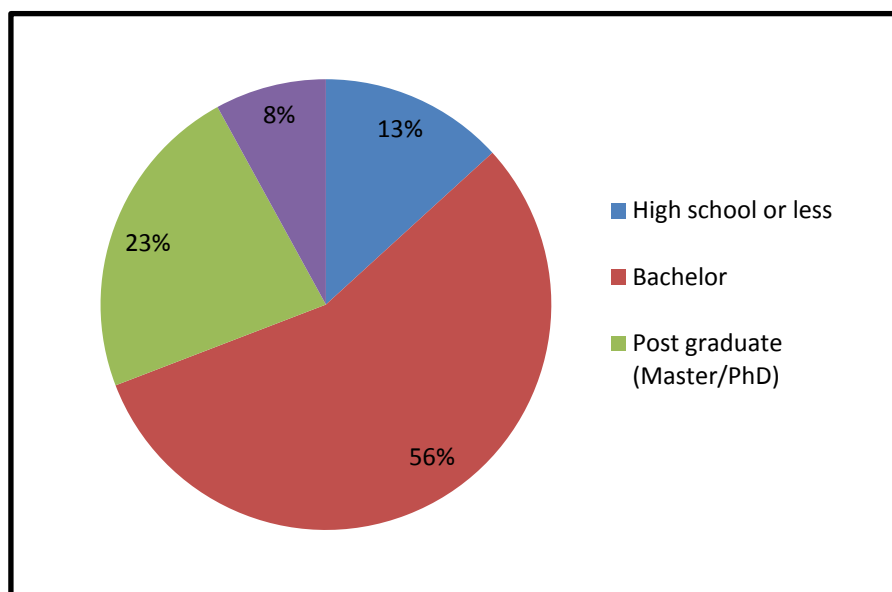
Figure 5.7: Pie chart of respondents' level of education
Source: Edited by author

The last three questions in the demographic section focused on the part of Mecca in which the respondents lived, their reasons for living in Mecca and the length of time they had lived in Mecca. The choices offered in regards to where respondents lived were based on the same division we proposed within the urban growth analysis in chapter 4. Respondents had to choose between five parts: Northwest, Northeast, Southeast, Southwest and West. Each part was defined by districts, therefore the respondent could easily recognise the part they belonged to. The results show that the part with the highest respondent number was West part, with around 27 percent of respondent's living there. The Northeast part had the lowest percentage, with only around

13 percent of respondents living there. These results indicate that the questionnaire was distributed fairly evenly, as shown in Table 5.7 and Figure 5.8.

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	West part	219	27.2	27.2	27.2
	Northwest part	148	18.4	18.4	45.6
	Northeast part	105	13.1	13.1	58.7
	Southeast part	153	19.0	19.0	77.7
	Southwest part	179	22.3	22.3	100.0
	Total	804	100.0	100.0	

Table 5.7: Respondents divided by part of Mecca

Source: Edited by author
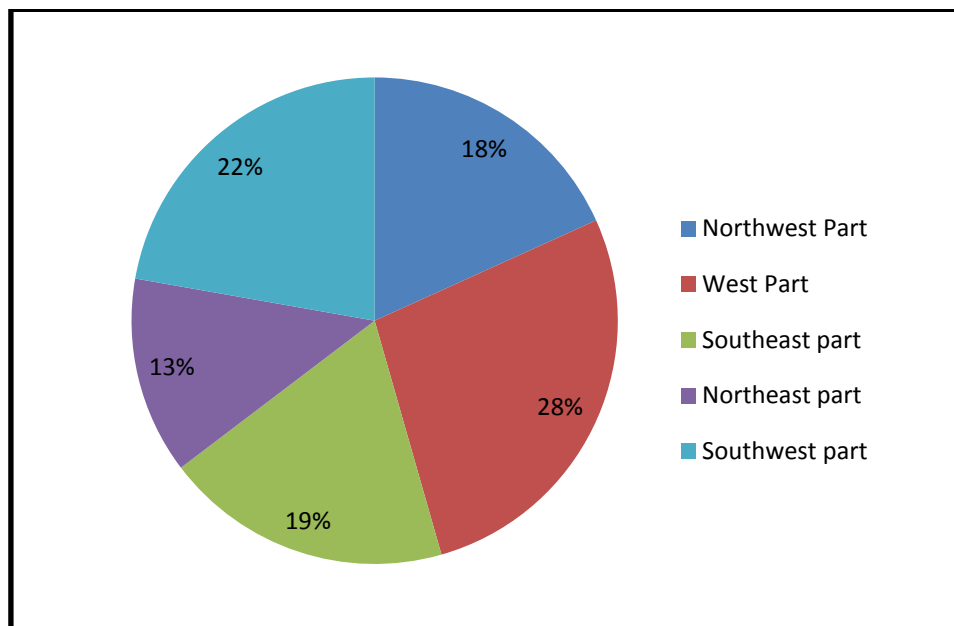
Figure 5.8: Pie chart of respondents' distribution

Source: Edited by author

More than 85 percent of respondents had lived in Mecca for more than 15 years and more than 75 percent lived there because of their family ties. Therefore, it can be assumed that the perception and opinion of the respondents represent the true inhabitants of Mecca, making their perceptions and opinions a very valuable for this research (Table 5.8 & Table 5.9).

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Less than 5 years	34	4.2	4.2	4.2
	5 - 10 years	43	5.3	5.3	9.6
	11 – 15 years	31	3.9	3.9	13.4
	More than 15	696	86.6	86.6	100.0
	Total	804	100.0	100.0	

Table 5.8: Duration of time living in Mecca

Source: Edited by author

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Family	624	77.6	77.6	77.6
	Work	59	7.3	7.3	85.0
	Study	5	.6	.6	85.6
	Personal reasons	116	14.4	14.4	100.0
	Total	804	100.0	100.0	

Table 5.9: Reason for living in Mecca

Source: Edited by author

- *Respondent's knowledge regarding the Hajj sites*

The second section of the questionnaire was dedicated to measuring the respondents' existing knowledge regarding the HS, through both indirect and direct questions. The indirect questions concerned whether they had ever performed the Hajj ritual and whether they had worked during the Hajj season inside the sites. These questions gave an indication of respondents' knowledge about the different sites. If they had performed the ritual, then they were expected to know about the facilities located there and they would also probably have used all, or at least part, of those facilities. Additionally, they were asked which year they performed the ritual in, since most of the current facilities in the HS were built in the last 15 years. Due to this consideration, it was important to know whether the respondents who had performed the ritual had performed it during the last 15 years or not.

The results from this section show that more than 85 percent of the respondents have performed the Hajj ritual at least once in their lifetime, with more than 45 percent of them having performed it in the last five years, and an additional 30 percent having done it in the last 15 years. This means that more than 75 percent of the respondents have performed the ritual during the last 15 years (Table 5.10, Table 5.11 and Figure 5.9). These results give an indication that the opinions and perceptions of the respondents regarding the HS facilities were based on a good level of knowledge of the Hajj sites.

		Frequency	Percentage	Valid percentage	Cumulative percentage
	No	98	12.2	12.2	12.2
Valid	Yes	706	87.8	87.8	100.0
	Total	804	100.0	100.0	

Table 5.10: Respondents Hajj Performed

Source: Edited by Author

		Frequency	Percentage	Valid percentage	Cumulative percentage
	Never	98	12.2	12.2	12.2
	During the last 5 years	377	46.9	46.9	59.1
Valid	Before 5 - 10 years	173	21.5	21.5	80.6
	Before 10 -15 years	83	10.3	10.3	90.9
	Before 15 years	73	9.1	9.1	100.0
	Total	804	100.0	100.0	

Table 5.11: Respondents' year of performing the Hajj

Source: Edited by author
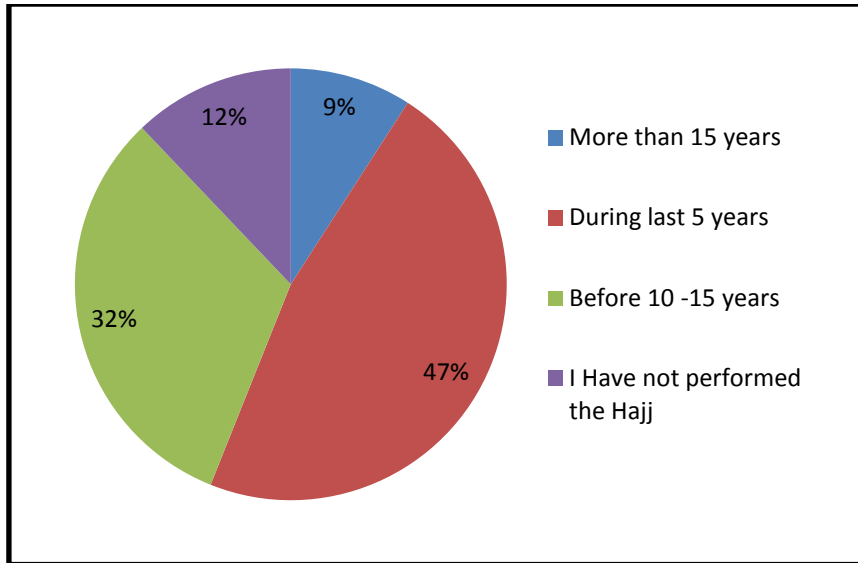
Figure 5.9: Chart based of respndents' year of perfoming the Hajj

Source: Edited by author

Respondents were also asked, via a direct question, to self-determine their degree of knowledge about the HS and their facilities. The reason for this question was for the researcher to be certain before proceeding to the next section of the questionnaire that the respondents had at least a medium level of knowledge regarding the sites' facilities. This is due to the fact that if they did not possess any previous knowledge regarding the sites, their perceptions and opinions would not be as accurate.

Results from this question show that more than 70 percent of respondents felt they had a medium to high level of knowledge, while only less than 7 percent said they have no knowledge about the HS facilities (Table 5.12 & Figure 5.10)

		Frequency	Percentage	Valid percentage	Cumulative percentage
	High	212	26.4	26.4	26.4
	Medium	349	43.4	43.4	69.8
Valid	Low	189	23.5	23.5	93.3
	No knowledge	54	6.7	6.7	100.0
	Total	804	100.0	100.0	

Table 5.12: Respondents' level of knowledge about the HS Facilities

Source: Edited by author

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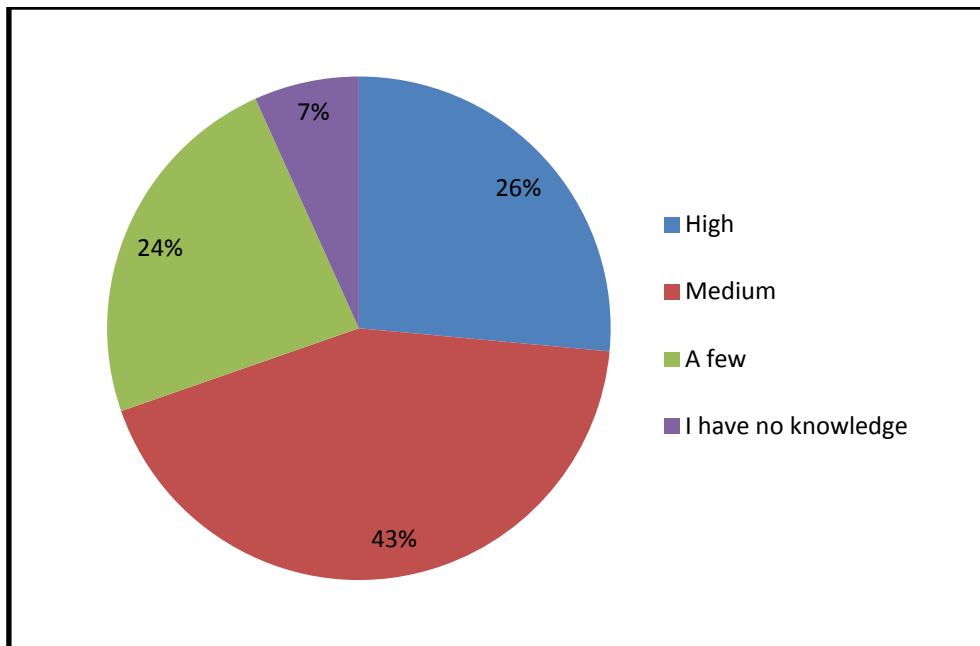
Figure 5.10: Pie chart of respondents' level of knowledge about the HS facilites

Source: Edited by author

- Respondents' relationship with the Hajj sites during the off-season

The third section of the questionnaire was designed to gain insight into the relationship between Mecca's citizens and the sites, especially when the Hajj is not occurring, in order to measure the physical closeness of the sites to the city of Mecca. As explained in chapters three and four, the sites are now considered part of Mecca and their roads and streets are included in Mecca's road network. Due to this, respondents were asked if they used the roads passing through the HS during their usual travel around Mecca. Additionally, they were asked whether they had visited the sites when the Hajj is not in progress. Questions such as this can give an indication about the relationship between Mecca's citizens and the HS, particularly when the Hajj is not occurring.

Results from this section show that more than 85 percent of respondents use the HS road network sometimes or most of the time during their usual travel in Mecca. Less than 13 percent of respondents had never used those roads (Table 5.13). This therefore confirms that the HS are considered to be part of Mecca and that their location is connected to different parts of Mecca.

		Frequency	Percentage	Valid percentage	Cumulative percentage
	No	101	12.6	12.6	12.6
Valid	Yes (Most of time)	280	34.8	34.8	47.4
	Yes (Sometimes)	423	52.6	52.6	100.0
	Total	804	100.0	100.0	

Table 5.13: Result of using the roads network of the HS by respondents

Source: Edited by author

With regard to the question of whether the respondents had visited the sites outside of the Hajj season, respondents were able to choose a reason if they answered in the positive. The results show that more than 85 percent of respondents had visited the sites outside of the Hajj season and more than 55 percent chose picnicking as their reason for visiting the HS. This indicates that the use of the HS when the Hajj is not taking place already occurs in an unofficial way. People are using the open spaces located there, yet without access to the closed buildings (Table 5.14, Table 5.15 & Figure 5.11).

		Frequency	Percentage	Valid percentage	Cumulative percentage
	No	105	13.1	13.1	13.1
Valid	Yes	699	86.9	86.9	100.0
	Total	804	100.0	100.0	

Table 5.14: Results of respondents visiting the HS during the off-season

Source: Edited by author

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Never	105	13.1	13.1	13.1
	Visit	105	13.1	13.1	26.1
	Picnic	461	57.3	57.3	83.5
	Work	110	13.7	13.7	97.1
	Other	23	2.9	2.9	100.0
	Total	804	100.0	100.0	

Table 5.15: Reason for visiting the HS during the off- season

Source: Edited by author
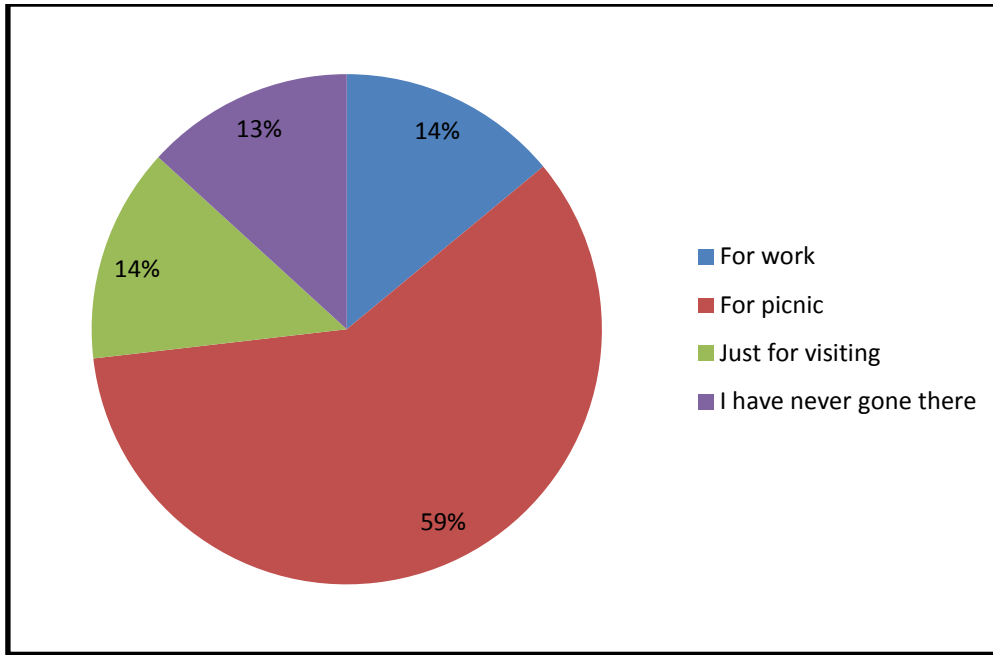
Figure 5.11: Pie chart showing the reason for visiting the sites during the off-season

Source: Edited by author

- *Respondents' perspectives of using the Hajj sites' facilities when the Hajj is not taking place*

The fourth section of the questionnaire was the most important part, as it is where the respondents were asked about their opinion in relation to using the HS facilities in the off-season. This section was based on scaled questions and respondents were asked to choose between strongly agree, agree, neutral, disagree and strongly disagree. The facilities discussed were the three mosques located in the three HS (Arafat, Muzdalifah and Mina), the hospitals and healthcare centres distributed within the three sites, the permanent tents located in Mina, the pedestrian paths, the monorail that was introduced recently to connect the three sites, the open spaces, and the toilet complexes.

Regarding the use of mosques for other religious purposes during the year, results show that more than 40 percent of respondents strongly agreed, while more than 35 percent agreed. Therefore, in total, almost 80 percent of respondents strongly agree or agree in terms of using the mosques when the Hajj is not occurring. Less than 10 percent of respondents disagreed or strongly disagreed (Figure 5.12).

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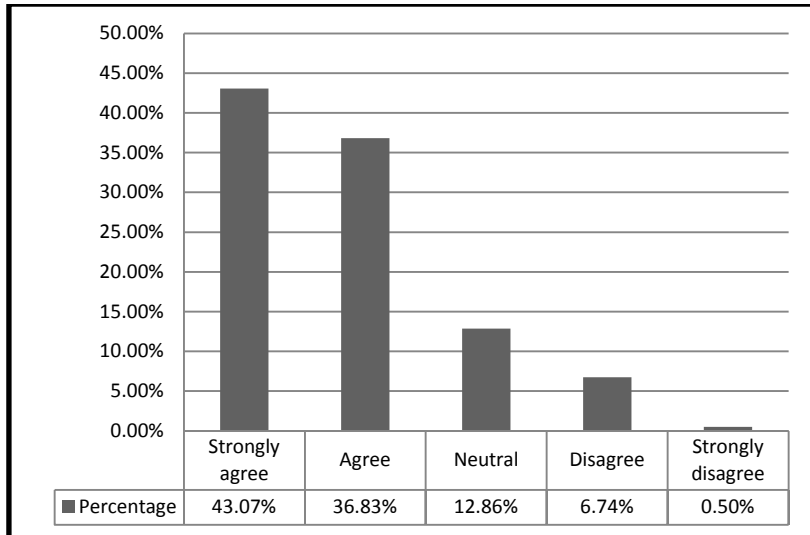
Figure 5.12: Respondents' perceptions about using mosques

Source: Edited by author

Regarding the use of hospitals and healthcare centres, more than 85 percent of respondents strongly agreed or agreed, and less than 6 percent disagreed or strongly disagreed. This indicates that respondents feel that the health facilities should be used more to serve Mecca's citizens all year round (Figure 5.13)
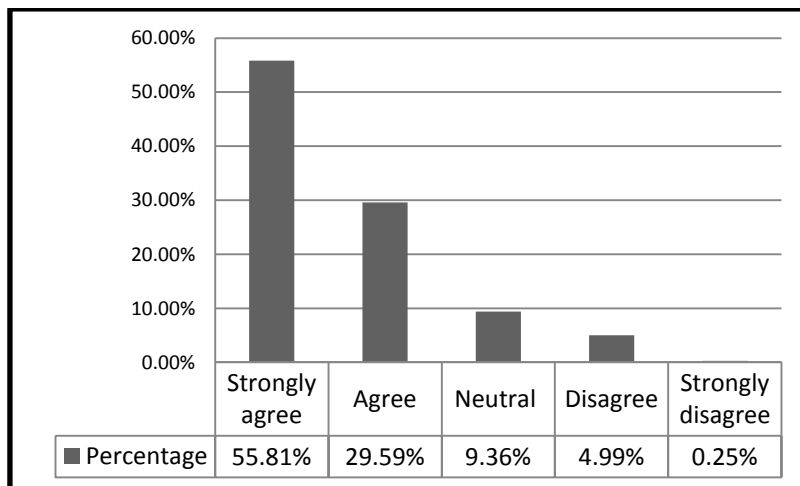
Figure 5.13: Respondents' perceptions about using the health facilities

Source: Edited by author

On the other hand, fewer respondents agreed with using the permanent tents in Mina. Only 25 percent strongly agreed and 30 percent agreed. In addition,

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more than 20 percent of respondents disagreed and about 4 percent strongly disagreed (Figure 5.14). These percentages indicate that almost 25 percent of respondents feel that it would be hard to use the tents when the Hajj is not occurring or cannot imagine how the tents could be used for other purposes.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
■ Percentage	25.97%	30.59%	18.60%	21.60%	3.25%
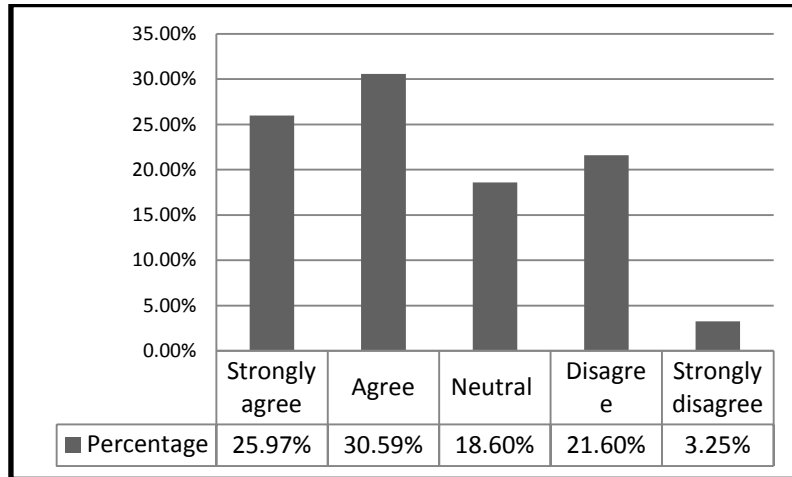
Figure 5.14: Respondents' perceptions about using permanent tents
Source: Edited by author

More than 45 percent of respondents strongly agreed with the use of pedestrian paths, and more than 36 percent agreed, meaning that in total, more than 81 percent of respondents agreed or strongly agreed. However, almost 10 percent disagreed or strongly disagreed (Figure 5.15). These results indicate that even though the pedestrian paths were built for the Hajj ritual and are located within the HS, people think it is better to use the paths for Mecca's citizens.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
■ Percentage	45.44%	36.95%	7.99%	7.74%	1.87%
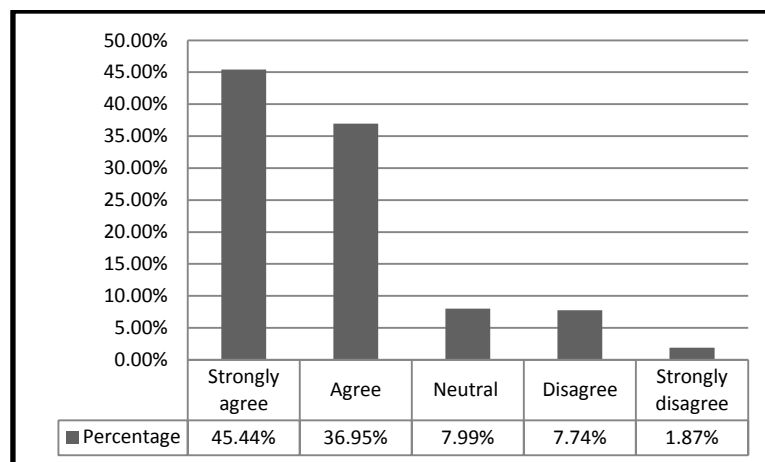
Figure 5.15: Respondents' perceptions about using pedestrian paths
Source: Edited by author

The monorail project was the facility which had the highest percentage of respondents strongly agreeing. More than 60 percent of respondents strongly agreed and more than 30 percent agreed, so almost 90 percent of respondents think it is important to be able to use the monorail in order to support their movements within the sites and around them. Less than 3 percent of the respondents disagreed and nobody strongly disagreed with the use of the monorail. (Figure 5.16).

