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Towards Green Pilgrimage: A Framework For Action in Makkah, Saudi Arabia

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The great Islamic pilgrimage (Hajj) to the Holy places in Makkah, Saudi Arabia, is considered one of the largest annual mass confluences of people in the world. Hajj takes at least four-days and attracts more than three million pilgrims who perform specific steps to fulfil the requirements of this unique journey. However, Hajj presents an extraordinary challenge to the Saudi government for ensuring safety during such a large-scale mass gathering, and stakeholders are overwhelmed by managing the logistics of this event. Despite prior studies' efforts to explore attitudes towards pilgrimage safety, and to investigate ways to minimise carbon footprints on the environment, research on how to move towards greening this massive event is scarce. Hence, this paper provides a holistic overview of the challenges facing the Saudi government and involved stakeholders towards achieving the greening of this pilgrimage. This exploratory study uses a qualitative approach; data were collected via a semi-structured interview, six focus groups, and participant observation (on-site observation) in the city of Makkah during the Hajj season of 2018. Results show that the Ministry of Hajj and Umrah put various elements in place, such as recycling, solid waste management, and environmental protection. However, limited communication among stakeholders involved in the event makes it difficult to go further in achieving green goals. In this study, opportunities and challenges for green pilgrimage are divided into seven main groups: initiatives towards green pilgrimage, waste management, energy efficiency and transportation, greening water resources, greening food, green rituals, and promoting green awareness. A framework of action for developing sustainable green pilgrimage in Saudi Arabia is suggested and also, implications for the Saudi government and stakeholders are discussed in the light of extant literature. Recommendations are provided for better application of green pilgrimage initiatives in Saudi Arabia, with a particular focus on the Holy City of Makkah.

Key Words: green pilgrimage, stakeholders, Makkah, green event management, Saudi Arabia

Introduction

Saudi Arabia is a developing country, particularly when it comes to environmental protection (Alsebaei, 2014). Although many prior studies argue that the primary reason for hosting a mega-event is to increase economic benefits (Matheson & Baade 2004; Pillay & Bass, 2008), in the case of Muslim pilgrimage (i.e., Hajj), the Saudi government focuses on ensuring the safety of pilgrims and enhancing free services. Massive projects related to improving infrastructure and municipal services were conducted in 2010, with a total spend of \$19 billion (Ministry of Hajj and Umrah [MOHU], 2018) to maximise pilgrims' experience in the process of Umrah

and Hajj (Alhothali *et al.*, 2021). Plumb *et al.* (2010) suggest that Saudi Arabia recently became concerned about its environment and natural resources because of the increased number of visitors which causes a dramatic increase in the levels of pollution (Alaska *et al.*, 2017). Hence, the Ministry of Municipal and Rural Affairs (MOMRA) (2003) announced that the Saudi government would publish a technical manual and guidance for sanitary landfills, which includes regulations for dealing with waste, air, soil, and water pollution. However, Solid Waste Management (SWM) during Hajj was not mentioned at that time.

Due to the lack of prior studies on greening religious events, we used the wider literature on green events as our frame of reference. Most of the previous studies explore green practices in events such as sports and festivals in western countries. However, a limited number of studies have examined green event practices in general, in developing countries such as Saudi Arabia, and green pilgrimage practices in particular. Previous studies have called for further investigation on whether green event practices can vary based on country (Laing & Frost, 2010), and a call to explore the barriers to implement event green practices is also emphasised (Myung *et al.*, 2012). Furthermore, a study by Laing and Frost (2010) has underscored the importance of exploring green event practices from stakeholder perspectives.

Pilgrimage is considered to be a religious event; prior research on green pilgrimage has suggested a set of general guidelines for best practices in sacred sites, but these lack details on implementation and potential challenges, especially in developing countries (Agarwala *et al.*, 2019). Hence, in the current study, the challenges which impede the application of green pilgrimage practices, and the opportunities that should be exploited for implementing them during Islamic pilgrimage are explored, with an emphasis on taking a stakeholder-centric approach. Following this exploration, a framework of actions for the practical application of green pilgrimage in Makkah is suggested.

Green Event Management

In recent years, there has been increasing attention by scholars to the critical role of green tourism planning, greening events and the call to escalate research on the environmental outcomes of events has been intensified recently (Elgammal, 2007, Getz, 2008; Laing & Frost, 2010; Myung *et al.*, 2012). A green event refers to an event that follows a sustainable policy or integrates sustainable practices into its management and operations. Sustainability is the umbrella of green practice as it encompasses environmental practices with sustainable economic and socio-cultural outcomes (Getz, 2009). According to Mair and Jago (2010), 'greening' refers to an 'investment in environmentally friendly facilities and practices' (Mair & Jago, 2010:78).

Extant literature has emphasised the benefits of pursuing green practices as implemented by both lodgings (Kasim, 2007), and meeting and conventions (Mair & Jago, 2010). Green event practices are evidenced in prior case studies where the organisers have developed strategic goals to implement the green method in mass events. For instance, the International East Coast Blues and Roots Festival (Bluesfest) in Australia, which has won the best practice in green event management awards, has developed six strategic goals. These goals are, building:

- (1) institutional capacity;
- (2) a culturally relevant festival;
- (3) a festival that respects, transforms, and grows local community;
- (4) a zero-waste celebration;
- (5) carbon-neutral initiatives and
- (6) a festival site that is a functioning, healthy and natural ecosystem (Laing & Frost, 2010).

The extant literature explores multiple barriers and challenges which hamper the application of green practices (Mair & Laing, 2010; Li & Liu, 2019; Zamzuri, 2020). A pioneering study by Mair and Jago (2010) suggests a framework to explore drivers and barriers to organising a sustainable business event. The study found that finances are the salient barrier to pursue green event practices. Laing and Frost (2010) explored the challenges and opportunities related to staging green events and found that the main barriers to greening festivals are: the financial costs, lack of time, control over festival venues, and the inability to source appropriate suppliers or supplies. In a subsequent study, Mair and Laing (2012) explored several hurdles that impede event organisers, such as the costs of greening, their perceived lack of time, and a general lack of awareness of the options for greening (Mair and Laing, 2012). Building on the model of Mair and Jago (2010), Li and Liu (2019) explored the drivers of and barriers to greening events from an event planner's perspective. Their study found that lack of awareness, lack of support from the government, and lack of human capital to be among the most significant barriers to green event management.

Pilgrimage and Tourism

The World Tourism Organization (UNWTO) has shown interest in religious tourism as a tool for preserving humanity’s shared heritage and build cultural understanding. On the other hand, the UNWTO highlighted ‘crucial challenges’ that face achieving such benefits, which include: conservation of sacred sites, preservation of local traditions and religious practices and development of local communities (Rifai, 2015). Although an ongoing debate has been taking place on the difference between pilgrims and tourists, attempts to distinguish between them is obscure and complicated. Collins-Kreiner (2009) suggests that arguments about pilgrims and tourists have been raging between scholars who focused on similarities between tourists and pilgrim typologies while other focus on typological differences (Cohen, 1992; Graburn, 1989; MacCannell, 1976; Smith, 1992). The literature highlights the fact that they both share traveling and visiting places, which is mostly what tourism involves (Gupta, 1999). Therefore, Turner and Turner (1978:20) suggested that ‘a tourist is half a pilgrim if a pilgrim is half a tourist’. Importantly, in this

discussion, pilgrimage is defined as constituting a critical element of religious / faith-based / spiritual tourism, which is a rapidly growing area of study (Timothy & Boyd, 2003, Haq & Jackson, 2009; Griffin & Raj, 2017; Heidari *et al.*, 2018).