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
■Percentage	60.80%	30.59%	5.74%	2.87%	0.00%
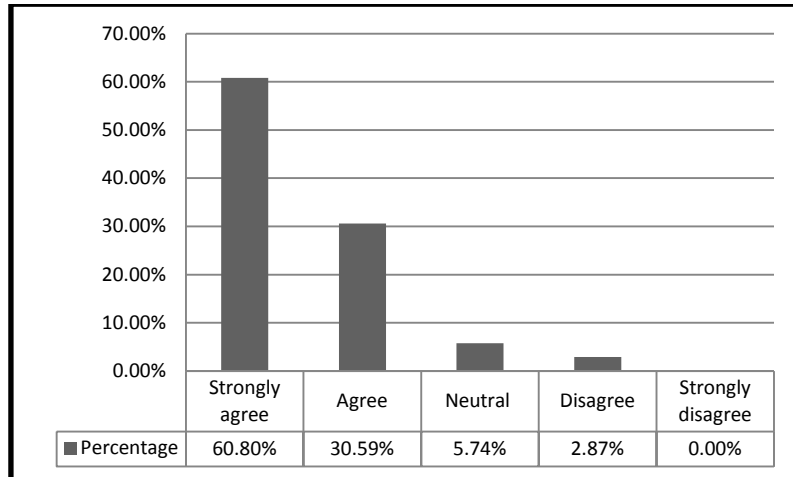
Figure 5.16: Respondents' perceptions about using the monorail

Source: Edited by author

The open spaces and the toilets complexes were the last facilities respondents were asked about. The results for those facilities are almost the same. More than 50 percent of respondents strongly agreed with the use of both, and around 30 percent agreed. Less than 7 percent disagreed or strongly disagree with the use of the two kinds of facilities. In addition, 80 percent of respondents agreed with using the open spaces outside the Hajj season (Figure 5.17 & Figure 5.18).
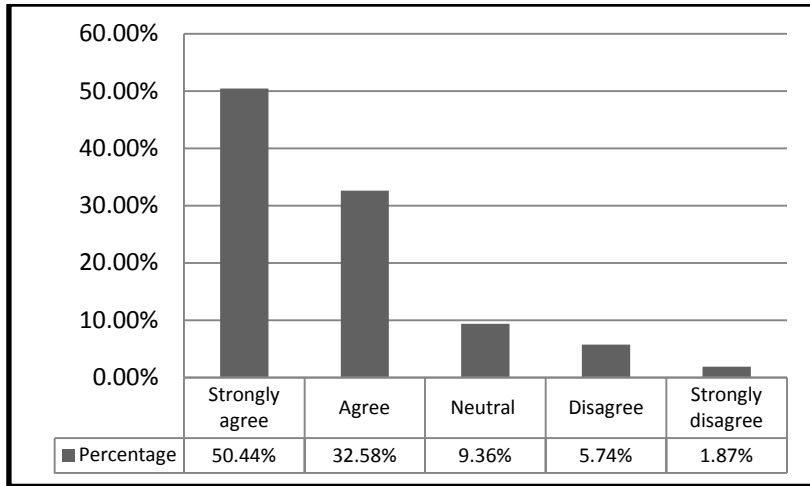
Figure 5.17: Respondents' perceptions about using open spaces

Source: Edited by author
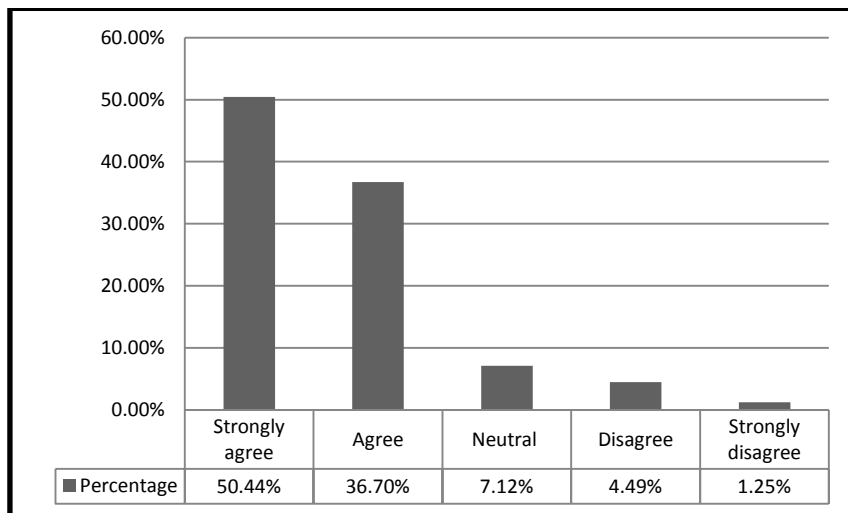
Figure 5.18: Respondents' perceptions about using the toilets complexes

Source: Edited by author

The last and the most important question of this section and of the entire questionnaire was related to whether respondents would be able to go and use the HS facilities if they were made available for use when the Hajj was not taking place. This question was attempting to measure the likelihood of success of using the HS when the Hajj is not in progress.

The result is very interesting, with 50 percent of respondents stating they would definitely participate and 40 percent stating "maybe". Less than 3

percent said they would not go. These results give an important indication in terms of how the involvement of Mecca's citizen would boost the usage of the HS when the Hajj isn't occurring and make it a success (Table 5.16 & Figure 5.19).

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Definitely	390	48.5	48.5	48.5
	Maybe	321	39.9	39.9	88.4
	Don't know	72	9.0	9.0	97.4
	I won't go	21	2.6	2.6	100.0
	Total	804	100.0	100.0	

Table 5.16: Respondents' ability to use the facilities in case of activation

Source: Edited by author
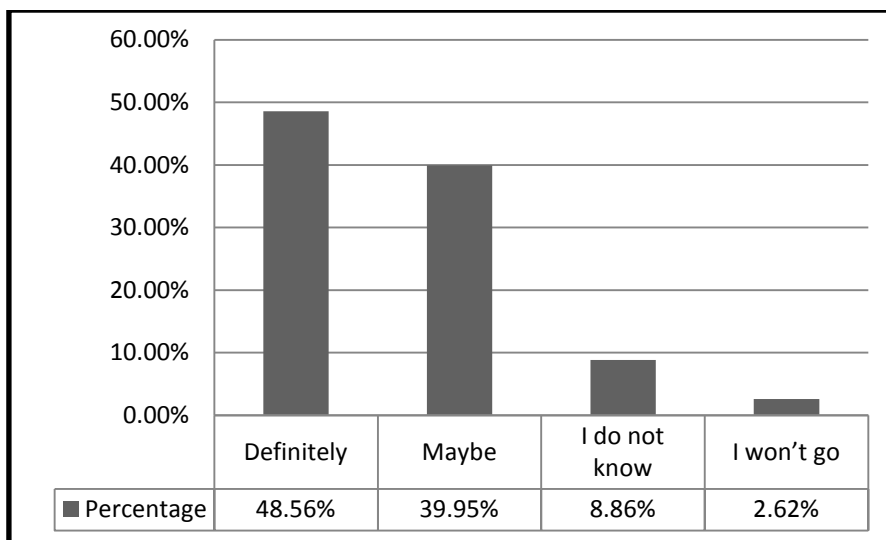
Figure 5.19: Chart showing respondents' ability to use the facilities in case of activation

Source: Edited by author

The following chart (Figure 5.20) makes a direct comparison among the all of the responses discussed above. This comparison assists with demonstrating which of the facilities Mecca's citizens would be most likely to accept being used when the Hajj is not in progress.

In addition, it also demonstrates the ordinal degree for each facility in relation to the others. Hence, this may aid decision-makers in gaining an understanding of which facilities should be the first to be opened up in the off-season.

	Mosques	Hospitals	Tents	P.Paths	Monorail	O.Spaces	Toilets
Strongly agree	43.07%	55.81%	25.97%	45.44%	60.80%	50.44%	50.44%
Agree	36.83%	29.59%	30.59%	36.95%	30.59%	32.58%	36.70%
Neutral	12.86%	9.36%	18.60%	7.99%	5.74%	9.36%	7.12%
Disagree	6.74%	4.99%	21.60%	7.74%	2.87%	5.74%	4.49%
Strongly disagree	0.50%	0.25%	3.25%	1.87%	0.00%	1.87%	1.25%
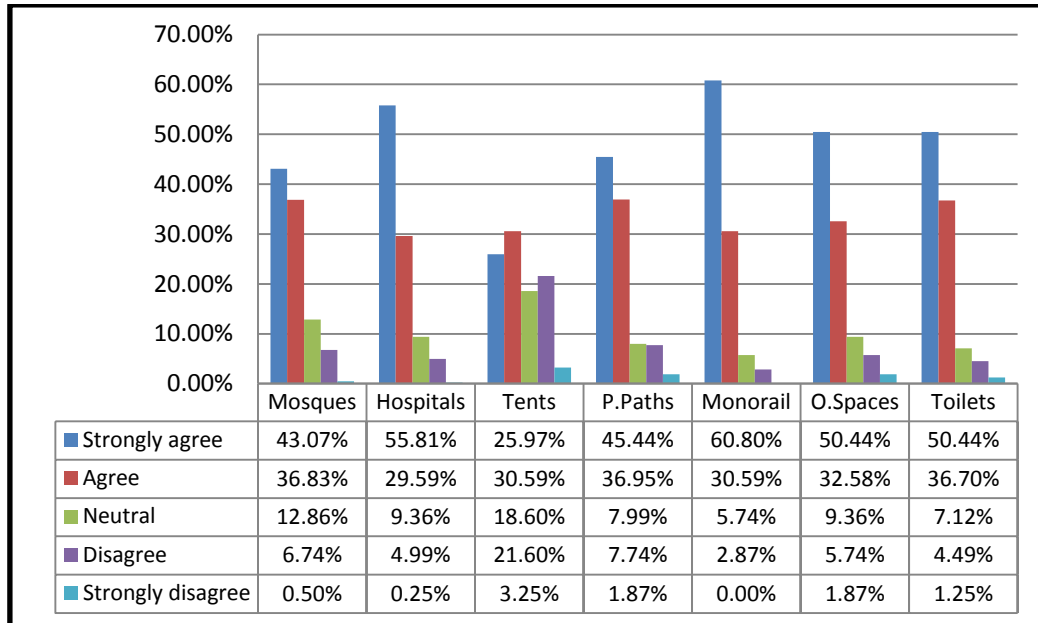
Figure 5.20: Chart comparing the percentage of agreement for each facility

Source: Edited by author

The monorail project has the highest percentage of strong agreement, while hospitals are in second position. Furthermore, the monorail has the lowest percentage of strong disagreement, and the hospitals are again in second position. Thus, these findings suggest the two facilities that the respondents appear to deem the most important, and which they feel could be used to address the needs of Mecca's citizens all year round.

- *Respondents' intentions to participate, based on their demographic data*

Analysing the respondent's intentions to participate in accordance with their demographic information could give an insight into the potential users' categories, which may provide decision makers with some ideas regarding whom is going to participate in using the HS facilities when the Hajj is not occurring in case of activation.

- *Gender*

The first demographic information concerned was gender and the results show that the males showed more certainty than the females in terms of participation as 55.08 percent of the male respondents said they would definitely be part of the activation concept, while less than the half of the female respondents (39.17 percent) felt sure about their participation. However, the difference is not that big, especially when taking into account that less than 3 percent of males and females chose a negative answer in terms of being a part of the idea (Figure 5.21).

	Definitely	Maybe	Don't know	No
Male	55.08%	35.38%	6.57%	2.97%
Female	39.17%	46.39%	12.35%	2.10%
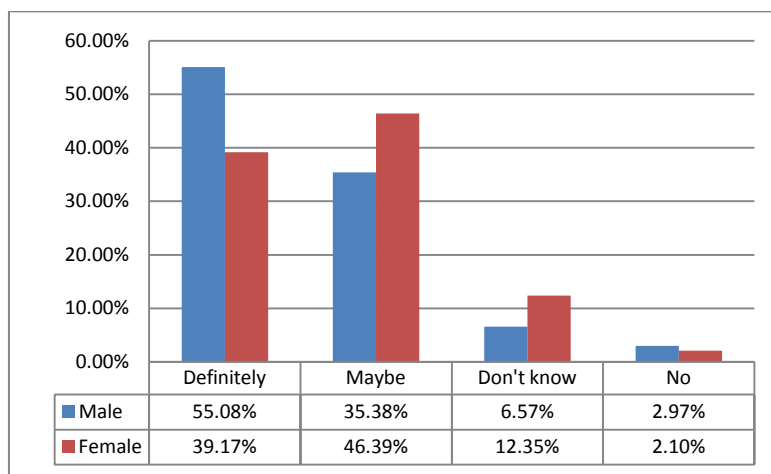
Figure 5.21 Chart of male and female decisions regarding their intention to participate
Source: Edited by author

- *Nationality*

Regarding nationality, the results show that the non-Saudi respondents are more willing to use the Hajj facilities during the off-season with a figure of approximately 57.53 percent, while less than the half of the Saudis chose definitely as an answer for this question (Figure 5.22).

Such findings indicate that it would be of huge important to launch another questionnaire in many languages in order to obtain the perceptions of different non-Saudis groups in Mecca.

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	Definitely	Maybe	Don't know	No
■ Saudi	47.61%	40.36%	9.17%	2.87%
■ Non-Saudi	57.53%	35.62%	6.85%	0.00%
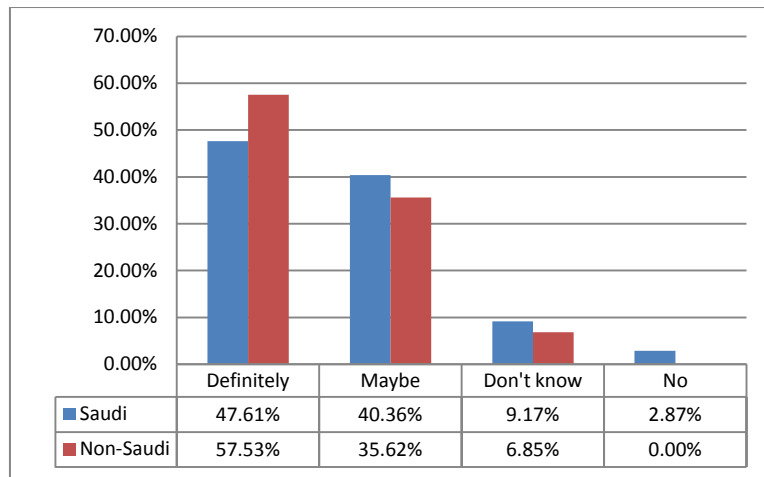
Figure 5.22 Chart of Saudis and non-Saudis decisions regarding their intention to participate

Source: Edited by author

- *Age*

Age is one of the most important pieces of information in this analysis, as the alternative uses of the HS could be provided in accordance to the expected potential users' ages. The results show that the respondents aged between 25 to 45 are expected to be the primary potential users, with more than 50 percent of this age range indicating they would definitely be part of the activation.

However, the other ages also demonstrated a high interest in being part of the activation, with more than 40 percent giving definitely as an answer. These results indicate that the alternative uses plan should take into account the differences of the potential users' ages and not focus on providing alternative uses for only one specific age group, although more possibilities for the ages of 25 to 45 could be provided as they would be expected to visit the sites most (Figure 5.23).

	Definitely	Maybe	Don't know	No
■ Less than 25	45.61%	43.86%	8.77%	1.75%
■ 25-35	47.28%	40.58%	9.90%	2.24%
■ 36-45	51.17%	36.62%	10.33%	1.88%
■ 46-55	51.03%	38.62%	6.90%	3.45%
■ More than 55	43.42%	46.05%	5.26%	5.26%
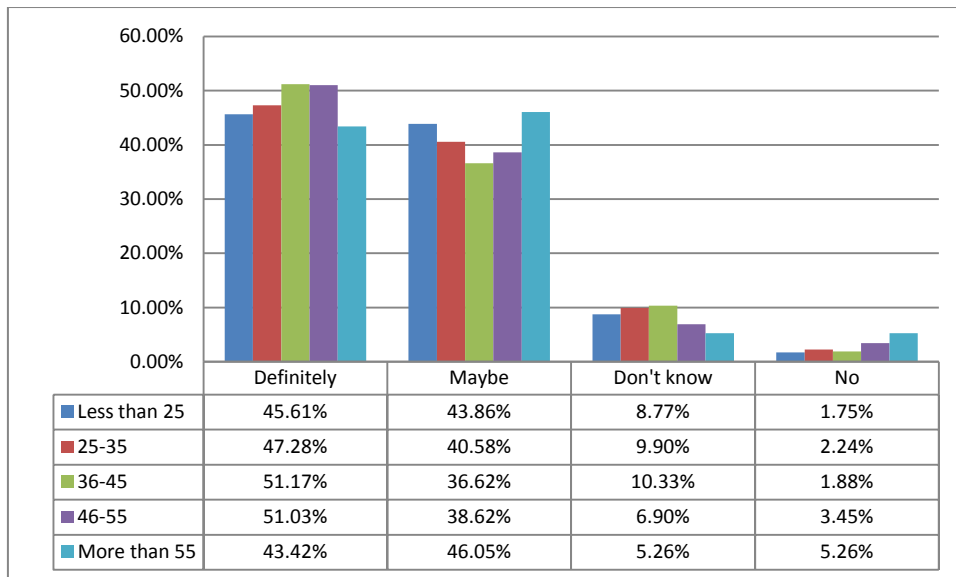
Figure 5.23 Chart of age categories' decisions regarding their intention to participate

Source: Edited by author

- *Educational level*

The educational level of the respondents appears to have no important impact on their decision regarding the participation issue, as shown in figure 5.24. It can be observed that there is similarity between all respondents, whether are educated to high school, degree or post-graduate level.

	Definitely	Maybe	Don't know	No
■ High school or less	48.44%	43.75%	1.56%	6.25%
■ Diploma	46.73%	40.19%	11.21%	1.87%
■ Bachelor	49.33%	37.78%	10.44%	2.44%
■ Post_Graduate	47.54%	43.72%	6.56%	2.19%
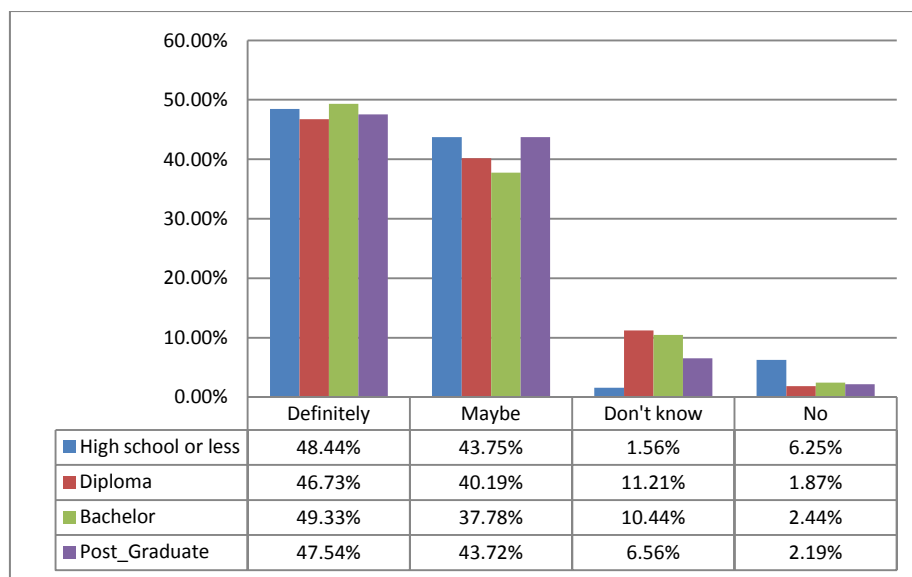
Figure 5.24 Chart of respondents' decisions based on their education level

Source: Edited by author

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- *Degree of respondents' knowledge about the Hajj sites*

The results show that as the more the respondents know about the HS and their facilities, as the more they are willing to be part of the activation concept. As can be observed in the below chart, respondents with a good level of knowledge relating to the HS seem more certain about their participation than the respondents with a lesser degree of knowledge.

It can thus be observed that 65 percent of the respondents with a higher degree of knowledge say they will definitely participate, while only less than 30 percent of the respondents with no knowledge about the HS felt certain regarding their possible participation. This therefore indicates that ensuring the potential users know a lot about the sites will form part of the activation process (Figure 5.25).

	Definitely	Maybe	Don't know	No
High	66.04%	25.94%	5.66%	2.36%
Medium	48.42%	40.40%	9.17%	2.01%
Few	34.39%	50.79%	12.70%	2.12%
No_knowldge	29.63%	53.70%	7.41%	9.26%
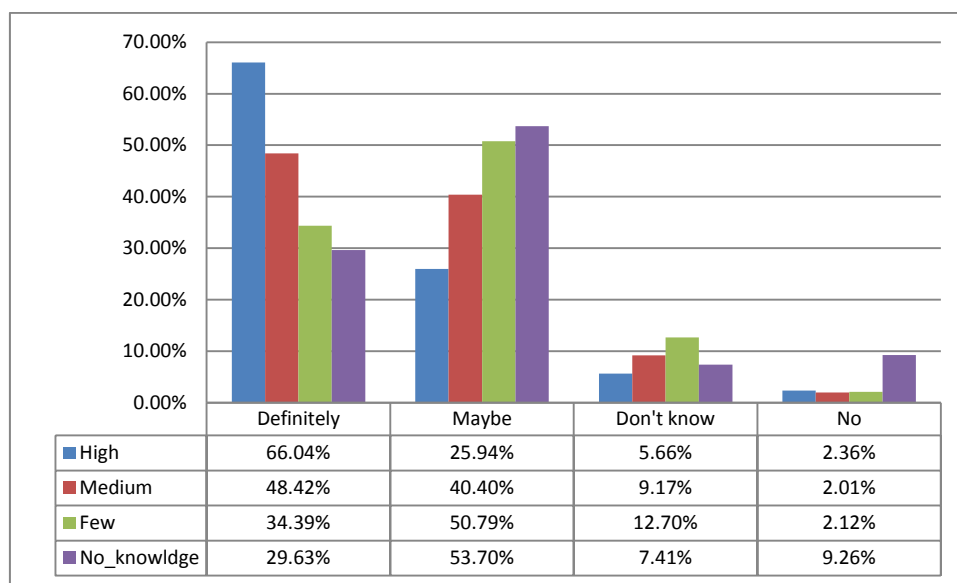
Figure 5.25 Chart of respondents' decisions based on their degree of knowledge about the HS
Source: Edited by author

- *Respondents' perceptions based on their geographical part*

In order to better understand the perceptions of respondents and the relationship between the different parts of Mecca which they inhabit, as well as their degree of agreement with the use of each facility, respondents were asked which part of Mecca they lived in. They could choose Northwest (NWP), Northeast (NEP), Southeast (SEP), Southwest (SWP) and West

(WP). These part definitions were obtained from the analysis of Mecca's urban growth, which was undertaken in chapter four. As discussed earlier, 27.2 percent of respondents were from the WP, 18.4 percent were from the NWP, 13.1 percent were from the NEP, 19 percent were from the SEP and 22.3 percent were from the SWP (Figure 5.26).

This question aimed to discover whether the amount people agreed with the use of the HS in the off-season varied based on where respondents lived. Moreover, it aimed to discover whether the abilities of respondents to take part and use the HS when the Hajj is not in progress correlated with the part of Mecca in which they lived. Due to this, for this section of the analysis, only questions related to the respondents' perceptions and the question regarding their ability to make better use of the facilities year round were considered. For each facility, the percentage of agreement for each part was calculated, in order to establish which parts agreed most strongly.
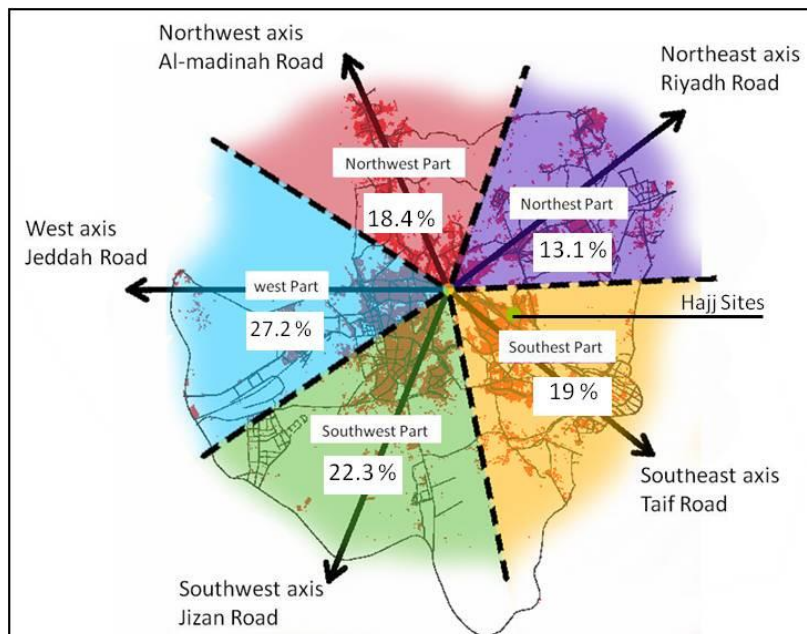
Figure 5.26: Respondents' percentages per part

Source: Edited by author

Before proceeding to the results, it is important in this step to conduct a reliability test once again, employing the data for each part. This ensures that the results from each part are measuring what they were designed to.

Therefore, Cronbach's alpha reliability test was applied a second time so as to identify the reliability coefficient for each part. The results in (Table 5.17) show that all of the tested parts' data has a score > 0.8., except for the SEP, which has a score > .7. For this reason, according to the scale mentioned previously, the condition of most parts is considered good, while the SEP is considered merely acceptable.

	Cronbach's Alpha	Cronbach's Alpha based on standardised items	No of items	Condition
West Part	.826	.834	8	Good
Northwest Part	.860	.862	8	Good
Northeast part	.838	.851	8	Good
Southeast part	.745	.763	8	Acceptable
Southwest part	.835	.839	8	Good

Table 5.17: Reliability test for each parts' data
Source: Edited by author

The following section will illustrate the results with regard to dividing the data obtained based on the geographical part of Mecca in which respondents live. The results for each facility will also be described, alongside highlighting the parts with the highest percentage of strong agreement.

- The mosques

According to the analysis based on the geographical parts, the results show that the NEP has the highest percentage of strong agreement, with around 56.19 percent of respondents strongly agreeing with the use of the mosques, while the SEP has the second highest percentage, with about 46.41 percent of respondents strongly agreeing (Figure 5.27).

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
West Part	39.73%	38.81%	11.42%	9.59%	0.46%
Northwest Part	39.19%	41.22%	13.51%	5.41%	0.68%
Northeast part	56.19%	30.48%	11.43%	1.90%	0.00%
Southeast part	46.41%	30.07%	15.69%	6.54%	1.31%
Southwest part	39.66%	40.78%	11.73%	7.82%	0.00%
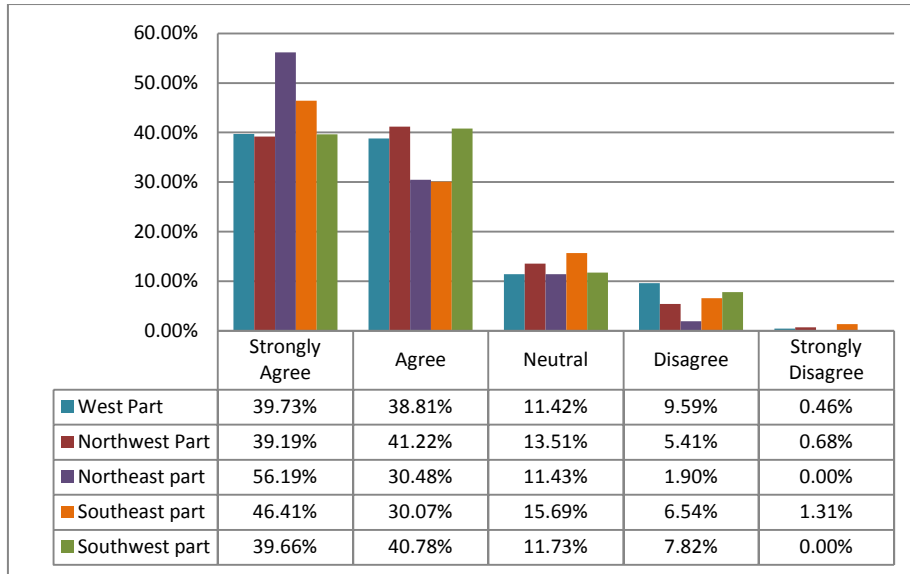
Figure 5.27: Chart comparing percentage of agreement for using the mosques among parts

Source: Edited by author

- The hospitals

For hospital facilities, the results show that the SEP had the highest percentage of strong agreement, with around 67.97 percent strongly agreeing. While the NEP has the second highest percentage of strong agreement, with about 46.41 percent strongly agreeing (Figure 5.28).

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
West Part	50.23%	32.88%	10.50%	5.94%	0.46%
Northwest Part	50.00%	34.46%	8.78%	6.08%	0.68%
Northeast part	59.05%	30.48%	8.57%	1.90%	0.00%
Southeast part	67.97%	20.92%	9.15%	1.96%	0.00%
Southwest part	55.87%	27.93%	8.94%	7.26%	0.00%
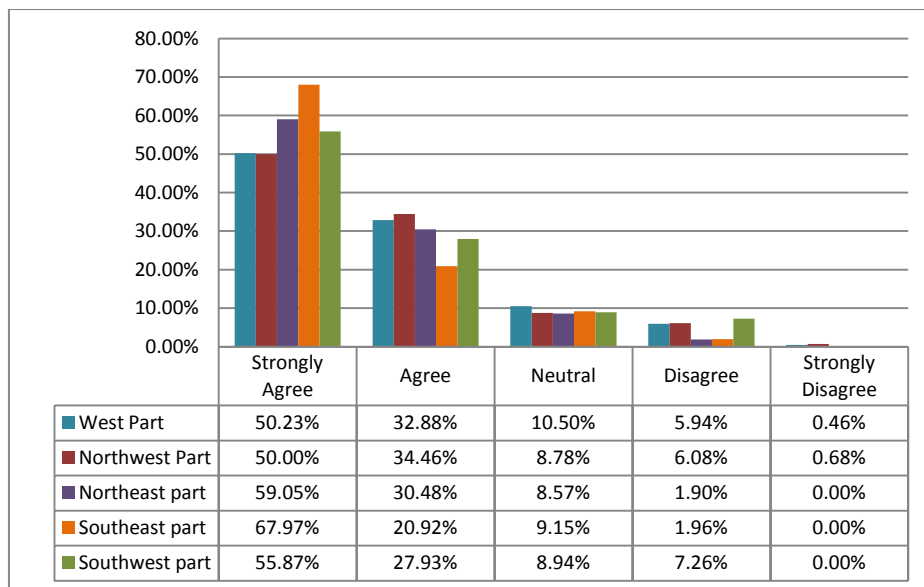
Figure 5.28: Chart comparing percentage of agreement for using hospitals among parts

Source: Edited by author

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-   The permanent tents

The use of the permanent tents located in Mina had a noticeable percentage of respondents who disagreed with their use, although a similar percentage strongly agreed and agreed, while there were even a similar percentage of neutral responses. In other words, responses to the use of this facility did not give a clear indication in relation to people's overall perceptions. This has also been reflected in the percentages among the parts. However, the NEP has the highest percentage of strong agreement, with about 31.43 percent (Figure 5.29).

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
West Part	22.83%	31.96%	16.44%	25.11%	3.65%
Northwest Part	24.32%	37.16%	16.89%	20.27%	1.35%
Northeast part	31.43%	23.81%	21.90%	20.95%	1.90%
Southeast part	26.80%	29.41%	19.61%	18.95%	5.23%
Southwest part	26.82%	28.49%	20.11%	21.23%	3.35%
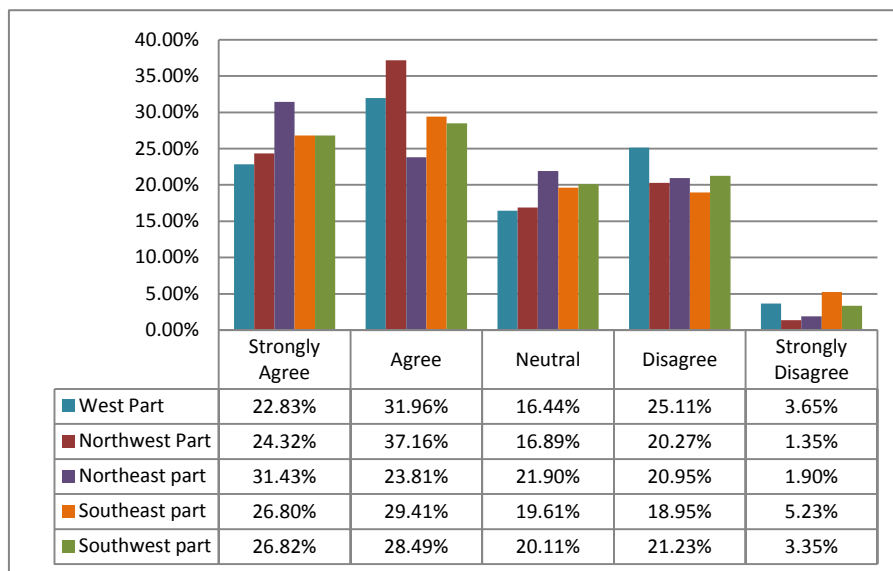
Figure 5.29: Chart comparing percentage of agreement for using permanent tents among parts
Source: Edited by author

-   The pedestrian paths

Figure 5.30 shows that the SEP and NEP are the two parts with the highest percentage of strong agreement with regard to using the pedestrian paths, with approximately 54.90 percent and 52.32 percent respectively. This result indicates that people from these parts, where those paths are located, appear to need facilities like this.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
■ West Part	42.01%	38.36%	7.76%	10.50%	1.37%
■ Northwest Part	43.92%	37.84%	8.78%	8.78%	0.68%
■ Northeast part	52.38%	36.19%	4.76%	3.81%	2.86%
■ Southeast part	54.90%	31.37%	9.15%	2.61%	1.96%
■ Southwest part	37.99%	39.66%	9.50%	10.06%	2.79%
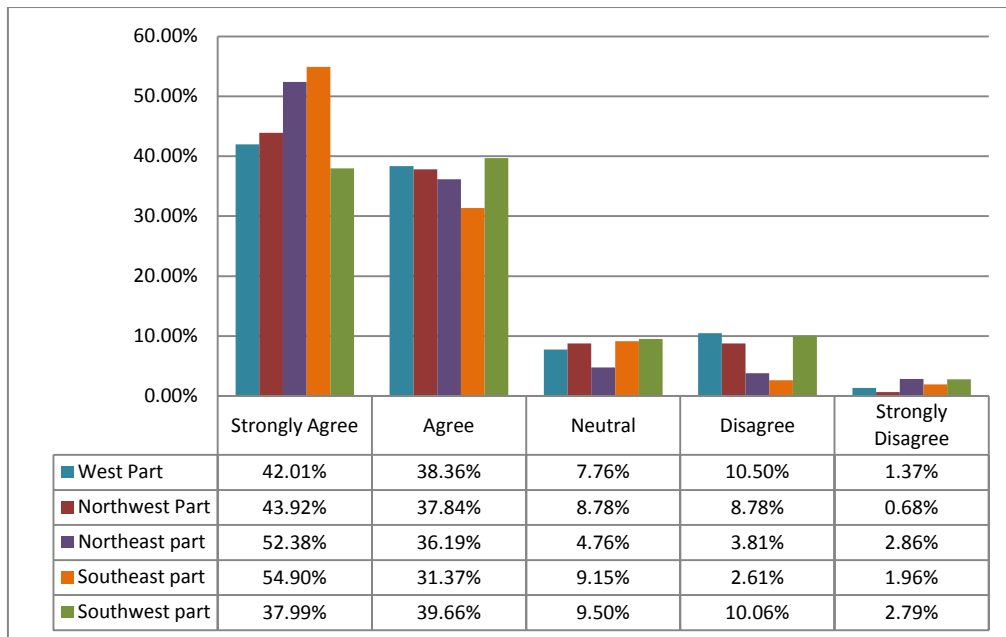
Figure 5.30: Chart comparing percentage of agreement for using pedestrian paths among parts

Source: Edited by author

- The monorail project

Results for the use of the monorail demonstrate some interesting findings. The part with the highest percentage of strong agreement was the SEP, with almost 66 percent of respondents strongly agreeing. The interesting thing to note is that the SEP is where the HS are located, and thus the monorail project is also located there.

This finding indicates that people from that part feel strongly that the project could support their movement within their part. On the other hand, the second highest percentage of strong agreement is in the NEP, with almost 64.76 percent, yet this could be because this part is closest to the SEP. The lowest percentage of disagreement is found in the SEP respondents, where less than 0.7 percent disagreed. (Figure 5.31).

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
■ West Part	56.62%	32.88%	7.31%	3.20%	0.00%
■ Northwest Part	58.11%	33.78%	4.73%	3.38%	0.00%
■ Northeast part	64.76%	31.43%	0.95%	2.86%	0.00%
■ Southeast part	66.01%	26.14%	7.19%	0.65%	0.00%
■ Southwest part	61.45%	28.49%	6.15%	3.91%	0.00%
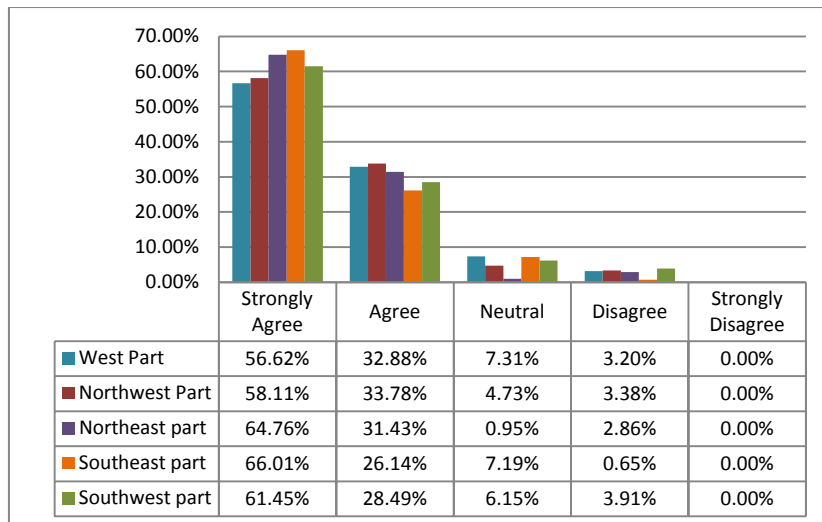
Figure 5.31: Chart comparing percentage of agreement for using the monorail project among parts

Source: Edited by author

- The open spaces and toilet complexes

Results also illustrate that the NEP and SEP were the parts which are most supportive of the use of open spaces and toilet complexes. 62.75 percent of respondents in the SEP and 59.05 percent in the NEP strongly agreed with the use of open spaces when the Hajj is not in progress, and 60 percent of respondents in the NEP and 52.94 percent in the SEP strongly supported the use of toilet complexes located within the HS (Figure 5.32& Figure 5.33)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
■ West Part	43.38%	34.70%	12.79%	6.39%	2.74%
■ Northwest Part	47.30%	37.16%	8.11%	7.43%	0.00%
■ Northeast part	59.05%	26.67%	8.57%	3.81%	1.90%
■ Southeast part	62.75%	26.14%	6.54%	3.27%	1.31%
■ Southwest part	45.81%	35.75%	8.94%	6.70%	2.79%
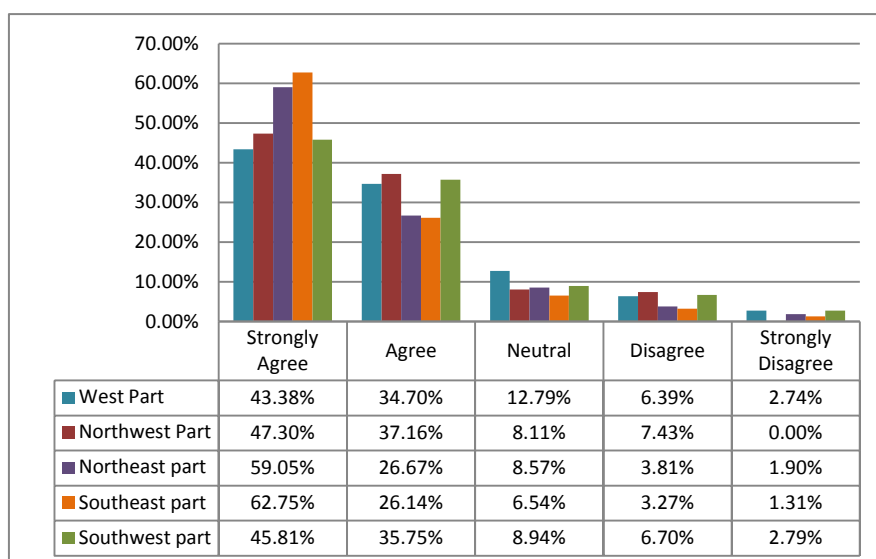
Figure 5.32: Chart comparing percentage of agreement for using open spaces among parts

Source: Edited by author

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	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
West Part	47.95%	37.90%	6.39%	5.94%	1.83%
Northwest Part	52.70%	33.11%	8.11%	4.73%	1.35%
Northeast part	60.00%	30.48%	4.76%	4.76%	0.00%
Southeast part	52.94%	36.60%	6.54%	2.61%	1.31%
Southwest part	43.02%	43.02%	8.94%	3.91%	1.12%
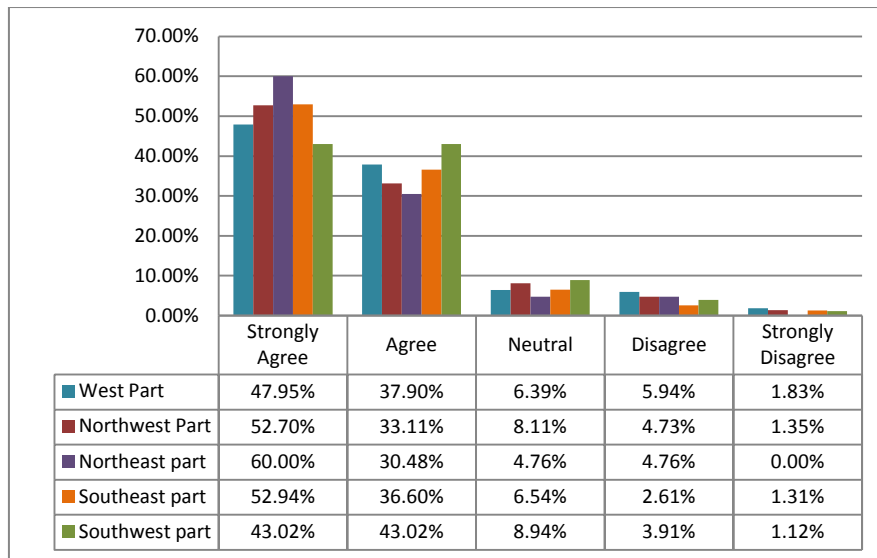
Figure 5.33: Chart comparing percentage of agreement for using toilet complexes among parts

Source: Edited by author

- *Respondents' intentions to participate, based on their geographical part*

Another important aspect in the analysis of respondents' perceptions according to their part is to measure their ability to participate if the HS facilities were to be made available for use in the off-season. This measurement can therefore enable the researcher to understand whether or not people from the parts where the HS are located are likely to use the sites all year round. Respondents were asked whether they would use the HS when the Hajj was not occurring, and were given a choice of responses -definitely, maybe, don't know and will not go. The measurement was based on finding which part chose "Definitely" at the highest rate.

Results for this question (Figure 5.34) demonstrated that more of the NEP and SEP chose "Definitely" as their response. The NEP had 63.81 percent of respondents indicate they definitely would use the HS, and the SEP had 52.29 percent. At the same time, these parts also had the lowest levels of "will not go" as a response. The SEP has the lowest level of "will not go" with approximately 0.65 percent of respondents. The NEP is the second lowest with 0.95 percent. Hence, these findings suggest that people from the two parts closest to the HS (SEP and NEP) are more likely to use the HS when

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the Hajj is not taking place. However, the other parts also have a high percentage of respondents who chose "Definitely", and a low percentage who chose "No".

	Defenitly	Maybe	Don't know	No
West Part	40.18%	44.29%	11.42%	4.11%
Northwest Part	50.00%	35.14%	12.16%	2.70%
Northeast part	63.81%	30.48%	4.76%	0.95%
Southeast part	52.29%	40.52%	6.54%	0.65%
Southwest part	45.25%	43.58%	7.82%	3.35%
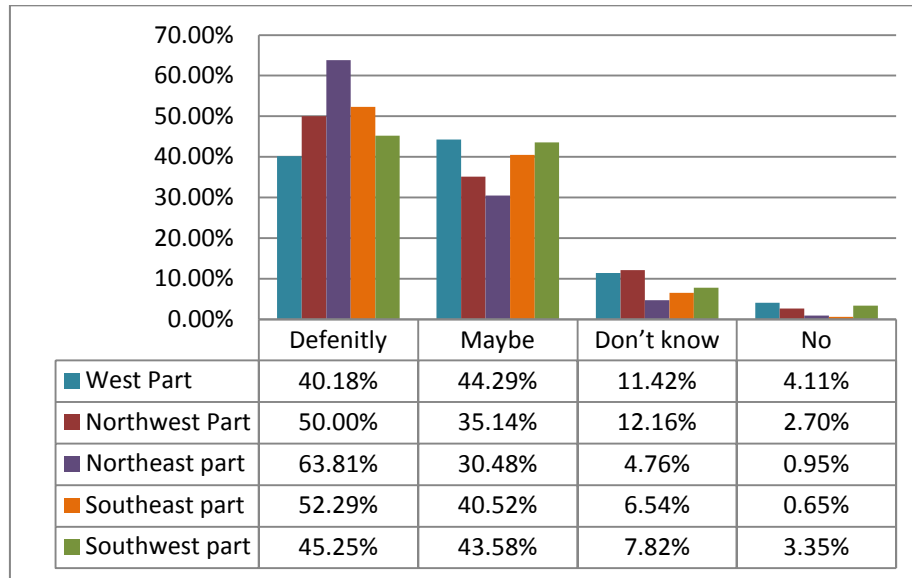
Figure 5.34: Chart of respondents' ability to use the facilities based on their part

Source: Edited by author

Moreover, it was noticed within some facilities, such as the mosques and the permanent tents that the respondents from the NEP agreed more strongly in terms of usage when the Hajj is not occurring than the respondents from the SEP. However, respondents from the SEP are closer to those facilities. The researcher believes that such an issue could arise from the fact that people from the NEP tend to use the HS road networks more than the people from the SEP (Figure 5.35). Thus, people from the NEP usually have more contact with the permanent tents and the mosques within Mina and Muzdalifa, which could be a reason why they agreed more strongly than the people from the SEP. In general, it is clear from the previous analysis, that people from the SEP and the NEP agree more strongly with the concept than the people from the other parts of the city, which appears to be primarily due to their closeness to the HS.

	WP	NWP	NEP	SEP	SWP
■ Yes	23.74%	26.35%	78.09%	39.80%	25.69%
■ Sometime	60.27%	54.05%	20.95%	49.67%	63.13%
■ No	15.98%	19.59%	0.95%	10.45%	11.17%
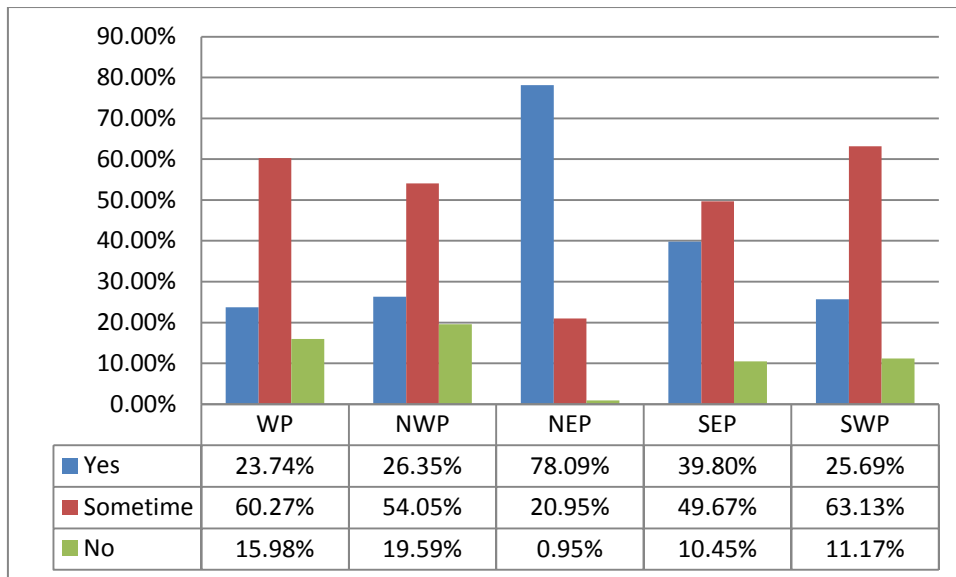
Figure 5.35: Chart showing the usage of the HS road networks during the non-Hajj season

Source: Edited by author

- *The attitude of the respondents*

In order to better understand the perception that respondents had about the general concept behind this study, it is useful to measure the attitude for responses in terms of each question. This is especially true for questions related to people's perceptions regarding using the facilities and their ability to participate. These attitudes can be measured by comparing the mean score obtained from responses for each facility question with the weighted mean for the *Likert scale*. Abdulfattah (2008) introduced the weighted mean for the trio, quartet and quintet Likert scale questions. Here the researcher only considered the quartet and quintet, according to the scaled questions that were used (Table 5.18)

Weight	Opinion	Weighted mean	Attitude
1	Definitely	from 1.00 to 1.74	Definitely
2	Maybe	from 1.75 to 2.49	Maybe
3	Don't know	from 2.50 to 3.24	Don't know
4	No	from 3.25 to 4.00	No

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		from 1.00 to 1.97	Strongly agree
1	Strongly agree	from 1.00 to 1.97	Strongly agree
2	Agree	from 1.80 to 2.59	Agree
3	Neutral	from 2.60 to 3.39	Neutral
4	Disagree	from 3.40 to 4.19	Disagree
5	Strongly disagree	from 4.25 to 5	Strongly disagree

Table 5.18: Weighted mean for quartet and quintet Likert scale questions

Source: Edited by author

For the Likert-scaled questions in this case, with regard to respondents' perception about using the HS facilities in the off-season, as well as the question regarding their ability to participate, the response's mean score needed to be calculated for each question.

This allows the researcher to compare it with the data in the previous table and aims to determine the general attitude of responses for each question. This measurement was applied for all responses, as well as for the responses based on each geographical part. Table 5.19, below, shows the general attitude of responses regarding each facility and further, shows the general attitude of responses in relation to people's ability to participate if the HS facilities were opened up for use in non-Hajj time.

Question	N	Minimum	Maximum	Mean	Attitude
Using mosques	804	1.00	5.00	1.8483	Strongly agree
Using hospitals	804	1.00	5.00	1.6405	Strongly agree
Using tents	804	1.00	5.00	2.4577	Agree
Using P. paths	804	1.00	5.00	1.8396	Strongly agree
Using the monorail	804	1.00	5.00	1.5062	Strongly agree
Using O. spaces	804	1.00	5.00	1.7600	Strongly agree
Using P. toilets	804	1.00	5.00	1.6953	Strongly agree
Ability of participation	804	1.00	4.00	1.6567	Definitely

Table 5.19: The attitude of responses for each facility for all respondents

Source: Edited by author

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Moreover, in order to understand the general attitude of respondents in terms of the geographical parts of Mecca, the same calculation of finding the mean was applied, but to each part separately. The following table presents the attitude of responses according to each part (Table 5.20).

Using of:	WP		NWP		NEP		SEP		SWP	
	Mean	Attitude	Mean	Attitude	Mean	Attitude	Mean	Attitude	Mean	Attitude
Mosques	1.9224	Agree	1.8716	Agree	1.5905	S. Agree	1.7627	S. Agree	1.8771	Agree
Hospitals	1.7352	S. Agree	1.7297	S. Agree	1.5333	S. Agree	1.4510	S. Agree	1.6760	S. Agree
Tents	2.5479	Agree	2.3716	Agree	2.3810	Agree	2.4641	Agree	2.4581	Agree
P. Paths	1.9087	Agree	1.8446	Agree	1.6857	S. Agree	1.6536	S. Agree	2.0000	Agree
Monorail	1.5708	S. Agree	1.5338	S. Agree	1.4190	S. Agree	1.4248	S. Agree	1.5251	S. Agree
O. Spaces	1.9041	Agree	1.7568	S. Agree	1.6286	S. Agree	1.5425	S. Agree	1.8492	Agree
P. Toilets	1.7580	S. Agree	1.6892	S. Agree	1.5429	S. Agree	1.6275	S. Agree	1.7909	Agree
Ability of Participation	1.7945	Maybe	1.8757	Maybe	1.4286	Definitely	1.5556	Definitely	1.9927	Maybe

Table 5.20: Respondents' attitude according to geographical part
Source: Edited by author

According to the table above, for questions relating to using the HS facilities when the Hajj is not occurring, the NEP and SEP were the parts that demonstrated the strongest agreement. On average, they strongly agreed with all the facilities being used, except for the permanent tents, which, on average, they agreed with. In contrast, the other parts varied between strong agreement and agreement, depending on the facility.

Moreover, the NEP and SEP also chose "Definitely" as the average attitude taken towards the question of people's ability to participate, while the other parts chose "Maybe" to represent the average attitude. Thus, this is another finding indicating a correlation between where respondents live and their perceptions of the concept proposed in this research. People from the SEP and NEP, where the HS are located, therefore appear to be more likely to strongly agree with using the HS facilities when the Hajj is not occurring. Furthermore, they are more likely to feel certain that they will use such facilities if they were to be available.

5.4 The possible alternative uses of the Hajj sites based on respondents' perceptions

This part of the chapter illustrates the possible alternative uses that could be applied within the HS when the Hajj is not in progress. These possible uses have been extracted from the respondent's comments, as the last section of the questionnaire allowed respondents to express their opinions freely. There were a total of 363 comments left, meaning that almost 45 percent of the total respondents left a comment. The comments varied between supportive, disagreeing and fearful. In addition, some offered ideas for possible alternative uses. Below, the main alternative possible uses discussed by the respondents will be highlighted.

- School activities that focus on teaching the students the Hajj rituals on site. This would help them to learn about the rituals in practice rather than only in theory.
- The sites could be opened up as official religious tourist destinations for the people visiting Mecca. This could also involve opening up the healthcare centres, mosques, toilet complexes and food kiosks.
- The permanent tents in Mina could be rented to students, as the main university of Mecca *"Umm Al-Qura University"* is very close to the HS.
- The main mosques in Arafat, Mina and Muzdalifa could serve during *Ramadan[42],* when Muslims in general worship more than in other months.
- The open green areas in Arafat could serve as a central park for Mecca citizens, as the city has no central parks as yet.
- The HS could be used as Islamic museums that can be visited by foreigners to learn more about this Islamic pilgrimage ritual.
- Permanent buildings could be converted into public service offices to serve Mecca citizens when the main offices are overcrowded.
- Portable public spaces within the sites, including children's parks, sports playgrounds, picnic zones, relaxing spots, pedestrian paths and food trucks could be created.

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[42] Ramadan is the ninth month of the Islamic calendar, and is observed by Muslims worldwide as a month of fasting to commemorate the first revelation of the Quran to Muhammad according to Islamic belief.

- The monorail could transport visitors and tourists between the sites and, if possible, car parking could be provided around the monorail stations to make the stations more accessible to visitors and citizens of Mecca.

- Opening the permanent tents to host some temporal events, such as exhibitions, bazaars, local public markets, and restaurants.

- Opening the mosques to serve the daily Muslims prayers, or even only once a week to host the weekly Islamic pray called *"Jumu'ah prayer"*, which is performed every Friday.

- Using the hospitals to cover the existing shortages in Mecca's health services or as private clinics. Alternatively, they could be used as university hospitals and medicine research centres. Another option is renting them out and using the rent to cover the annual maintenance costs.

- The sites could be used to train the workers who work during the Hajj rituals to memorise the location of the services, hospitals, tents and transportation units in order to prepare them to serve more effectively during the season.

- Make the sites exhibition sites for different cultural events and facilitate connections with sites outside Mecca.

- Using the permanent tents and the Mina towers as temporary accommodation for visitors to Mecca and to provide frequented transportation methods to facilitate the visitor's travel to and from Mecca's centre.

- Exploiting the open, asphalted spaces in Muzdalifa as public parking for buses or cars that could transport visitors to Mecca, since parking in the centre of Mecca is very limited and always crowded.

- Allowing young people to practice their hobbies within the open spaces in Muzdalifa and Arafat, which may contribute to keeping them away from undesirable illegal activities.

- Using the sites and the facilities in a way that helps to evaluate their performance and detect any defects in advance of the Hajj season.

- Facilitating the use of the toilet complexes with a specific fee in order to guarantee their maintenance.

- Making the sites a dedicated space for foreigners visiting Mecca to visit for religious purposes, facilitated by Mecca's authorities in order to control their activities and provide the necessary services for them all in one place.

- Using the pedestrian paths between the three sites for sports, running, cyclist and walking.

- Installing a solar cells system over the permanent tents of Mina to produce alternative electricity energy, as the tents cover a large area.

- Also of note is that one respondent suggested that alternative uses should only occur on weekends and vacation days, in order to prevent possible damage from everyday use.

The ideas above were the most commonly repeated among respondents. However, many respondents also expressed concern about the negative impacts of opening the sites up for alternative uses. Some respondents were worried about the additional cost of maintenance, while others were afraid that the sites may lose their sacredness and significance. Moreover, many comments provided suggestions to enhance the ideas, but other comments completely disagreed with the suggestions. However, the ideas above can give decision makers some insight into how the sites could be used when the Hajj is not occurring.

5.4.1 The appropriated alternative uses of the Hajj sites based on researcher's point of view

There are countless alternative ideas for using the HS during the non-Hajj period, as can be seen from the potential users' proposals, but in order for these ideas to be properly implemented, deep analysis and study are required in relation to the advantages and disadvantages of such implementations. Nevertheless, it would be beneficial to provide some analysis regarding similar examples, such as those mentioned in chapter 2, as well as the potential users' proposals in order provides some focus with regard to the most appropriate alternative uses that could potentially be appropriated.

- City park

By reviewing the alternative uses of the underused urban spaces examples given in chapter 2, the first example was the Tempelhof Airport in Berlin. In this example, the airport was shut down but opened temporarily to the public as a park and nowadays, is considered an incredible place to get some exercise and practice hobbies like rollerblading and cycling, due to the perfectly flat runways. In addition, there are dedicated grassy areas that have been designated for BBQs and picnic zones.

Thus, it is clear that such an example could be implemented successful within the HS and this idea meets with the potentials users' proposals and requirement as well. Many of users' comments proposed that the HS, and especially the open green areas in Arafat, could serve as a central park for Mecca's citizens, particularly as the city has no central parks as yet (Figure 5.36).

While other comments proposed the concept of creating portable public spaces within the HS, including children's parks, sports playgrounds, picnic zones, relaxing spots, pedestrian paths and food trucks. However, the researcher believes that opening and preparing some parts of the HS open areas for such uses could enhance the need to operate other facilities also, such as the monorail, the mosques and the toilet complexes since there will be demand from the people who would be spending their time there.
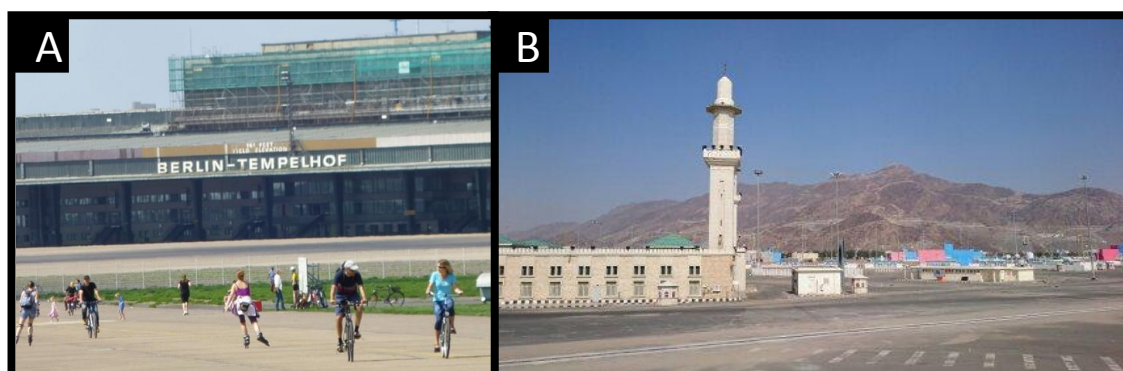
Figure 5.36 The possible alternative uses of the HS where A) shows how the underused airport in Berlin is used by citizens as a public park, and B) shows some parts of the HS where it could also be possible for it to be used as a public park
Source: Manipulated by author

- Urban farms

The *AgroCité* project example also offers an interesting idea for an alternative use of an underused urban space, which involves taking abandoned lots or vacant land and converting them into vibrant, profitable micro-farms in order to strengthen the local food system. The *AgroCité* project started as a community garden, which works in experimental ways to create energy from composting and understanding the natural cycles of organic materials. The researcher believes that such s concept could also be adapted within the HS, especially in Arafat, where approximately 25 percent of its area is covered by vegetation, as was detailed in figure 4.12 in chapter 4.

Thus, these green areas could be enhanced by introducing the concept of urban farming within some parts of Arafat, thus encouraging the citizens to practise their agricultural hobbies within an area where the vegetation already exists. Moreover, according to Alriyadh news in (2009), Arafat already has an improved watering system that is made to water approximately 300,000 trees distributed all over Arafat at a rate of 40,000 m³ of water daily (Alryiadh news, 2009). Therefore, instead of starting the urban farm from zero, as with the Agrocite project, Arafat is already prepared for this kind of alternative use, which could thus maximise the coverage of the daily water usage on one hand, and further, provide energy, food and organic products for the surrounding areas (Figure 5.37).

Figure 5.37 the possible alternative use of the green area in Arafat where A) shows the *AgroCité* urban farm project, and B) the green areas in Arafat that offer the opportunity for an urban farm project

Source: Manipulated by author

-   Local public market

The third example, which was highlighted in chapter 2, was the Spitalfields market building in London whereby the building had been emptied of its boisterous life prior to redevelopment and during the gap before any redevelopment taking place, an interim alternative project was embarked upon. This included a temporary mix of activities, such as culture, sport and food, which has created an interesting area and also serves as a great outlet for local and non-local people to enjoy.

The researcher believes that a similar concept could be introduced in the HS, especially within the empty permanent tents in Mina. The tents cover approximately 57 percent of the total area, which offers the opportunity for similar such interim activities to take place with economic purposes, as happened within the Spitalfields building. Such an idea was also proposed by some of the potential users as can be seen in the previous section; some respondents proposed opening up the permanent tents to host some temporal events, such as exhibitions, bazaars, local public markets, and restaurants (Figure 5.38).
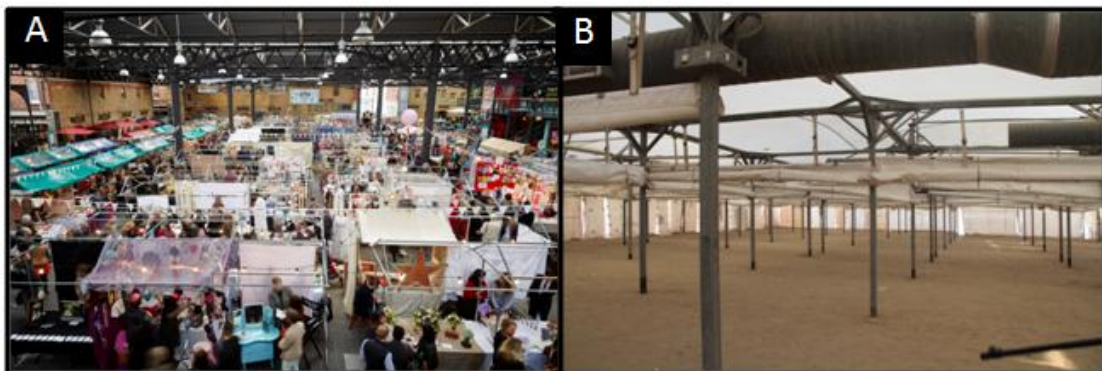
Figure 5.38 A) shows the interim activities within the Spitalfields building and B) shows part of the permanent tents area where can some interim activities could be introduced.
Source: Manipulated by author

Moreover, the location of Mina, as shown in Figure 4.30 in chapter 4, is another advantage that could mean that introducing similar activities there would be a success, which is the fact that Mina is located next to a fully built-up area on one side and on the other, there is a new zone which offers huge

potential for urban expansion and is expected to enhance the importance of Mina as a location also. Thus, the permanent tents in Mina share characteristics with the Spitalfields building in terms of them being a huge, covered and underused area that is located in an important location whereby interim activities that could be similar to Spitalfields may be appropriated

- Temporary events

The sports venues' examples that were explored in chapter 2 were some of the closest examples that share some of the HS characteristics in terms of the seasonal occasional use that those venues are also dedicated to. For instance, the baseball stadiums are usually dedicated to baseball games for 81 days per year, while the offseason usually brings a period of quiet and vacancy for the ballparks, which further often translates into a decline in revenue. Therefore, in order to combat this revenue drop, some baseball teams have worked to keep fans coming to their ballparks through hosting temporary events during the offseason, as explained in chapter 2.

Hence, this concept could also be appropriated to be adapted within the HS, as the sites are already prepared to host the event of the Hajj, thus, other occasional events (whether on a large or small scale) could be workable within the sites, which could also make use of the different facilities provided there. The concept was also proposed by some of the respondents, whom proposed using some parts of the HS for exhibitions, open museums, cultural events and sporting events.

Nowadays, the city of Mecca already hosts many occasional events that take place on some of the land or some of the open car parks in Mecca, while the researcher believes that these events could be more appropriated to be hosted within the HS themselves, as the sites are already prepared for such kinds of events and have all the necessary facilities.

The Mecca spring event for example is a cultural, social and entertainment event that takes place within a grand open car park and includes many different activities, such as, a museum, an exhibition, theater shows and a food bazaar. This year, the events were visited by approximately 30,000

people, both   from inside Mecca and outside (Saudi press agency, 2017). Thus, hosting this event within the HS would maximise the use of the HS facilities and bring make many economic, social   and revenue benefits (Figure 5.39).

Figure 5.39 A) Shows the Mecca spring event that takes place in a car park, and B) shows part of the HS where the same event could be appropriately situated as an alternative
Source: Manipulated by author

- Extending the access for the Hajj sites' facilities outside the season

For some facilities, such as the hospitals and the mosques, the respondents proposed an extension of the use of these facilities during the offseason, which cannot be considered alternative uses, but instead an extension of the same primary use for outside the season.

Regarding the hospitals for example, the respondents and the researcher believe that they could be used to cover the existing shortages in Mecca's health services or as private clinics. Moreover, they could be used as university hospitals and medicine research centres. Another option is renting them out and using the rent to cover the annual maintenance costs. The most important tissue concerning the usage of hospitals during the offseason would be that a clear start and finish date would need to be defined in order for these facilities to be ready before the Hajj started again.

The mosques on the other hand, could be used for other religious purposes, such as the weekly Friday prayer, or during the month of Ramadan, or for the

Eid[43] prayers. The researcher believes that it would be inappropriate opening the mosques all year round and for all daily prayers however, as the mosques of Arafat and Muzdalifa are quite far from the urban areas and moreover, the closest urban areas are full of small mosques which are more convenient for the people who live there anyway. However, the urban growth analysis within chapter 4 shows that the facilities within Mina and Muzdalifa, such as the hospitals and mosques could have more opportunity to cover the future urban expansion needs, thus, decision makers and local authorities should take into account the availability of these facilities when planning for the future of the HS and their surrounding areas.

5.5 Conclusion

This chapter has examined the perceptions and opinions of Mecca citizens with regard to the concept of using the HS when the Hajj is not occurring. This section of the study was done to support the previous research and analysis discussed in chapters 3 and 4, which focused on illustrating the potential of using the HS facilities in the off-season and on what could make the use of the facilities more effective. This study was undertaken by publishing an e-questionnaire, as it was an appropriate method that has been used in other recent studies for data collection in similar cases.

The general responses from the respondents show that most of the respondents agreed with the idea of reusing the HS facilities. However, their level of agreement varied according to the facility. The hospitals and the monorail project were the facilities with the highest degree of agreement from the respondents, while there was variation regarding the other facilities. Part of the explanation for this could be the respondents feel there is a shortage of the general health care services in Mecca and that they are always under strain. Thus, they believe the shortage could be addressed through the use of the health facilities inside the HS, even if it was in a temporary manner. As mentioned, the monorail project also had a higher degree of

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[43] Is the special prayer offered to commemorate two Islamic festivals; the first day after Ramadan and the third day of the Hajj days after the pilgrims finish the ritual of Arafat day

agreement than the rest of the facilities, which could be attributed to the fact that respondents feel that the project is huge and costs a lot, hence they think the project needs to be utilised better to realise its full benefits.

On the other hand, most of the respondents expressed that they are willing to participate in the alternative uses of the HS if they were made possible. Although, it was also observed that there was an important correlation between respondents' knowledge regarding the HS and their willingness to participate in potential alternative uses and it was identified that the higher the respondent's knowledge, as the more likely they were to say that they would definitely take part in the HS activation project. Thus, it is believed that in order to motivate the potential users to participate within the alternative uses project, it is of great importance to improve their knowledge of the HS by using various methods such as social media, public workshops and conferences and so on.

Moreover, results from the analysis of responses according to respondent's geographical parts of Mecca demonstrate an interesting correlation between respondents' geographical part and the percentage of strong agreement. Thus, respondents from NEP and SEP where the HS are located are more likely to strongly agree with the use of the HS facilities when the Hajj is not occurring than the other parts. While, they also showed more willingness to use the facilities in case of they be made available outside of the Hajj season.

Moreover, this study has successfully proved that the HS have become a part of Mecca and that most respondents use their road networks every day as part of their daily travel. Therefore, it can be concluded that the sites have an important central location, which could have a positive effect on the ability of people to use the sites' facilities if they were to be made available all year round.

Regarding the possible alternative uses for the sites, respondents mentioned a wide variety of possible uses that they think could be applied. Consequently, these ideas may help local authorities and decision-makers to gain a wider perspective and assist them if they decide to investigate using the HS facilities in the off-season. However, the researcher believes that some

alternative uses could be more appropriate than others in accordance with similar examples, respondents' perceptions and the researcher's point of view. While such alternative uses may include; a city park, urban farming, a public market and temporary occasional events.

Chapter 6 Conclusion and discussion

6.1   Introduction

This research's main aim was to study and explore the effectiveness of using the Islamic pilgrimage sites, known as the Hajj Sites (HS), when the event of the Hajj is not occurring and thus, the sites become underused. This was achieved through using a quantitative approach that focused on illustrating the different potentials of the HS, in order to support potential decisions regarding the reuse of such sites.

A theoretical work was done to accomplish the established objectives in chapters 2 and 3. Chapter 2 discussed the phenomenon of underused urban space (UUS) in an urban context through highlighting their definition, the reasons for their existence, their different forms and the possible benefits of their exploitation. Review of previous studies was conducted, whereby similar examples and current academic discussions relating to UUS were presented. While, chapter 3 discussed the HS and how they are considered to be a type of UUS and ending by illustrating the current urban characteristics that the HS have in order to support the idea of using the HS when the Hajj is not in progress.

After understanding the general concept of UUS and the HS as a form of this concept, it was important to then determine an appropriate approach that would allow for the exploration of the potential usages of the HS during their underused status. The reviewed literature and the similar examples of alternative uses of UUS explored demonstrated that the existence of the facilities and building within these spaces, alongside the importance of their locations, could enhance the potential usages of such spaces.

Thus, it was important with regard to the HS to explore their potentials in terms of the existing facilities and buildings on one hand, and on the other hand, to explore the importance of their locations. Within chapter 3 the potentials that the HS hold in terms of facilities and building was therefore explored, while chapter 4 illustrated the power of the sites' locations within

the different areas of Mecca in which urban growth has occurred and is expected to continue. This was demonstrated via the use of remote sensing and GIS technologies, in addition to some morphological indexes and predictor models.

The initial findings in chapter 4 illustrated that the HS have an important location within the city of Mecca, while the sites located between the southeast part (SEP) and the northeast part (NEP) were the parts that have experienced the highest rate of urban growth over the last 15 years (Figure 6.1).
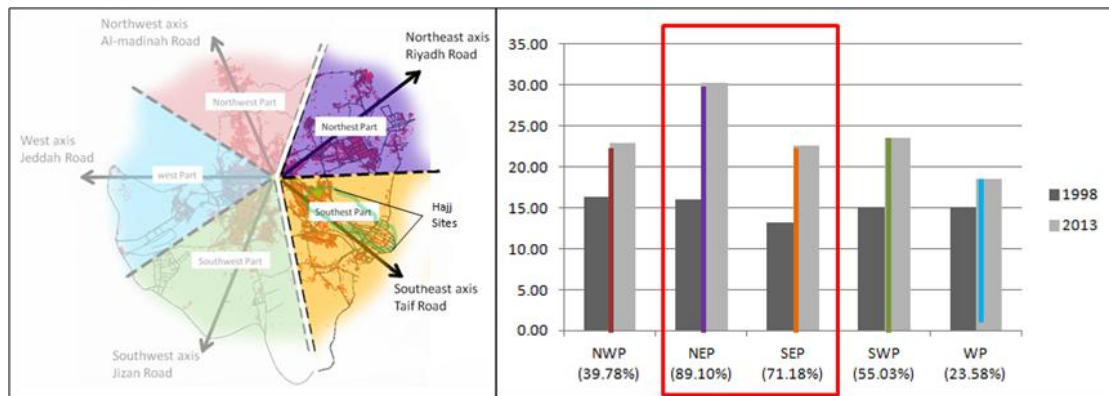
Figure 6.1 The Hajj sites in the parts with the highest rate of urban growth
Source: Edited by author

These findings therefore were encouraging in terms of exploring the potential that the HS have with regard to the future urban growth of Mecca. Through gaining a better understanding of the variables that have played important roles in past urban growth changes, thus these variables can be used to predict the future scenarios of possible urban growth changes, which can subsequently help with understanding the possible potentials that the HS locations have in terms of the future urban growth of Mecca.

After applying different urban analysis methods, such as a morphological index and a multiple regression analysis, it was identified that the highest rate of future urban growth was predicted to be occurring within two zones; those located beside the HS and also belonging to the NEP and the SEP areas, as shown in the following Figure 6.2.
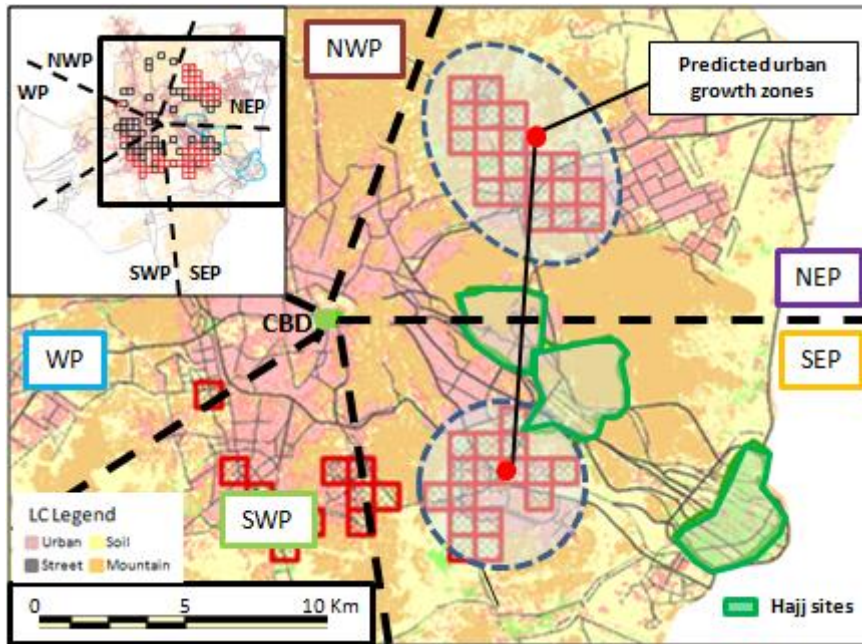
Figure 6.2 A map showing that the predicted urban growth zones are within the NEP and SEP

Source: Edited by author

These findings have also shed more light on the potentials that the HS have with regard to them being used alternatively while the Hajj is not occurring. That is to say, that the HS and their facilities will have better potential of being used in the future by people from the NEP and SEP as the analysis in chapter 4 demonstrated that there will be more people there as a result of the urban growth that will likely occur. Yet at the end of this analysis, some important questions also arose regarding whether the people from the NEP and SEP would agree to using the facilities in the offseason or not. Furthermore, even if they do agree, would they be willing to participate in such a concept or not? Lastly, does their closeness to the HS have any bearing on their perceptions?

The importance of finding the answers to these questions was driven by the fact that the perceptions and opinions of the people, especially those from the NEP and SEP, can give an indication of whether or not the urban growth within such areas enhances the potential usages of the HS? That is to say, that if the people from the NEP and SEP demonstrated disagreement with regard to using the HS during the offseason, and refusing to participate in such a concept, this means that assuming that the HS would have more potential

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usages as a result of the expected urban growth occurring there is not totally true, and vice versa.

Therefore, it was of great importance to enhance the assumptions and findings of chapter 4 by measuring the perceptions of people, especially those from the NEP and SEP over other parts of Mecca, which represent a higher level of agreement/disagreement regarding using the HS during the offseason on one hand, and on the other hand, also measuring their willingness to participate in the alternative uses if they were implemented. Thus, chapter 5 aimed to provide such information via the survey and questionnaire methods of data collection.

The main results of chapter 5 showed that, in general, people from all parts of Mecca strongly agreed with the concept of using the HS in alternative ways when the Hajj is not occurring, while they also expressed their willingness to participate in such concept in the case of implementation. Moreover, it was found that people from the NEP and SEP are more likely to strongly agree with the concept. While, they also showed more willingness to use the facilities outside of the Hajj season than the other parts, as the attitude of their responses shows in Table 6.1.

Using of:	WP		NWP		NEP		SEP		SWP	
	Mean	Attitude	Mean	Attitude	Mean	Attitude	Mean	Attitude	Mean	Attitude
Mosques	1.9224	Agree	1.8716	Agree	1.5905	S. Agree	1.7627	S. Agree	1.8771	Agree
Hospitals	1.7352	S. Agree	1.7297	S. Agree	1.5333	S. Agree	1.4510	S. Agree	1.6760	S. Agree
Tents	2.5479	Agree	2.3716	Agree	2.3810	Agree	2.4641	Agree	2.4581	Agree
P. Paths	1.9087	Agree	1.8446	Agree	1.6857	S. Agree	1.6536	S. Agree	2.0000	Agree
Monorail	1.5708	S. Agree	1.5338	S. Agree	1.4190	S. Agree	1.4248	S. Agree	1.5251	S. Agree
O. Spaces	1.9041	Agree	1.7568	S. Agree	1.6286	S. Agree	1.5425	S. Agree	1.8492	Agree
P. Toilets	1.7580	S. Agree	1.6892	S. Agree	1.5429	S. Agree	1.6275	S. Agree	1.7909	Agree
Ability of Participation	1.7945	Maybe	1.8757	Maybe	1.4286	Definitely	1.5556	Definitely	1.9927	Maybe

Table 6.1: Respondents' attitude according to geographical part
Source: Edited by author

Accordingly, chapter 5 successfully supported the findings of chapter 4, whereas the results in chapter 4 illustrated that the HS have the potential to be

used during the non-Hajj time since they are located between the NEP and SEP areas of Mecca, where the most urban growth has occurred and where the highest rate of urban growth will possibly occur in the future also. Whilst, the results of chapter 5 supported those findings by proving that the people from the NEP and SEP were more likely to strongly agree with the concept and would be more willing to participate in such a concept.

In general, the combination of the methods used in chapter 4 and 5 provides a wider perspective for decision makers and local authorities regarding how effective introducing alternative uses of the HS during their underused status could be. This chapter will proceed to summarise the major findings of the study, as well as reviewing the research's objectives, challenges and questions and potential for future research, all based on a discussion of the limitations encountered in the research process for this thesis.

6.2 Conclusion

6.2.1 Underused urban spaces in an urban context

As discussed in Chapter 2, the term "underused" is used to refer to something which is used below its optimal level. In an urban context, the meaning refers to urban spaces that are being unused for a period of time (long or short), with the expectation that they will be reused, either by a specific, known date or by an unknown date.

The most appropriate definition of underused in this research, when referring to an urban space, is that underused refers to a space being used to a lesser degree than is normal or desirable, or not being used as much as it could or should be. This concept also has many associated terms, such as vacant spaces, abandoned structures, waiting spaces and seasonal event spaces. Moreover, the concept takes many forms in urban contexts; former industrial sites, former housing settlements, vacant infrastructure, and permanent infrastructure for temporary events such as exhibitions, the Olympic games and cultural events, which can all be considered to be underused spaces to some degree.

As discussed in chapter 2, for a space to be officially considered to be underused, there are some conditions and criteria that need to be met, such as a local authority's recognition of its status, or the space being unused for more than 120 days, as suggested by the bulk of the relevant literature. However, any space in an urban area, whether or not it has infrastructure and facilities, can be considered to be underused when it is not being used as much as it should. The reasons behind the existence of UUS can also play a part in forming their characteristics, the following section will illustrate some of the reasons for this.

6.2.2   The reasons behind their existence

According to the many studies reviewed in chapter 2, the reasons for the existence of underused spaces in urban areas vary from case to case. The implementation of long-term planning is considered to be one of the most common reasons, since in many cases, urban spaces become UUS when waiting for new uses, due to the implementation process taking a longer time than expected.

Grand event areas, such as stadiums for the Olympics, or centres for exhibitions, in many cases, become unused due to decision-makers having an unclear vision of their future, despite them often being fully equipped with modern infrastructure. In addition, natural disasters have been the cause of many unused and abandoned urban spaces, and in some cases, even entire cities.

However, while there are many definitions and reasons for the phenomenon of UUS, this did not alter the researcher's understanding of the issue. The chief definition of UUS is that they are spaces in urban areas that have become unused or are used below their optimum level. Thus, this research has given greater focus to the impact of those spaces on the urban areas surrounding them, in order to understand how to appropriately deal with their existence.

6.2.3 The impacts of such spaces on the urban area

The existence of UUS can create many problems, yet they also have the potential to provide a number of opportunities. The problems UUS can create include attracting undesirable activities, such as illegal dumping and vandalism, which negatively affect the quality of life of people living in the areas where the UUS are located, along with spaces being used for waste and crime.

However, the spaces can also present huge opportunities for achieving many social and economic goals, for example, through hosting temporary activities or social events, or by being a place that meets some of the local social needs, such as serving as public spaces or even as car parking space. Thus, the existence of underused spaces in urban areas has encouraged the emergence of the temporary use (TU) concept. TU helps to exploit the opportunities mentioned above and helps to prevent the problems that can arise from UUS. However, the type of alternative TU has to be based on the characteristics of the space, such as whether it has buildings and facilities, or whether it is in a central area or on the outskirts of a city. Each UUS is unique, thus it is important to study and analyse a space in order to determine whether it would be appropriate and effective to introduce TU to the space.

6.2.4 Integration of alternative temporary uses into underused urban spaces

The concept of TU as an appropriate alternative use for exploiting the underused status of spaces was discussed in detail in chapter two. This helped to determine the profile of TU in the current discussion concerning urban studies issues. As discussed in that chapter, the concept of TU is not new, since every use in life is considered temporary with a start time and an end time. However, the difference is that some uses last longer than others.

The integration of the TU concept into UUS is considered to be a fairly recent change in thinking. In other words, many researchers and planners have recently proposed introducing TU to underused spaces to achieve many economic, social and ecological benefits, as well as to also help with

preventing some associated issues. It is also important to consider that the possible benefits of TU vary in accordance with the characteristics of the UUS.

Yet, some common economic benefits of organising the TU of UUS are that decay and vandalism can normally be reduced or avoided, and the costs of protection and surveillance could be partially, or even totally, covered by TU renters. Common social benefits for the TU of UUS include social events and activities being held in the UUS, which can help to improve the social life of the area and its people.

In many cases, temporary uses based on social goals can improve the level of citizen participation in planning for the future of such spaces. Again, each case has different benefits, based on its characteristics, size, existing structures, and location. Therefore, in order to achieve as many benefits as possible, introducing the TU of UUS must be done in an informed way, primarily by evaluating and exploring the effectiveness of TU for that space. This evaluation can provide enhanced information that local authorities and decision-makers can use to decide on whether or not TU should be allowed to be used in a given UUS.

The discussion in chapter 2 attempted to establish a general context so as to help gain a better understanding of the concepts and cases that share some characteristics with the case study of the HS. Unfortunately, the underused status of the HS has a limited profile in previous UUS research and studies. Even local studies regarding the HS were only focused on the sites during the rituals, while the underused status when the Hajj is not occurring has had no profile in prior research. However, the previously mentioned discussion has improved the researcher's understanding of how to explore the effectiveness of reusing the HS during their time of being underused, and this was further discussed in later chapters.

6.2.5 The Hajj sites as a form of underused urban space

As illustrated in chapter 3, the HS are the sites where more than two million Muslims gather every year to perform the Islamic pilgrimage known as the Hajj. The ritual lasts around five days and occurs in Mecca and at three dedicated sites near Mecca, referred to as the *Sacred sites* or the *Hajj sites*. The sites and facilities are only used for the five days of the ritual, despite sophisticated, permanent infrastructure and facilities existing there.

As discussed in chapter 2, according to various literatures, any site in an urban area that is unused for 120 days or more can be considered to be underused. Since the HS are free of any official use for almost 180 days a year, this means they are therefore a form of UUS. The availability of modern facilities and buildings, and the characteristics of the sites' original use means that the HS belong to the subset of UUS called *seasonal event sites,* indicating that these sites are only seasonally active.

The main difference between the HS and the other event sites, such as exhibition sites and Olympic sites, is that those events occur every four years and in various different sites during the same period, while the Hajj occurs every year, in the same place, which creates a period where the sites become unused while waiting for the next season, this makes the HS more similar to spaces where occasional seasonal events are held, such as sport venues or exhibition structures. The unused status of the sites during this time, despite the facilities and buildings they hold, therefore constituted the main focus of this research. Practically, this involved exploring the effectiveness of introducing alternative TU to the HS when the Hajj is not occurring.

6.2.6 Exploring the effectiveness of using the Hajj sites alternatively

Finding a suitable method or a standard guideline to be followed was another challenge that was faced during the research process for this study. While there were similar cases and research, as discussed in chapter 2, they all had limitations, primarily because the cases didn't have the same characteristics

as the HS. Most of them dealt with different cases from varying points of view, and the majority of the cases had a focus on former industrial buildings, or former housing settlements, where the reason for the spaces being unused was the economic decline of the surrounding areas. For this reason, the proposed solutions did not fit for the case of the HS.

However, some of the benefits mentioned in the case studies are able to also be realised through the reuse of the HS. These benefits include the avoidance of decay and vandalism, along with part of the maintenance costs being covered via the rent paid by temporary users for the existing facilities. However, illustrating the possible benefits by comparing the HS with similar cases was not an effective way to convince local authorities and decision-makers of the potential that using the HS in the off-season has. Therefore, a quantitative approach was utilised here in order to appropriately explore the effectiveness of reusing the HS.

The approach mainly focused on illustrating the potential that using the HS held. It was believed that by illustrating this to local authorities and decision-makers in a clear way, it would thus be more effective, since it would provide them with a wider perspective about the importance and effectiveness of using the HS when the Hajj is not occurring. The potentials were discussed theoretically in chapters 2 and 3, chiefly through referencing primary sources, including, interviews with officials, press reports and historical archives. Additionally, secondary resources, including research, articles and websites, were also used. Moreover, the potential offered by the location of the HS and the social potential that the HS held were discussed in chapter 4 and 5, and were examined by using remote sensing and GIS techniques, morphological index analyses, multiple regression analyses, and an online survey.

- Internal potentials

The internal potentials illustrated in chapter 3 demonstrated that the three HS (Arafat, Mina, and Muzdalifah) are full of different facilities and buildings, established to serve the pilgrims during the five day event of the Hajj. The facilities include fully equipped hospitals, mosques, a monorail project, open

spaces, pedestrian paths and toilet complexes. Although the facilities were designed for pilgrims, they could also be used for other uses, particularly as they have similar characteristics to normal cities in terms of their size, design, and characteristics.

Analysing and illustrating the facilities helped to determine what type of facilities exist in the HS. This information could therefore assist decision-makers when they are considering appropriate alternative uses. In addition, this information aids in clarifying the differences between the HS and similar cases of seasonal event sites, where the existing facilities are often limited and dedicated only to the event in terms of their design, size, and construction. These differences confirm that the case of the HS is unique and the idea of reusing the sites alternatively would perhaps be more effective than with other seasonal sites.

Chapter 3 also argued that the idea of reusing the HS is even more appropriate nowadays than ever before, since the sites have been radically developed over the past 20 years. During the early ages, the sites were located quite far from Mecca, and most of the facilities were limited, therefore the idea of reusing the sites after the season was less discussed and would not have been effective. At that time, the sites were similar to modern day campsites, where some people may spend their summer vacation, with no comprehensive facilities being available or being necessary.

- External potentials

The highlighting of the external potentials of the HS in the second section of chapter 3 was mainly done so as to enhance the internal potentials. It was very important to illustrate the sites' connectivity and proximity with their surroundings after illustrating the provided facilities. The analysis confirmed that the HS have external potentials, as well as internal ones. One of these external potentials is the connection between the HS road networks and Mecca's road networks.

This connection facilitates access to the sites, not only during the event, but also when the Hajj is not in progress, thus allowing Mecca's citizens to reach the HS more easily. The analysis also showed that the sites can be easily reached by visitors coming from the other nearest city, called Jeddah, where the closest airport to the HS is also located. This connectivity makes the idea of introducing alternative uses into HS more efficient, as the possible users can easily reach the sites, regardless of whether they are from Mecca or not.

- Location future potential

Another perspective and analysis that was used in order to strengthen the research's output. This analysis illustrated the relationship between the location of the HS and surrounding urban growth patterns. The results shown in chapter 4 are divided into two parts. The first evaluated the HS locations and changes in urban growth in Mecca over the past 15 years, while the second illustrated the importance of the locations in terms of the future, predicted urban growth of Mecca. For both parts, the analysis used remote sensing and GIS technologies, as they are suitable technologies and are commonly used for similar analyses worldwide. The technologies were supported by morphological indexes and multiple regression analyses, in order to understand the urban growth behaviour.

The results for the first section, which analysed urban growth in Mecca between 1998 and 2013, show that Mecca has undergone significant changes in urban cover since the government first embarked on a series of ambitious development projects in order to accommodate the growing number of pilgrims and citizens. It should be noted that most of the changes were in areas of Mecca that were close to the HS, those areas were named northeast part (NEP) and southeast part (SEP), and that the same areas have higher growth opportunity, as demonstrated by the entropy index. Moreover, even the HS have increased their built up areas over the 15 year period, despite the sites being underused. This finding indicates that the sites have gained increased facilities every year, enhancing their internal potential for alternative TU. Further, these results suggest that the location of the HS has

played a significant role in the urban growth patterns of Mecca over the 15 year period studied.

The data obtained, and the results extracted, was a motivation in terms of extending the analysis by creating an urban growth model using biophysical data, which could predict the future urban growth of Mecca. This enabled the researcher to determine whether the location of the HS is gaining importance or not. The model was created using a multiple regression analysis, which indicated four variables could partially predict the future urban growth of Mecca: the distance from Mecca's centre, the distance from the HS, the percentage of soil cover area and the percentage of street cover. As shown in chapter 4, the predicted urban growth maps indicate that the sites' location will become increasingly important, as a significant aspect of the future growth of Mecca will be its proximity to the HS, especially within the NEP and SEP. These findings illustrate that the locations of the HS seem to have future potential, as their facilities could help Mecca to cope with future growth needs, in particular in terms of usage by the people from the NEP and SEP areas, as they are the closest to the HS.

- Potential users' support

The perceptions of people living near to the HS was another important issue that was studied, in order to determine whether local people would support the idea of using the HS when the Hajj is not taking place, especially those belonging to the NEP and SEP areas, where the future urban growth will most likely occur. Measuring the public's perception is crucial for any urban planning decision. Therefore, in chapter 5, the perceptions of people living in Mecca regarding the TU of the HS were measured. The results obtained from the online questionnaires showed that the majority of Mecca's citizens use the HS road networks daily, indicating that the sites already form a part of Mecca. In addition, most respondents strongly agreed with using the facilities at the HS in the off-season. Moreover, a notable finding was that the people who live in the NEP and SEP were more supportive of the concept than others and were also more open to the idea of using the facilities if they were

to be available all year round. This could be due to the fact that people from those areas interact with the sites more than others, and therefore see more potential in being able to use the facilities to meet the local area's social needs.

The findings outlined in chapter 5 could provide support for the earlier chapters, which demonstrated that the HS have a lot of possible potential if utilised out of season. Within the chapter, some possible alternative uses were suggested that could fit within the HS, mainly based on people's suggestions, similar cases and the researcher's analysis and conclusion. Those ideas include; for example the green areas in Arafat being used in some parts as urban farms that could create organic food and help local people to practise their agricultural hobbies, in addition to using other parts as a main central park for surrounding areas. While, the permanent tents in Mina could be used as a local public market that could create economic revenue. Moreover, the plain areas in Muzdalifa could be used for hobbies like rollerblading and cycling, due to the perfectly flat runways and so on.

It is believed that these findings may be useful in providing Mecca's local authority with vital information regarding the likely effectiveness of the temporary use of the HS, thus helping with their decision-making process, or at the very least, opening the door to future thinking and investigations relating to this idea. Although, the general effectiveness of using the HS when the Hajj is not occurring has been explored through this research, yet this research could be supported by further analysis, exploring even more possible potentials. However, this research can act as preliminary guidance, which can help to influence local authorities, researchers, planners and decision-makers with regard to considering the possibility of temporarily using the HS for alternative uses. In terms of the general concept of UUS, the researcher believes that a contribution has been made to current discussions regarding UUS and the concept of TU, predominantly via the presentation of this research's case study, in addition to the ways in which methods were adapted. Although it is difficult to find prior case studies of UUS that are

similar to the HS, the methods employed in this study could offer another perspective to the cases that share some similarities with the HS.

6.3 Discussion

6.3.1   Limitations

- Research relating to the TU of UUS as an alternative solution in an urban context is still in its infancy. Examples of these types of uses are still being discussed and studied worldwide, from various points of view, and using different methods. Finding previous studies that share the same characteristics of the HS was one of the limitations faced in this research.

- Before commencing the research, it had been assumed that there would be a difficulty in obtaining enough information in relation to the HS, yet it was also assumed that there may be some limited local studies on the subject. However, even studies relating to the general concept of UUS vary, with the majority of them exploring the effectiveness of TU, rather than exploring the potentials of UUS. That is to say, most of the studies mentioned in chapter 2 discussed TU and its benefits, and did not discuss whether TU was being implemented in UUS or any general urban space.

- The concept of UUS therefore requires further study and a greater number of examples to be researched, analysed and discussed in order to explore the potentials they have, for both alternative TU and for new, permanent use. The scale of the discussed examples was another limitation that made a comparison with HS inappropriate. These limitations created some difficulties in filling the gaps between the previous studies of UUS and the study of the HS.

- Hajj research centre is considered to be the dedicated centre for any study or research regarding the HS. However, most of their published studies have focused on issues relating to the sites during the Hajj, while the underused status of the sites still has a low and limited profile. Furthermore, it was also difficult to collect the desired data, such as maps, satellite images, previous research related to the HS, and interviews with

authorities, as well as to gain access to the facilities inside the HS. Therefore, the researcher believes that by presenting this research and its results and finding to those responsible of the Hajj research centre may encourage them to enhance the general research's outcomes by facilitating the necessary data to the researcher of this thesis and to whomever may conduct similar investigations or even, this may encourage the centre to establish some of their research regarding the Hajj sites during the offseason.

- The results of people's perceptions, presented in chapter 5, were limited by the online questionnaire, as it is considered by many academics and researchers as an inaccurate method of collecting data. However, the large number of respondents, the diversity of responses and the good reliability test score may suggest that the questionnaire provided a good enough indication of how using the HS in the off-season is likely to be perceived by Mecca's citizens. This information could be enhanced through launching other questionnaires and extending the sample size, which could include people from outside Mecca and even, outside the country. This would mean that more opinions from interested people worldwide could be gathered, as the sites are considered an important destination for Muslims from all over the world.

6.3.2   Recommendations and future work

The results of this study are exclusive to the specific study area. Taking into account the weaknesses and limitations of each of the research processes that have been undertaken in this study, it is proposed that researchers and planners should take the following recommendations into account for further work:

- For researchers, urban planners and urban designers, the underused status of the HS requires further study, focusing on the problems and opportunities from other perspectives. Increasing the amount of research discussing the issue is believed would help local authorities and decision-makers with making future decisions about the HS.

- Local authorities, Mecca's research centres and others, should help to accommodate easier access to up-to-date, official data. This would allow academics, researchers and students to improve the outputs of their work, and would enhance the reliability of their results and findings. The use of enhanced technologies, such as remote sensing and GIS, is crucial for most studies regarding urban planning and design issues. They can cost a lot in terms of adoption, training, data collection, and professional consultation. However, long-term they save money, as better decisions can be made and advanced solutions can be found if the data is shared between all parties who share national and local goals and objectives. Therefore, the use of such technologies in local research centres, universities and even city municipalities, is strongly recommended, in order to gain new perspectives regarding urban planning issues.

- It may be useful to support the findings of this research by investigating grand temporary events, such as bazaars, and festivals, that take place during the year in many places in Mecca. This would help to evaluate the possibility of holding these events in the open spaces in the HS, and would provide a clear indication with regard to the local people's ability to get to the HS, alongside their acceptance of the use of the sites when the Hajj is not in progress.

- As discussed in chapter 3, Mecca has changed radically during the past 15 years. Considering that change is a natural process in every urban issue, it is believed that Mecca will continue to change, either at the same rate or faster. According to many press reports, huge projects in Mecca are planned in order to increase the number of foreign pilgrims and visitors. This will mean an enhancement to the HS facilities, increasing the HS internal potentials more than ever. Therefore, it is very important to study the possible impacts of these projects on the underused status of the HS.

- Future work will focus on studying and analysing each of the HS facilities individually in order to provide an appropriate plan for managing the possible alternative uses of each facility.

Finally, it is hoped that the methods used in the empirical part of the study and the results and data that have been provided will help other researchers, planners, students and authorities in their related studies.

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Appendixes

Appendix A: Press reports about the underused status of Hajj sites

الشرق الأوسط

اولى | ملفات الشرق | الملاحق | الرأي | الاقتصاد | الأخبار | الأولى | صفحة المدخل

نى.. مدينة الثلاثة أيام

تعمر في المواسم وتخلو بقية العام

الشرق الأوسط

قال ياقوت الحموي في كتابة معجم البلدان عن منى «بأنها مكان قرب مكة يعمر ايام المواسم ويخلو بقية السنة الا ممن يحفظها».

هذا ظلت منى منذ القرون الماضية حتى يومنا هذا، فهي مدينة الثلاثة ايام التي يتذكرها الناس خلال هذه الايام وتشسى بقية العام، حيث تزدهر وتعج بالزحام في كل ركن فيها خلال الايام الثلاثة، حتى لا تجد لك موطئ قدم فيها، بل يرى العاملون في الحج ان الاعداد الموجودة من الحجاج والعاملين في الحج تفوق الطاقة الاستيعابية لمشعر منى وهو ما يشير اليه الدكتور محمد ادريس وكيل الشؤون الاكاديمية في معهد خادم الحرمين للابحاث ويقول: لا توجد دراسة حالية لدينا في معهد خادم الحرمين لاستغلال منى العام والاستفادة منها، ولكن قد تجرى ذلك.

يضيف: مشكلة منى انها وادي وجبل وتقدر مساحتها بـ6 كيلومترات وتمثل المساحة الشرعية المستغلة منها 53 في المائة بينما لايمكن الاستفادة من بعض الجبال لان انحدار فيها يقدر بـ40 في المائة في بعضها، وبالتالي فانها تشغل اكثر من الطاقة الاستيعابية.

العودة الى تعريف منى يرى الدكتور حسين بن سعيد فرانكين في موسوعته الثقافية لدار المعرفة «ان منى بلدة قريبة من مكة المكرمة تحتضن الجمار الثلاث ومنح الهدي ومسجد الخيف وعلى مقربة منها كان غار يتعبد فيه النبي احيانا، وفي منى هم النبي ابراهيم عليه السلام بذبح ابنه اسماعيل وهو مناجهلها موضع الذبح في رجم.

رغم ان تسمية منى قيلت بين علماء اللغة لمبررات واسباب ومن بينها ما اجمع عليه عدد من المؤرخين والعلماء بان التسمية تعود الى ما يمنى اي يتدفق او يسيل من دماء فيها يوم النحر.

وكل الجمرات اهم المعالم الدينية في منى على مدار الايام الثلاثة التي تظل فيها منى عامرة بالحجيج باعتبارها ترمى في كل يوم من الايام الثلاثة التي يوجد فيها الحجاج في منى فان الجمرات حسب كتاب لسان العرب لابن منظور «فان مواضع الجمرات الحالية كانت مواقع لاصنام ومواقع مقدسة وقبور لاهداف».

وود الدكتور ادريس موضحا: تعد منى جزءا من المشاعر المقدسة الثلاثة عرفات ومزدلفة ومنى التي يقضى فيها الحجاج ثلاثة ايام بعد تفرتهم من عرفات.

تعد منى من الجهتين الشمالية والجنوبية جبال شاهقة شديدة الانحدار، وكذلك يحدها وادي محسر من الجهة الشرقية اذ تقدر مساحتها الشرعية بنحو 650 هكتارا منها 330 هكتار اراض منبسطة في الوادي و300 هكتار تمثل سفوح الجبال.

قامت الحكومة السعودية عمدت مؤخرا الى توسعة المشعر بازالة بعض التلال التي تدخل ضمن الحدود الشرعية منها وتم في هذا الصدد تهذيب عدد من سفوح الجبال لتوسعة المساحات المستوية وزيادة اماكن التخييم ولهذا الغرض تم تنفيذ مشاريع لقطع الصخور، حيث بلغت المساحة التي يتم الاستفادة منها 750 الف متر مربع وبتكلفة قدرها 200 مليون ريال، كما تم تثبيت الصخور المتفككة في جبال منى في اكثر من 13 موقعا.

المشاعر المقدسة خارج الخدمة 270 يوما

يشعر زائر المشاعر المقدسة هذه الأيام كأنه في أيام الله في عرفات، وليالي المشعر الحرام في المزدلفة، وأيام التشريق ورمي الجمرات في منى، نظراً إلى الأعداد الكبيرة من الزوار والمعتمرين، إلا أن الزائر سرعان ما يلاحظ غياب الاهتمام والخدمات التي تقدم في هذه المشاعر خلال أيام الحج وهي سبعة فقط، في حين أن موسم العمرة والزيارات يستمر على مدى 270 يوماً كل عام.

لا ماء ولا طعام ولا ظل ولا خدمات صحية وبلدية وأمنية وتوعوية، أو حتى سيارة مرور واحدة تنظم حركة السير وتفك الاختناق والازدحام اليومي هناك. الأمر الذي يدفع للتساؤل: من أخرج المشاعر المقدسة وأماكن مكة المأثورة والمتواترة من خارطة اقتصادات موسم العمرة إلى بلد الله الأمين؟ وأكثر ما يلفت الانتباه في المشاعر المقدسة أن مساجدها الثلاثة مغلقة «بالضبة والمفتاح»، فلا مسجد نمرة في عرفات، ولا المشعر الحرام في مزدلفة، ولا مسجد الخيف في منى، يمكنك أن تصلي فيها، وهي مهبط الوحي وبلد الصلاة ومناسك الحج والعمرة! ولن يستطيع أحد تقديم جواب مقنع لأسئلة المعتمرين والزوار الذين يؤدون صلواتهم خارجها تحت ظل أروقتها الخارجية ولوحات أبوابها المغلقة المنقوش عليها الآية القرآنية «إنما يعمر مساجد الله من آمن بالله واليوم الآخر».

6 ملايين معتمر

وحتى الأسبوع الماضي أصدرت المملكة منذ مطلع شهر صفر الماضي، نحو 1.7 مليون تأشيرة، وصل منهم حتى الآن 953 ألف معتمر للأراضي المقدسة، تخدمهم 50 شركة تعمل في خدمة المعتمرين. وبحسب تقديرات وزير الحج فإن بدر الحجار فإن رقم القادمين في موسم العمرة هذا العام (9 أشهر) سيصل نحو 6 ملايين معتمر من مختلف دول العالم. وكانت الجهات المختصة في السعودية، أصدرت نحو خمسة ملايين تأشيرة عمرة في موسم العام الماضي 1434 هـ .

وما يشاهده زائر المشاعر لا يتوافق تماما مع ما أعلنه الحجار قبل بدء موسم العمرة من أن كبار مسؤولي وزارة والجهات التابعة لها يعملون «للتأكد في هذا الصدد من رصد الطاقات المادية والبشرية والارتقاء بالخدمات التي تقدم للمعتمرين تحقيقا للتطلعات السامية الكريمة من خادم الحرمين الشريفين الملك عبدالله بن عبدالعزيز آل سعود وسمو ولي عهده الأمين - حفظهما الله -، وفي مقدمة تلك الخدمات البرنامج الالكتروني الخاص بالعمرة الذي يتم بموجبه متابعة الخدمات المقدمة للمعتمرين»، وكذلك وعد بالمحاسبة الشديدة للشركات والمؤسسات المعنية في حالة أي قصور يقع للمعتمر منذ قدومه إلى الأراضي المقدسة وحتى مغادرته إلى بلاده سالماً آمناً.

إلا أن «مكة» تقدم بعد جولة استطلاعية شملت المشاعر المقدسة الثلاثة فقط، وهي أكثر الأماكن التي يقبل على زيارتها المعتمرون بشكل يومي، صوراً مباشرة تعكس مدى الحاجة إلى تدخل سريع وحاسم لتوفير خدمات مستحقة لضيوف الرحمن، وتليق بسمعة المملكة ومكانة مكة المكرمة وإنقاذ ما يمكن إنقاذه من اقتصادات موسم العمرة المهدرة بشكل يثير التساؤل والحيرة معا. فموسم العمرة ليس طوافا وسعيا فقط، ولا فندقا أو مجمعا تجاريا فحسب، ولا حجز كرسي طائرة أو حافلة نقل، بل منظومة خدمات ومنتجات لا حصر لها يمكن استثمارها بأقل جهد تنظيمي وتسويقي ممكن، لتوفير آلاف الفرص الوظيفية في طيف واسع من الخدمات التي يحتاج إليها ملايين المعتمرين من لحظة وصولهم إلى موعد مغادرتهم الأراضي المقدسة، فضلا على القيم المضافة لإظهار منظومة الجهود التي توفرها الدولة لخدمة بلد الله الأمين والمشاعر

عمرة.. وربع سبح

ينظم أغلب مكاتب شركات العمرة جداول رحلات دينية متنوعة لأهم الأماكن المأثورة والمتواترة في مكة المكرمة والمشاعر المقدسة، وتسير يوميا مئات الحافلات الكبيرة (50 راكبا) لنقل الراغبين من المعتمرين في هذه الجولات بأجر 100 ريال للراكب الواحد في رحلة تستغرق في المتوسط نحو 3 ساعات، جولة في الصباح، وأخرى بعد الظهر. في المقابل، ينشط أصحاب الباصات الصغيرة وسيارات الأجرة بنقل الراغبين بجولة سريعة من وإلى محيط المسجد الحرام إلى المشاعر المقدسة الثلاثة، مع مرور عابر على جبلي النور وثور فقط بسعر 50 ريالا للراكب الواحد في رحلات ترددية من الفجر وحتى مغيب الشمس

وغني عن القول أن معظم هذه الرحلات يفتقد إلى مرافقين يقومون بدور المرشدين السياحيين للتعريف بها وبالخدمات الموفرة والمشاريع الضخمة، وهو ما يضيع فرصة لإثراء معلومات المعتمرين القادمين من كل لون ولغة وثقافة بالحقائق الثابتة عن الأمكنة وتاريخها ودورها في السيرة النبوية ومناسك الشريعة الإسلامية وخدمة المملكة ورعايتها للحرمين الشريفين والمشاعر المقدسة وقبلة المسلمين في العالم.

أفواج من الرجال والنساء والأطفال من كل جنس ولون ولغة يأتون إلى جبل الرحمة في صعيد عرفات يوميا من ساعات الصباح الأولى وحتى مغيب الشمس للوقوف على الصخرات الكبرى أسفل الجبل بالقرب من المكان الذي وقف وخطب عليه النبي صلى الله عليه وسلم في نحو 112 ألف حاج في حجة الوداع، يرفعون أيديهم بالدعاء والتماس بركة المكان بعد أن حملتهم الأشواق والذكرى لمشاهدة ومعايشة أماكن مأثورة ومتواترة لم يخل عن ذكرها القرآن الكريم وكتب السنة والمناسك والسير.

خدمات معدومة

في محيط جبل الرحمة في عرفات، وعند مطل يشرف على جسور الجمرات الثلاث في منى ينتشر باعة جائلون، وآخرون يفترشون الأرض حيث كزحام الأقدام، يعرضون مواد استهلاكية وخردوات وألعابا للأطفال متنوعة رديئة الصنع. وعلى مرمى حجر تقف بضع سيارات متنقلة تبيع الماء والبسكويت والشاي والعصائر والتمور والمكسرات بأسعار سياحية. ودون أدنى تنظيم ورقابة أو إشراف على سلامة ما يقدم من طعام وشراب للزوار، ولا يخلو المكان من أصحاب الدراجات الرباعية والجمال والخيول الهرمة، لتأجيرها للزوار، وتجربة ركوبها، والتقاط صور تذكارية فورية (مقابل عشرة ريالات للصورة الواحدة). في مشهد عشوائي يذكر بالمثل المكي «كل في سوقه.. يبيع خروفه»-. فكل شيء هنا قابل للتسويق.. التاريخ، والهوية، وذاكرة المكان أيضا.. المهم أن يتم استنزاف جيوب الزوار بعيدا عن أعين الرقابة الغائبة.

ممشى عرفات!

الغريب أن أمانة العاصمة المقدسة نفذت مشروعا لتطوير ممرات المشاة في المشاعر المقدسة في عرفة، وبات أهالي مكة المكرمة يستخدمونه طوال أيام العام (عدا موسم الحج) كممشى رياضي واسع يمتد نحو كيلو مترين في اتجاه مزدلفة، ومع ذلك يبدو أن مسؤولي الأمانة لم يفكروا لحظة لتشغيل الخدمات المتوفرة على جانبي الممشى طوال العام. فجميع المرافق مغلقة حتى الضرورية منها، وعلى رأسها دورات المياه وأكشاك صغيرة لبيع المرطبات والمشروبات الباردة والساخنة والمأكولات السريعة، وهي فرص وظيفية متاحة للعاطلين، ونافذة تسويقية لا تعوض لبرامج الأسر المنتجة لتعزيز اقتصادات موسم العمرة على الأقل.

مسجد اليوم الواحد

يعد مسجد نمرة في عرفات ثاني أكبر مساجد مكة بعد المسجد الحرام، وربما رابع أكبر مساجد العالم الإسلامي، ومن المؤسف أن يكون مغلقا بالضبة والمفتاح طوال أيام العام عدا يوم عرفة فقط، ولا يعرف إلا الله والراسخون في العلم بوزارة الشؤون الإسلامية والأوقاف، مبرر إغلاقه ومنع الصلاة فيه حتى بعد أن فتحت المملكة موسم العمرة والزيارة طوال تسعة أشهر من العام.

آلاف المعتمرين والزوار هنا يحتاجون إلى مسجد يؤدون فيه فروضهم ونوافلهم. فضلا عن زيارة مسجد صلى وخطب على منبره النبي محمد، صلى الله عليه وسلم، ولا يستطيع المرء أن يصف متناوره وهو يشاهد وقوف المعتمرين للصلاة أمام أبوابه المغلقة، من دون الاستفادة من خدمات دورات المياه والظل والتكييف في المسجد الذي بني في عين المكان الذي صلى فيه النبي، صلى الله عليه وسلم، الظهر والعصر جمعا وقصرا في حجة الوداع، وخطب خطبة عرفة في السنة العاشرة للهجرة النبوية، ولا يجد المرء أي جواب يقنع السائلين عن مبرر إغلاق مسجد نمرة ومنع الصلاة فيه وعدم إعماره ونهيته، أو جزء منه، لاستقبال المصلين.

حال مسجد نمرة ليس الوحيد من بين مساجد المشاعر المقدسة. فمسجد المشعر الحرام في مزدلفة، ومسجد الخيف في منى، جميعها موصدة الأبواب طوال العام أمام كل راغب في الصلاة فيها من الزوار والمعتمرين رغم جاهزيتها وتكامل خدماتها من دورات مياه، وتكييف، وفرش وإنارة. وجميعهم يتوجهون لاكتساب فضل الصلاة فيها

مستشفى عرفات العام يضج بأنين الحجاج لـ 6 أيام فقط

يعاود صمته لعام كامل يخضع خلالها لعملية صيانة شاملة لمرافقه وتجهيزاته

مدخل مستشفى عرفات العام كما بدا مساء أمس

مكة (مشعر عرفات) . عبد القادر محمد

في الجهة الشرقية من صعيد عرفات الطاهر، وعلى بعد أمتار قليلة من جبل الرحمة، يطل مستشفى عرفات العام، واقفاً بجدرانه المسلحة بالإسمنت الصلب والحديد، وفي داخله زهاء 248 موظفا أساسيا موزعين بين أطباء وممرضين وفنيين، يضاف إليهم 180 آخرين متحركين بنفس التخصصات.

وبين جنبات مستشفى عرفات العام، تتسابق الأرواح الطبية العاملة فيه لإنقاذ أخرى دالفة إليه، بعدما ألمت بها آلام وأمراض عارضة وبعضها مزمنة، وسبيلهم في ذلك، خدمة الحاج وضيوف الرحمن أولاً.

ويعد مستشفى عرفات العام، المزود بمهبط للطائرات العمودية، نقطة التواصل الرئيسة بين العديد من الحالات المرضية "الحرجة" في صعيد عرفات، وشبكة المستشفيات السعودية المتخصصة في مكة المكرمة أو خارجها، ويبدأ عادة استعداداته الفعلية منذ اليوم السابع من شهر ذي الحجة كل عام، إذ استقبل هذا العام وحتى لحظات الفجر الأولى لليوم الاثنين ما يقارب الـ 25 حالة نقلت إلى عرفات لإكمال نسكهم، عبر قافلة تسيرها وزارة الصحة السعودية كل عام، تسهيلاً على الحجاج الذين يعانون أمراضاً تمنعهم من الحركة بشكل جيد طوال موسم الحج، كمرضى القلب والمصابين بالجلطات وكذلك مرضى السكري.

وأوضح الدكتور أحمد الخروبي مدير مستشفى عرفات العام لـ"العربية نت" أن المستشفى به 300 سرير مخصصة لأقسام التنويم، و12 سريراً لقسم الطوارئ، إضافة إلى أربعة أسرة للإنعاش القلبي الرئوي، و28 سريراً للعناية المركزة (الفائقة)، إلى جانب احتوائه على دور كامل للعزل، مكون من خمس غرف كبيرة للأمراض المعدية كالدرن (السل) الغريب والفريد في مستشفى عرفات العام، كغيره من المستشفيات والمراكز الصحية في المشاعر المقدسة، أنه يضج بأنين المرضى و"معركة" كسب الوقت الطبية لـ "ستة" أيام فقط من كل عام، تبدأ من اليوم السابع من شهر ذي الحجة وحتى اليوم الـ 12 من نفس الشهر، قبل أن يعاود صمته لعام كامل، يخضع خلالها لـ "مشرط" جراحة تجميلية، عبر عملية صيانة شاملة لمرافقه وتجهيزاته.

الجدير بالذكر، أن مستشفى عرفات العام ليس الوحيد في هذا المشعر، إذ يقع على بعد أمتار قليلة منه مستشفى جبل الرحمة، إضافة إلى مستشفى نمرة، وآخر تم إنشاؤه في موسم الحج الماضي يسمى مستشفى شرق عرفات، جميعها تعمل بكامل طاقتها التشغيلية طوال فترة الحج.

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الـ(دبابات) تحاصر المتنزهين في مشعر مزدلفة

مكة المكرمة ـ حامد القرشي

حوّل عدد من العمالة المقيمة والمخالفين مشعر مزدلفة إلى ساحات لتأجير الدبابات وركوب الخيل والحناطير المزركشة والجمال المزينة بالورود، مستغلين خروج العشرات من الأسر إلى المشعر في نهاية الأسبوع للتنزه بعيدا عن ضوضاء المدينة وملوثاتها. وقال عدد من المواطنين إن أصحاب تلك الدبابات والحيوانات يدرون أرباحا كبيرة، مستغلين إقبال الأطفال عليهم وغياب الرقابة في الوقت نفسه. وطالبوا الجهات المختصة بتكثيف المراقبة الميدانية حتى يتم ضبط تلك المخالفات التي شكلت إزعاجا مستمرا للكثيرين وأفسدت عليهم نزهاتهم. كما أشاروا أيضا إلى باعة المأكولات في الكافتيريات المتنقلة أو الجائلين بشكلون قلق؛ فمعظمهم يمارسون عملهم بشكل غير نظامي؛ ما يثير شكوكا حول مصدر مأكولاتهم.

وقال حاتم الهذلي إن مشعر مزدلفة تحوّل إلى ما يشبه حلبات السباق؛ حيث تنتشر الدبابات والخيول والجمال؛ ما يفسد بشكل كبير هدوء المكان ونظافته. وأضاف فهد النفيعي أنه اعتاد في إجازة منتصف الفصل الدراسي الثاني وعطلة نهاية الأسبوع الخروج مع أسرته إلى مشعر مزدلفة للتنزه والترفيه؛ حيث يلعب الأطفال كرة القدم، لكن مع هذه المشاهد ذهب الهدوء؛ فأصحاب الدبابات والحيوانات يأتون من الساعة الرابعة عصرا ويبقون إلى ساعة متأخرة من الليل، فضلا عن وجود عدد من باعة المنتو والفرموزة والكبة والبسبوسة.

رياضة الكريكت تحرم العائلات المكية من التنزه في مزدلفة

الجمعة 31 أكتوبر 2014 15:28

حامد القرشي – مكة المكرمة

حرمت رياضة (الكريكت) العائلات المكية من التنزه في مشعر مزدلفة نهاية الأسبوع بعد أن حول بعض أبناء الجاليات ساحات مزدلفة إلى ملاعب لهذه الرياضة ذات الشعبية الجارفة في بلادهم.

وقال محمد البقمي: اعتادت الكثير من الأسر المكية التنزه في مشعر مزدلفة طيلة أيام الأسبوع وبشكل خاص لليلتي الجمعة والسبت، حيث المساحات الكبيرة في مزدلفة التي تستهوي الكثير، لكن استغل عدد كبير من الوافدين ليلتي الجمعة والسبت لممارسة هواياتهم في رياضة (الكريكت) والتواصل مع بعضهم البعض في مشعر مزدلفة، إلا أنهم حرموا الكثير من العائلات المكية من التنزه بسبب هذه اللعبة التي أخذت مساحات من الموقع.

ويبين عبدالعزيز الزهراني أن الكريكت تعتبر من الرياضات التي تحتاج إلى مساحات كبيرة لأنها تمارس بواسطة كرة وعدد من اللاعبين، ففي إحدى الساحات الكبيرة بمزدلفة التي تستقطب أعدادا كبيرة من العائلات للتسامر وتناول أطراف الحديث استغل هؤلاء هذه المساحات لممارسة هذه اللعبة مما سبب ازعاجا للكثير من المتنزهين، متمنيا تخصيص مواقع لهذه العمالة في مواقع أخرى لممارسة هواياتهم في رياضة الكريكت.

ووصف محمد عبدالعليم أنها رياضة جماعية تمارس بـ 11 لاعبا من كلا الفريقين، وهم ينتشرون في الملعب، حيث يقوم واحد من اللاعبين من كل فريق برمي الكرة، وآخر من الفريق المقابل يحمي القاعدة المنصوبة ويقذف الكرة بالمضرب بعيدا بينما يقوم الفريق الآخر بمطاردة الكرة وإرجاعها ليقوم حامل المضرب بالجري في المكان المحدد لزيادة نقاط الفريق في عدد الدوران موضحين أنهم يقضون أجمل الأوقات في هذه اللعبة خاصة بعد أسبوع من العمل.

Current Situation of Hajj sites where; A) Arafat, B) Muzdalifah and C) Mina.

Source; Collected and Edited by Author

Mount of Mercy and Namera Mosque location.

Source; Collected and Edited by Author

Roads Network Map of Arafat.

Source; Arafat GIS Map. Available at (http://www.hajjgis.net) last accessed on April 2013.

Satellite Image Shows the Details inside Each Tent Zone.

Source; Google Earth Manipulated by Author

Arafat Tents Zone where; A) General view of the Zones, B) Details of Pedestrian Path Beside Tent Place and C) Form of Some Portable Tents during Hajj.

Source; Collected and Edited by Author

A) One of the Hospitals Buildings in Arafat, B) Fire Station Steel Structure.

Source; Collected and Edited by Author

A) the Old Model of Toilet Complexes, B) the New Model of Toilets Complexes in Arafat and C) The Public Drinking Water Fountain.

Source; Collected and Edited by Author
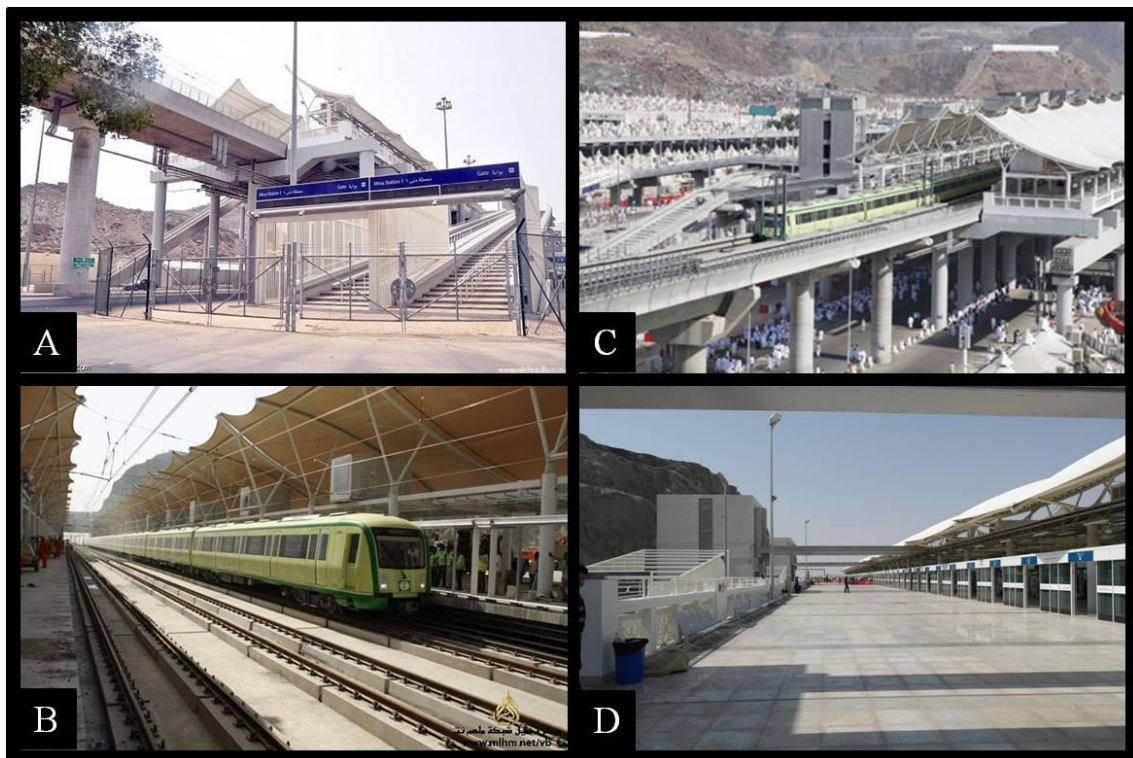
Figure 3: the Metro Line photos where; A) Shows the Entrance Ramp, B) the Train railway, C) the Station Building and D) the Station Platform.

Source; Collected and Edited by Author
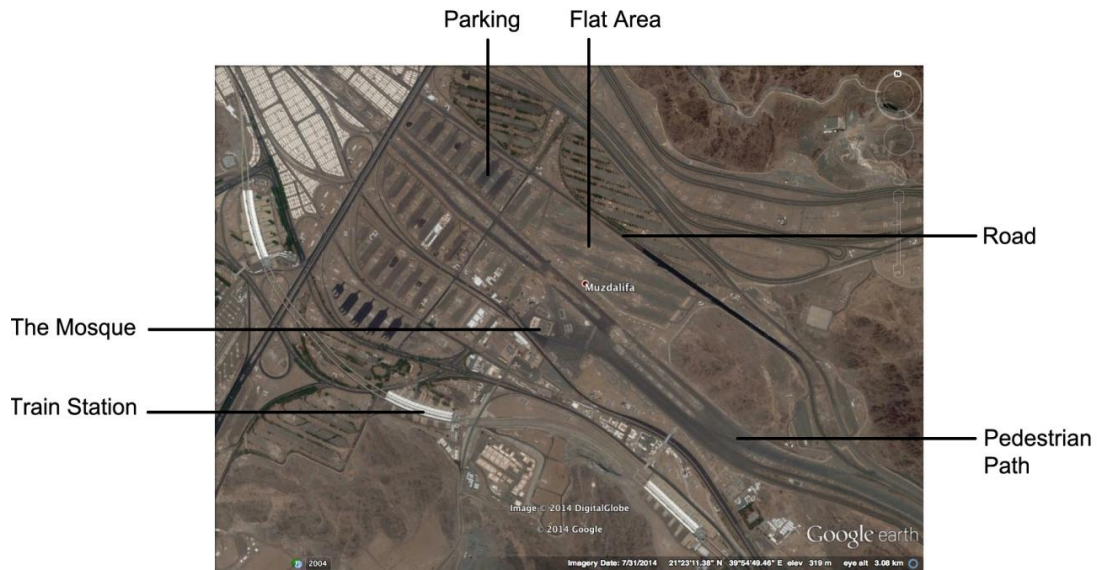
Satellite Image Shows the Different Part of Muzdalifah.
Source: Google Earth Manipulated by author

The Urban Characteristic of Muzdalifah at day and night.
Source; Author Archive
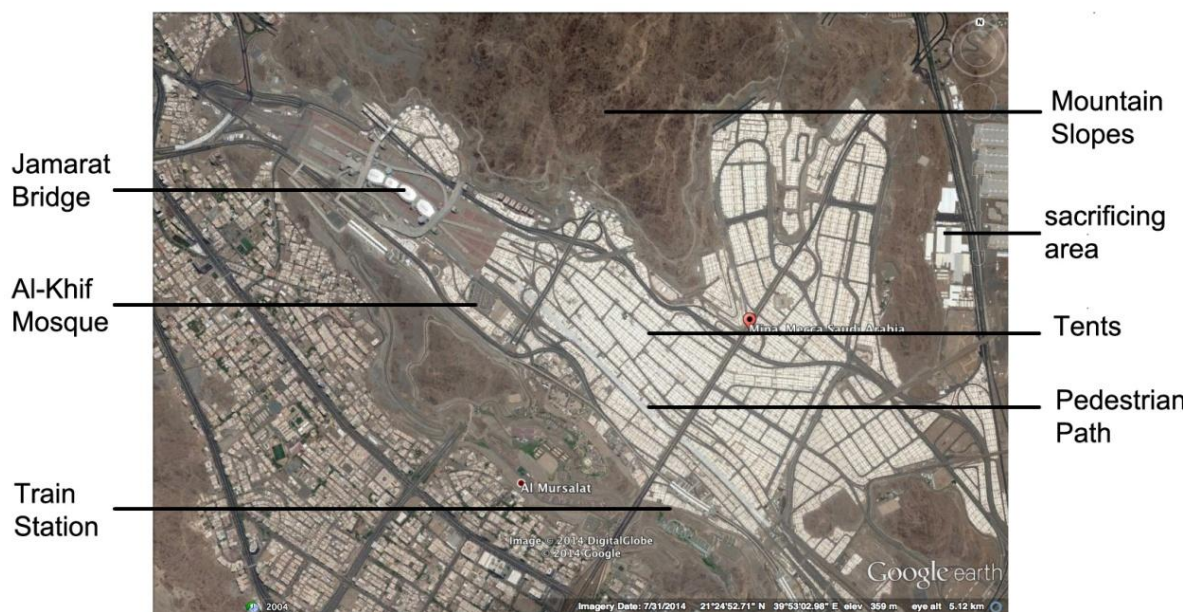
Satellite image of Mina.
Source: Google Earth manipulated by author

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The New Jamarat Bridge.
Source: http://www.kapl-hajj.org/jamarat_bridge.php
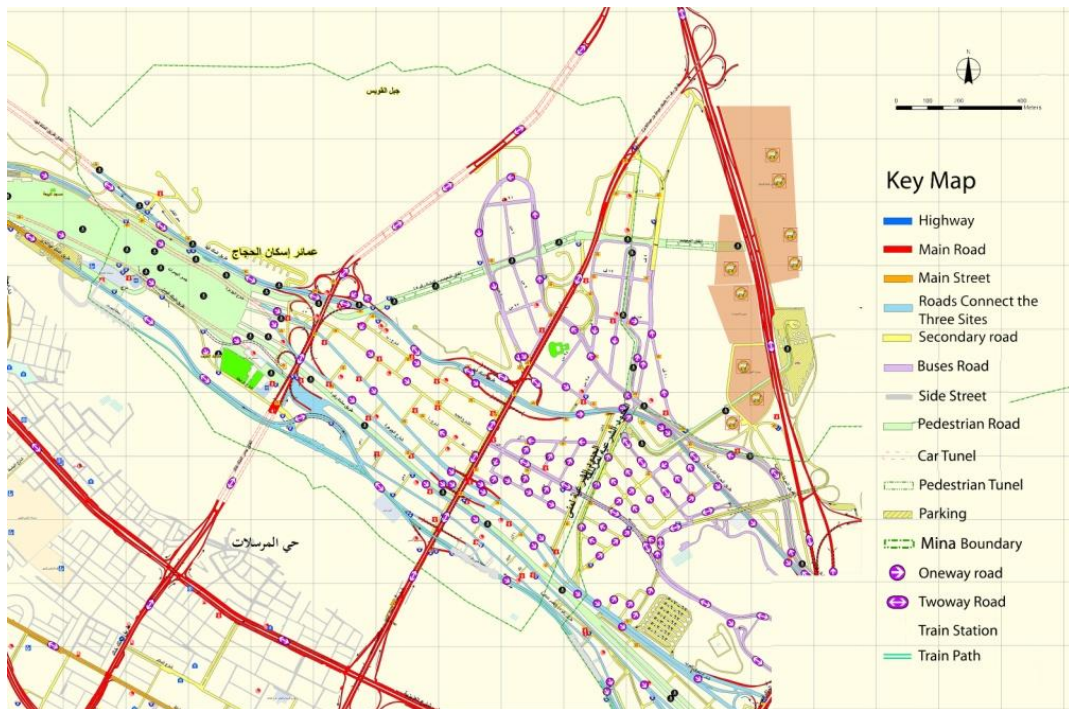
The Roads Network of Mina.

Source; Arafat GIS Map. Available at (http://www.hajjgis.net) last accessed on April 2013.

A) The Character of the vehicle's Roads, B) the Pedestrian Path in Mina.
Source: Author Archive

Figure 4: Top View Showing the Unequal Sectors Separated by the Roads Network.
Source: http://www.kapl-hajj.org/mina_tents_development.php
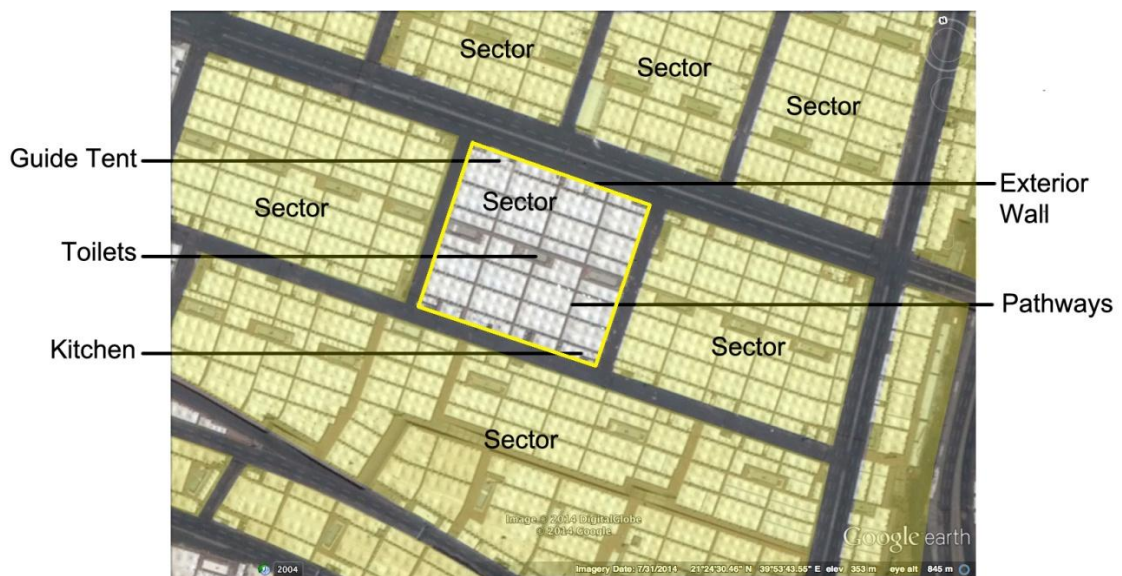
Satellite Image shows the details of Each Sector.
Source; Google earth manipulated by author
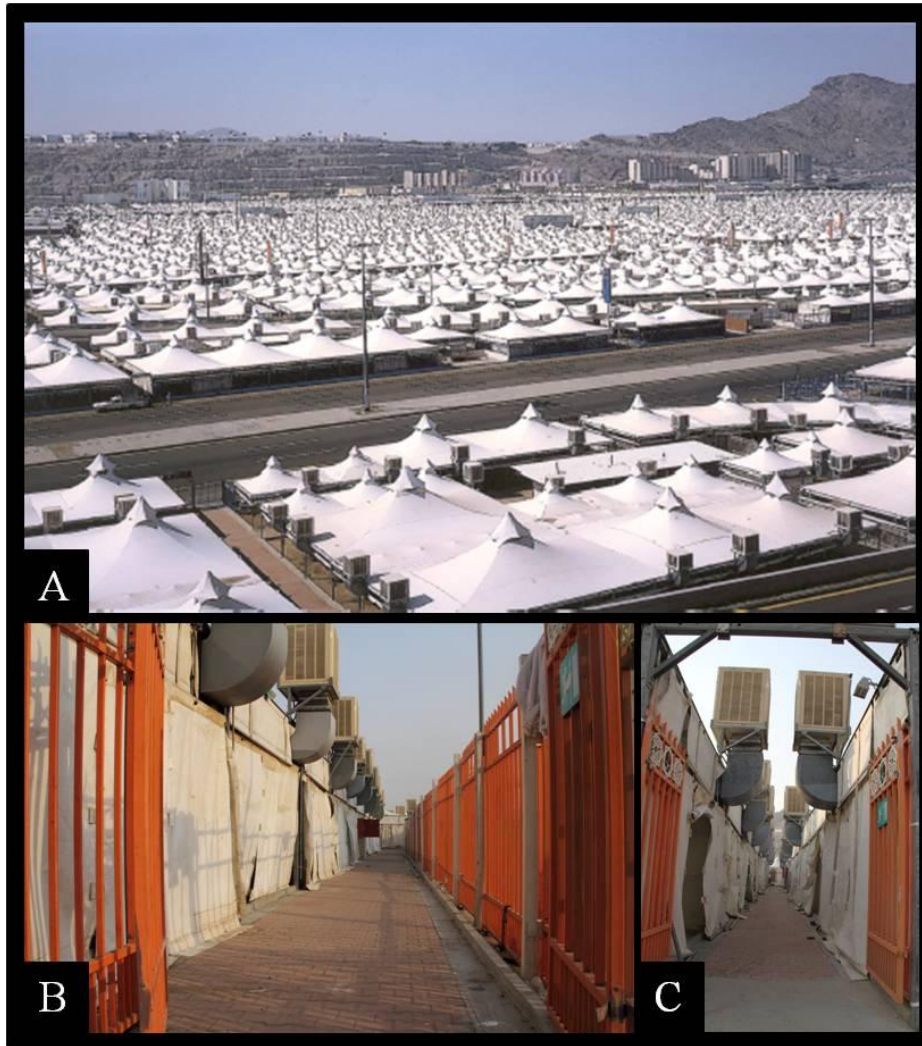
Tents Camps in Mina where; A) General View of Sectors, B) the Metallic wall encircled the sectors and C) the Entrance of sectors and the paved passageways between tents.

Source; Author Archive
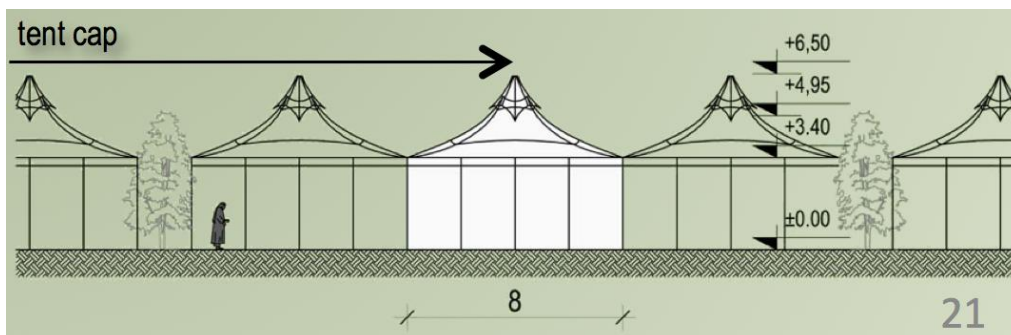
Elevations of Tents Shows the Dimensions.

Source: Ministry of Hajj, http://www.haj.gov.sa/en-us/Pages/default.aspx
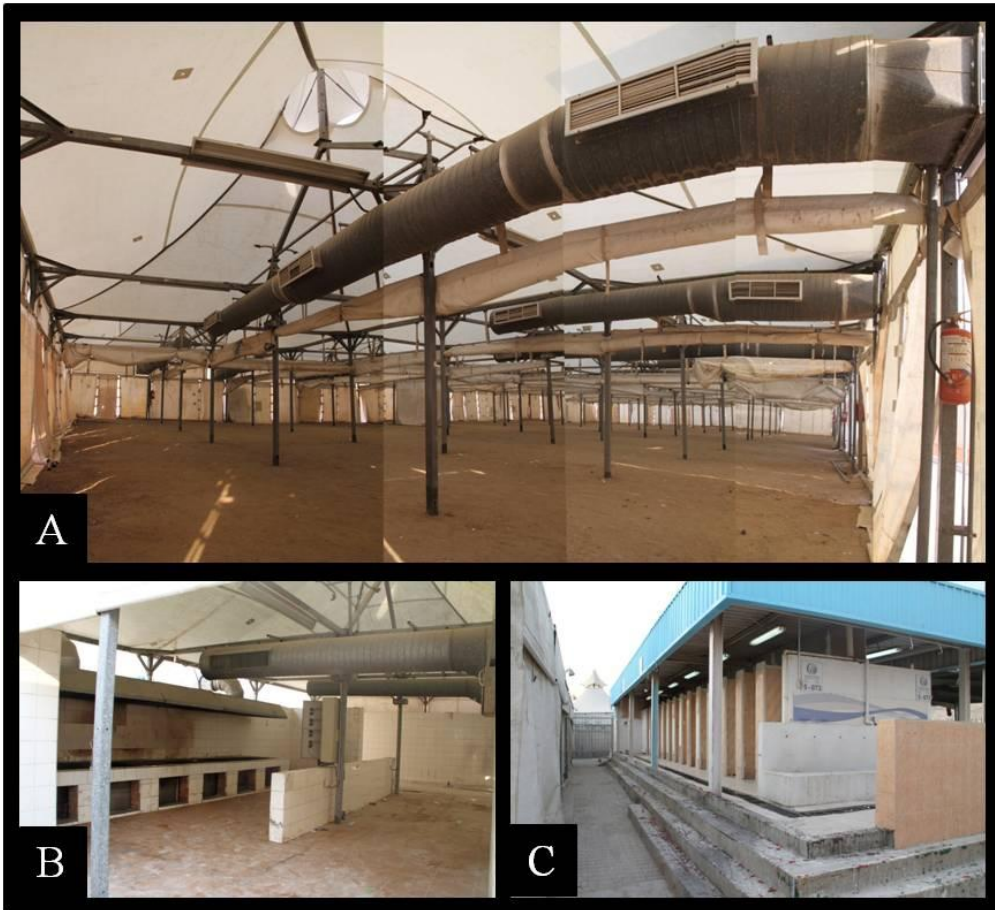
Inside Tents Camp where; A) Show the Steel Structure of Tents, B) the Kitchen unit and C) the Toilet Complex.
Source; Author Archive

The Built Towers for Pilgrims Accommodation in Mina.

Source: Ministry of Municipal and Rural affairs

Health Services Buildings in Mina where; A) Represent the Red Crescent Center, B) Health care unit and C) the Main Hospital of Mina.

Source; Author Archive

Appendix C: All land covers data of Mecca for all study years

West Part land cover change												
Land cover	1998.00		2003.00			2008.00			2013.00			Change 1998-2013	
	Area km	%	Area km	%	ch98-03	Area km	%	ch03-08	Area km	%	ch08-13	Km	%
Street	3.99	2.10	3.99	2.11	0.00	4.73	2.51	18.45	5.08	2.64	7.46	1.09	27.29
Urban	15.04	7.91	16.23	8.56	7.89	18.60	9.86	14.61	18.59	9.65	-0.06	3.55	23.58
Vegetation	0.31	0.16	0.61	0.32	99.00	1.06	0.56	73.69	1.66	0.86	57.24	1.36	443.49
un-Built-up	115.80	60.89	114.69	60.47	-0.96	111.29	58.99	-2.96	113.22	58.79	1.73	-2.59	-2.23
Mountain	55.03	28.94	54.15	28.55	-1.59	52.97	28.08	-2.18	54.03	28.06	1.99	-1.00	-1.82
Total	190.17	100.00	189.67	100.00	-0.26	188.65	100.00		192.58	100.00			

North east Part land cover change												
Land cover	1998.00		2003.00			2008.00			2013.00			Change 1998-2013	
	Area km	%	Area km	%	ch98-03	Area km	%	ch03-08	Area km	%	ch08-13	Km	%
Street	5.67	2.40	5.83	2.46	2.81	7.40	3.15	26.97	8.15	3.40	10.12	2.48	43.76
Urban	16.02	6.79	19.22	8.13	19.96	23.90	10.18	24.34	30.30	12.64	26.78	14.27	89.10
Vegetation	0.64	0.27	1.99	0.84	211.37	1.12	0.48	-43.51	1.86	0.78	65.67	1.22	191.40
un-Built-up	128.25	54.35	126.39	53.47	-1.45	118.90	50.68	-5.92	116.15	48.46	-2.32	-12.10	-9.43
Mountain	85.37	36.18	82.96	35.10	-2.82	83.31	35.51	0.42	83.21	34.72	-0.12	-2.16	-2.54
Total	235.95	100.00	236.38	100.00	0.19	234.63	100.00		239.66	100.00			`

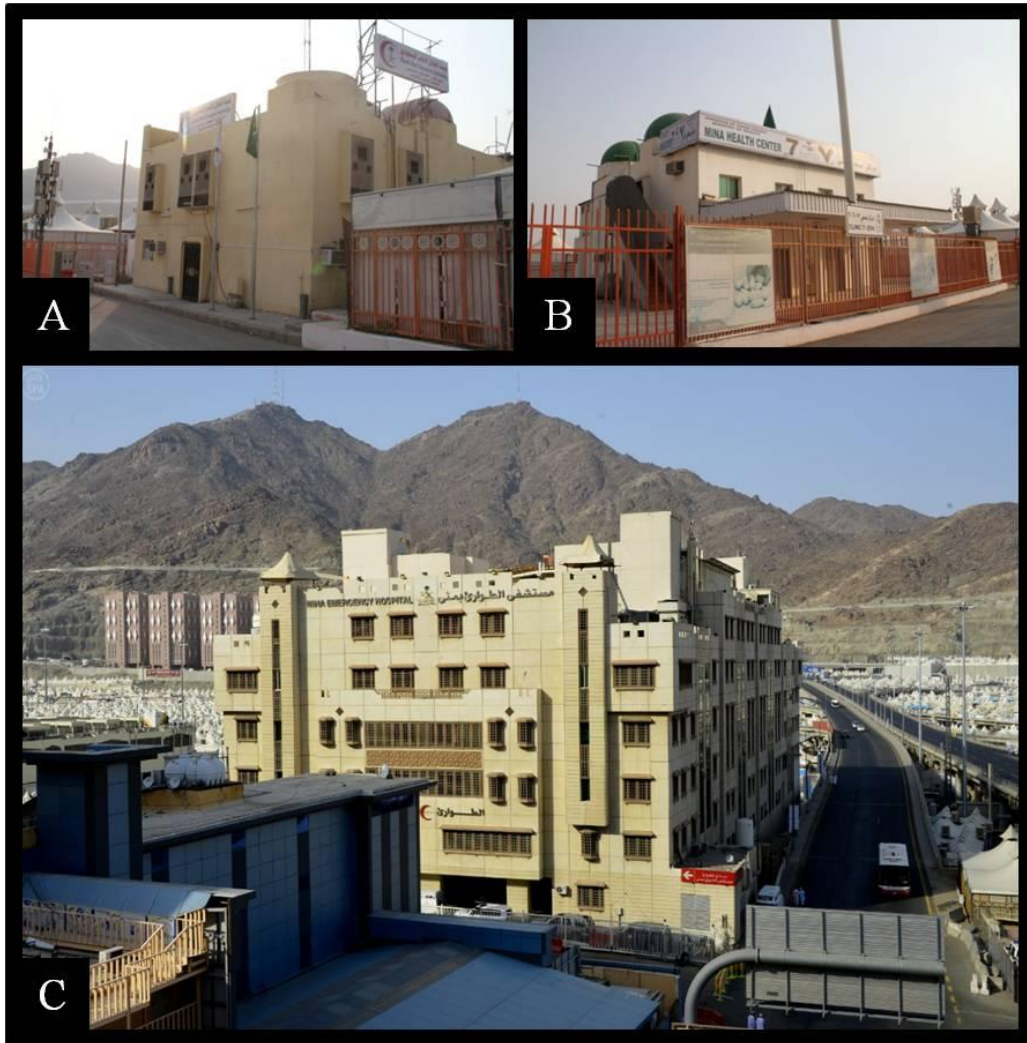| North west Part land cover change												
Land cover	1998.00		2003.00			2008.00			2013.00			Change 1998-2013	
	Area km	%	Area km	%	ch98-03	Area km	%	ch03-08	Area km	%	ch08-13	Km	%
Street	2.58	1.77	2.71	1.87	5.27	3.28	2.27	20.90	3.64	2.41	10.99	1.06	41.27
Urban	16.36	11.25	18.28	12.62	11.69	21.29	14.75	16.46	22.87	15.16	7.46	6.51	39.78
Vegetation	0.91	0.62	0.56	0.39	-38.31	0.59	0.41	5.31	2.06	1.36	249.28	1.15	126.90
un-Built-up	39.51	27.16	38.93	26.89	-1.46	36.16	25.05	-7.12	38.34	25.42	6.04	-1.17	-2.95
Mountain	86.08	59.19	84.31	58.23	-2.06	83.04	57.53	-1.50	83.94	55.64	1.08	-2.15	-2.50
Total	145.44	100.00	144.79	100.00	-0.45	144.35	100.00		150.85	100.00			

Southrth East Part land cover change												
Land cover	1998.00		2003.00			2008.00			2013.00			Change 1998-2013	
	Area km	%	Area km	%	ch98-03	Area km	%	ch03-08	Area km	%	ch08-13	Km	%
Street	10.46	3.56	10.80	3.71	3.24	12.05	4.13	11.56	12.82	4.30	6.41	2.36	22.56
Urban	14.72	5.02	19.53	6.71	32.65	22.63	7.76	15.85	25.92	8.70	14.56	11.20	76.04
Vegetation	5.25	1.79	6.04	2.08	14.91	6.84	2.35	13.24	6.90	2.32	0.89	1.64	31.29
un-Built-up	109.87	37.43	103.16	35.45	-6.11	102.88	35.28	-0.28	104.05	34.92	1.14	-5.83	-5.30
Mountain	153.27	52.21	151.47	52.05	-1.18	147.20	50.48	-2.82	148.30	49.77	0.75	-4.97	-3.24
Total	293.58	100.00	291.00	100.00	-0.88	291.59	100.00		297.99	100.00			

South West Part land cover change												
Land cover	1998.00		2003.00			2008.00			2013.00			Change 1998-2013	
	Area km	%	Area km	%	ch98-03	Area km	%	ch03-08	Area km	%	ch08-13	Km	%
Street	3.73	1.09	3.88	1.12	3.98	5.60	1.61	44.28	6.17	1.89	10.25	2.44	65.41
Urban	15.14	4.43	17.35	5.03	14.55	20.16	5.80	16.21	23.48	7.21	16.49	8.34	55.08
Vegetation	1.02	0.30	3.55	1.03	247.96	3.61	1.04	1.54	5.97	1.83	65.48	4.95	484.68
un-Built-up	204.80	59.94	203.30	58.93	-0.73	202.77	58.33	-0.26	195.83	60.12	-3.42	-8.97	-4.38
Mountain	117.00	34.24	116.90	33.89	-0.08	115.48	33.22	-1.22	94.30	28.95	-18.34	-22.70	-19.40
Total	341.69	100.00	344.98	100.00	0.96	347.61	100.00		325.75	100.00			

Correlations

		Urban Cover 1998 By Km2	Street Cover 1998 By Km2	No Built Cover 1998 By Km2	DEM Cover 1998 By Km2	Distance from City Center by Km	Distance from Hajj Sites Boundry by Km	Distance from Mina by Km	Distance from Muzdalifa by Km	Distance from Arafat by Km	Distance from Hajj Sites Center by Km	Distance from Main Roads by Km	Distance from Street Network by Km
Urban Cover 1998 By Km2	Pearson Correlation	1	.382**	-.256**	-.167**	-.510**	-.271**	-.354**	-.238**	-.064*	-.191**	-.296**	-.327**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.022	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
Street Cover 1998 By Km2	Pearson Correlation	.382**	1	-.066*	-.200**	-.240**	-.362**	-.341**	-.335**	-.279**	-.332**	-.248**	-.439**
	Sig. (2-tailed)	.000		.018	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
No Built Cover 1998 By Km2	Pearson Correlation	-.256**	-.066*	1	-.685**	.332**	.376**	.366**	.310**	.203**	.292**	.113**	.087**
	Sig. (2-tailed)	.000	.018		.000	.000	.000	.000	.000	.000	.000	.000	.002
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
DEM Cover 1998 By Km2	Pearson Correlation	-.167**	-.200**	-.685**	1	-.288**	-.331**	-.337**	-.309**	-.211**	-.290**	-.094**	.185**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000	.001	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276

Correlations

		Urban Cover 2013 By Km2	Street Cover 2013 By Km2	No Built Cover 2013 By Km2	DEM Cover 2013 By Km2	Distance from City Center by Km	Distance from Hajj Sites Boundry by Km	Distance from Mina by Km	Distance from Muzdalifa by Km	Distance from Arafat by Km	Distance from Hajj Sites Center by Km	Distance from Main Roads by Km	Distance from Street Network by Km
Urban Cover 2013 By Km2	Pearson Correlation	1	.481**	-.298**	-.216**	-.527**	-.325**	-.419**	-.301**	-.105**	-.250**	-.331**	-.402**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
Street Cover 2013 By Km2	Pearson Correlation	.481**	1	-.056*	-.304**	-.282**	-.377**	-.370**	-.354**	-.281**	-.346**	-.307**	-.436**
	Sig. (2-tailed)	.000		.044	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
No Built Cover 2013 By Km2	Pearson Correlation	-.298**	-.056*	1	-.623**	.378**	.421**	.423**	.357**	.229**	.335**	.150**	.159**
	Sig. (2-tailed)	.000	.044		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276
DEM Cover 2013 By Km2	Pearson Correlation	-.216**	-.304**	-.623**	1	-.223**	-.285**	-.286**	-.272**	-.194**	-.259**	-.053	.228**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000	.057	.000
	N	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276	1276

	1998		
Model Summary			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.510[a]	.260	.259	.13030
2	.606[b]	.367	.366	.12053
3	.728[c]	.530	.529	.10388
4	.733[d]	.538	.536	.10310
5	.736[e]	.541	.539	.10277
6	.739[f]	.545	.543	.10232

a. Predictors: (Constant), Distance from City Center by Km

b. Predictors: (Constant), Distance from City Center by Km, DEM Cover 1998 By Km2

c. Predictors: (Constant), Distance from City Center by Km, DEM Cover 1998 By Km2, No Built Cover 1998 By Km2

d. Predictors: (Constant), Distance from City Center by Km, DEM Cover 1998 By Km2, No Built Cover 1998 By Km2, Street Cover 1998 By Km2

e. Predictors: (Constant), Distance from City Center by Km, DEM Cover 1998 By Km2, No Built Cover 1998 By Km2, Street Cover 1998 By Km2, Distance from Hajj Sites Boundry by Km

f. Predictors: (Constant), Distance from City Center by Km, DEM Cover 1998 By Km2, No Built Cover 1998 By Km2, Street Cover 1998 By Km2, Distance from Hajj Sites Boundry by Km, Distance from Arafat by Km

| | | | 2013 | |
| | | | Model Summary | |
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.527[a]	.278	.277	.15517
2	.631[b]	.398	.397	.14177
3	.669[c]	.448	.447	.13578
4	.752[d]	.565	.564	.12056
5	.753[e]	.567	.565	.12033
6	.754[f]	.569	.567	.12012
7	.758[g]	.575	.573	.11928
8	.763[i]	.582	.580	.11835
9	.770[l]	.593	.590	.11690

a. Predictors: (Constant), Distance from City Center by Km

b. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2

c. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2

d. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2, No Built Cover 2013 By Km2

e. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2, No Built Cover 2013 By Km2, Distance from Street Network by Km

f. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2, No Built Cover 2013 By Km2, Distance from Street Network by Km, Distance from Hajj Sites Boundry by Km

g. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2, No Built Cover 2013 By Km2, Distance from Street Network by Km, Distance from Hajj Sites Boundry by Km, Distance from Mina by Km

h. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2, No Built Cover 2013 By Km2, Distance from Street Network by Km, Distance from Hajj Sites Boundry by Km, Distance from Mina by Km, Distance from Arafat by Km

i. Predictors: (Constant), Distance from City Center by Km, Street Cover 2013 By Km2, DEM Cover 2013 By Km2, No Built Cover 2013 By Km2, Distance from Street Network by Km, Distance from Hajj Sites Boundry by Km, Distance from Mina by Km, Distance from Arafat by Km, Distance from Hajj Sites Center by Km

		Change 1998-2013		
		Model Summary		
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.722[a]	.521	.520	.05262
2	.743[b]	.552	.551	.05090
3	.747[c]	.559	.557	.05054
4	.750[d]	.563	.561	.05031
5	.752[e]	.566	.564	.05014
6	.754[f]	.569	.566	.05002
7	.759[g]	.576	.573	.04963
8	.760[h]	.578	.575	.04951

a. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2

b. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km

c. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km

d. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km

e. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2

f. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2, Distance from City Center by Km

g. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2, Distance from City Center by Km, Distance from Muzdalifa by Km

h. Predictors: (Constant), Changes in No Built Cover Between 1998 and 2013 by Km2, Distance from Mina by Km, Distance from Street Network by Km, Distance from Hajj Sites Center by Km, Changes in Street Cover Between 1998 and 2013 by Km2, Distance from City Center by Km, Distance from Muzdalifa by Km, Distance from Hajj Sites Boundry by Km

Appendix D: Questionnaire Form in Arabic and English

السلام عليكم ورحمة الله وبركاته ...

ارجو منكم التكرم بالاجابه على الاستبانه والتي هي جزء من بحث دكتوراه حول امكانية الاستفاده من المرافق العامه في المشاعر المقدسه (منى، عرفات، مزدلفه) في غير موسم الحج ، وتهدف الاستبانه لمعرفة وجهة نظر عينه من سكان مدينة مكه المكرمه بشكل خاص حول الموضوع السابق الذكر، وتعتبر هذه الدراسه جزء من متطلبات الحصول على درجة الدكتوراه من قسم ادارة وتخطيط المدن بجامعة برشلونه التطبيقيه باسبانيا، علما بأن المعلومات التي يتم الحصول عليها سيتم التعامل معها بسرية تامة وبما تقتضيه أخلاقيات البحث العلمي و ستُستخدم لأغراض بحثية فقط

الباحث/ أيمن أمين إمام

البريد الإلكتروني/ aeimam@kau.edu.sa

المشرف الدراسي / جوسيب روكا

البريد الالكتروني/ josep.roca@upc.edu

مصطلحات هامه :

يرجى مراعاة المقصود بالمصطلحات التاليه عند الاجابه على فقرات هذه الاستبانه

المشاعر المقدسه : المقصود بالمشاعر المقدسه في هذا الاستبيان هي المشاعر الثلاثه : منى وعرفات ومزدلفه فقط

المرافق العامه : يقصد بالمرافق العامه في هذ الاستبيان : المساجد، المستشفيات والمراكز الصحيه، الخيام المطوره، قطار المشاعر، دورات المياه ، شبكة الطرق والمشاه، الساحات المفتوحه سواء التي بها تشجير كعرفات او المسفلته كمزدلفه .

أرجو التكرم بالإجابة على فقرات هذه الاستبانة، وذلك باختيار الإجابة الصحيحة من وجهة نظركم،. ولسعادتكم فائق الشكر والتقدير

القسم الاول : المعلومات الشخصيه :
1. هل انت من سكان مكه المكرمه (نعم/لا)
2. هل انت من مواليد مكه المكرمه (نعم / لا)
3. الجنس (ذكر/انثى)
4. الجنسية (سعودي/غيرسعودي)
5. الحالة الاجتماعيه (اعزب / متزوج / مطلق او ارمل)
6. العمر (اقل من 25/من 25-35/35-36/45-46/55-55/اكبر من 56
7. التحصيل العلمي (ثانوي او اقل/ دبلوم عالي/بكالوريوس/دراسات عليا)
8. الحي السكني الحالي بمكه (الاحياء : حي القرارة والنقا — حي الشامية والسليمانية — حي حارة الباب — حي الشبيكة — حي أجياد — حي الهجلة — حي سوق الليل والقشاشية — حي شعب عامر — حي الحجون — حي جرول — حي التيسير — حي المنصور — حي الطندباوي — حي المسفلة — حي النكاسة — حي مخطط الروابي — حي الروضة والششة — حي البيبان — حي النزهة الشرقية — حي النزهة الغربية — حي الزهراء — حي الهنداوية — حي الرصيفة — حي مخطط الحمراء — حي الإسكان — حي الخالدية — حي الكعكية — حي مخطط السبهاني — حي بطحاء قريش — حي كدي — حي الهجرة — حي العزيزية الغربية — حي العزيزية الشرقية — حي العزيزية الجنوبية — حي العوالي الشرقية — حي العوالي الغربية — حي المشاعر — حي ربع ذاخر — حي المعابدة — حي جبل النور — حي العدل — حي وادي جليل — حي العسيلة — حي الخضراء — حي الشرائع الغربية — حي الشرائع الشرقية — حي شرائع المجاهدين — حي الزاهر — حي الشهداء — حي السلامة — حي التنعيم — حي المدينة الصناعية — حي العمرة الجديدة — حي النوارية)
9. فترة سكنك بمكه (اقل من 5 سنوات / من 6 سنوات الى 10 سنوات / من 11 سنه الى 15 سنه / اكثر من 15 سنه)
10. سكنك بمكة بسبب (الاهل /العمل /رغبه شخصيه/ غير ذلك "اذكر")

القسم التاني (قياس مدى اللالمام بالمشاعر المقدسه) :
11. هل سبق لك الحج (نعم / لا) **فصل الاستبيان للناس اللي حجت واللي ما حجت اللي ماحجو يروحو على سؤال 12**

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عدد مرات الحج (مره واحدة / اكثر من ذلك)

اخر حجه كانت خلال (اخر خمس سنوات / قبل اكثر من خمسه الى عشر سنوات / اكثر من 10 سنوات الى 15 سنه / اكثر من ذلك)

12. هل سبق لك العمل في موسم الحج داخل المشاعر المقدسه (منى عرفات مزدلفه) سواء كان تطوعي او بمقابل (نعم / لا) **فصل الناس اللي اشتغلت واللي ما اشتغلت اللي ما اشتغلو على سؤال 14**

اخر مره عملت فيها خلال موسم الحج كانت خلال (اخر خمس سنوات / قبل اكثر من خمسه الى عشر سنوات / قبل اكثر من 10 سنوات الى 15 سنه / قبل اكثر من ذلك) .

13. خلال تنقلك في مكه لاي سبب هل تستعمل احد الطرق التي تمر بالمشاعر المقدسه (منى او عرفات او مزدلفه)
- (يوميا – احيانا – نادرا – لم استعملها من قبل – لا اذكر).

14. هل سبق لك زيارة المشاعر المقدسه (منى مزدلفه عرفات) في غير وقت الحج (نعم/ لا/ لااذكر)
اذا كانت الاجابه نعم يذكر السبب (للزياره / للتنزه / للعمل /غير ذلك ـاذكر-) .

15. اختر درجة معرفتك والمامك بالمشاعر المقدسه (منى ، عرفات ، مزدلفه) ومايتوفر بها من مرافق عامه (عاليه / متوسطه / قليله/ معدومه)

القسم الثالث (تقييم فكرة تشغيل المرافق العامه او جزء منها في غير موسم الحج)
من المعلوم ان المرافق العامه الموجوده في المشاعر المقدسه (منى، عرفات ، مزدلفه) مثل المساجد والمستشفيات والقطار والخيام المطوره .. الخ ، لا يتم تشغيلها والاستفاده منها الا خلال موسم الحج فقط . من وجهة نظرك كاحد سكان مدينة مكه ما 16. هو مدى تأييدك لفكرة تشغيل واستغلال هذه المرافق او جزء منها في غير موسم الحج وبما لا يأثر على تشغيلها في موسم الحج وقدسية هذه الاماكن :
- المساجد (لجميع الصلوات او بعضها كالجمعه وصلوات العيد والاستسقاء، او اقامة الندوات والدورات الدينيه .. الخ).
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)
- المستفيات والمراكز الصحيه (للطواريء او لبعض العيادات او العمليات غير المعقده و التنويم .. الخ) .
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)
- الخيام المطوره (لاسكان المعتمرين وماشابه ... الخ)
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)
- مسارات المشاه (كممشى عام، او لممارسة الانشطه الرياضيه المختلفه)
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)
- قطار المشاعر (لنقل الزائرين والمعتمرين... الخ)
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)
- الساحات المفتوحه (كمتنزه عام لاهل مكه، اولاقامة الانشطه الاجتماعيه ... الخ)
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)
- دورات المياه العامه (لخدمة الزائرين)
(اؤيد بشده – أؤيد – محايد – لا أؤيد – اعارض)

16. في حال تم تشغيل جزء من هذه المرافق العامه او كلها على مدار العام هل ستذهب للاستفادة منها او بعضها ؟ .
(اكيد / ممكن / لا اعلم / غير ممكن) .

Part 1: Personal Information

Sex:
1. Male
2. Female

Nationality:
1. Saudi

2. Non-Saudi

Marital Status:
1. Single
2. Married
3. Divorced/Widowed

Age:
1- < 25
2- 25 - 35
3- 36 – 45
4- 46 – 55
5- > 55

Level of education
1- High school or less
2- Diploma
3- Bachelor
4- Post graduate (Master/PhD)

Do you live in Mecca
1- Yes
2- No

Mecca resident's part

In which part of Mecca do you live?
1. West Part
2. Northwest Part
3. Northeast part
4. Southeast part
5. Southwest part

You live in Mecca since:
1. < 5 years
2. 5 - 10 years
3. 11 – 15 years
4. >15 years

You live in Mecca because of the:
1. Family
2. Work
3. Study
4. Personal reason
5. Other

Part 2: Measuring the level of knowledge about Sacred Sites

Have you performed the Hajj?
1. Yes
2. No

If yes, how many times?
1. Once
2. More than once
3. I Have not performed the Hajj

When was your last Hajj performance?
1. During last 5 years
2. Before 5 - 10 years
3. Before 10 -15 years
4. Before 15 years

Have you worked inside Sacred Sites during any Hajj season?
1. Yes
2. No

If yes, how many times did you work during Hajj?
1. Once
2. More than once
3. I Have not worked during Hajj

Last time you have worked during Hajj was:
1. During last 5 years
2. Before 5 - 10 years
3. Before 10 -15 years
4. Before 15 years

While you traveling in Mecca, have you ever used the roads network of Sacred Sites?
1. Yes (most of the times)
2. Yes (sometimes)
3. No (I have not used it before)
4. Do not remember

Have you ever visited Sacred Sites outside Hajj Season?
1. Yes
2. No
3. Do not remember

If yes, choose the reason of visiting
1. Just for visiting
2. For picnic
3. I have never gone there
4. Other reason

Choose your degree of knowledge about Sacred Sites and their public facilities
1. High
2. Medium
3. A few

4. I have no knowledge

Part 3: Your point of view...

Choose the degree of your support for the idea of reactivating the following public facilities outside Hajj season:

The Mosques:
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The Hospitals and medicine care centers:
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The permanent tents in Mina
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The Hospitals and medicine care centers:
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The Pedestrian paths
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The Monorail
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The Open spaces in Arafat or Muzdalifa

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The public toilets
1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

In case all or some of these facilities have been reactivated outside Hajj season would you go there?
1. Definitely
2. Maybe
3. I do not know
4. I won't go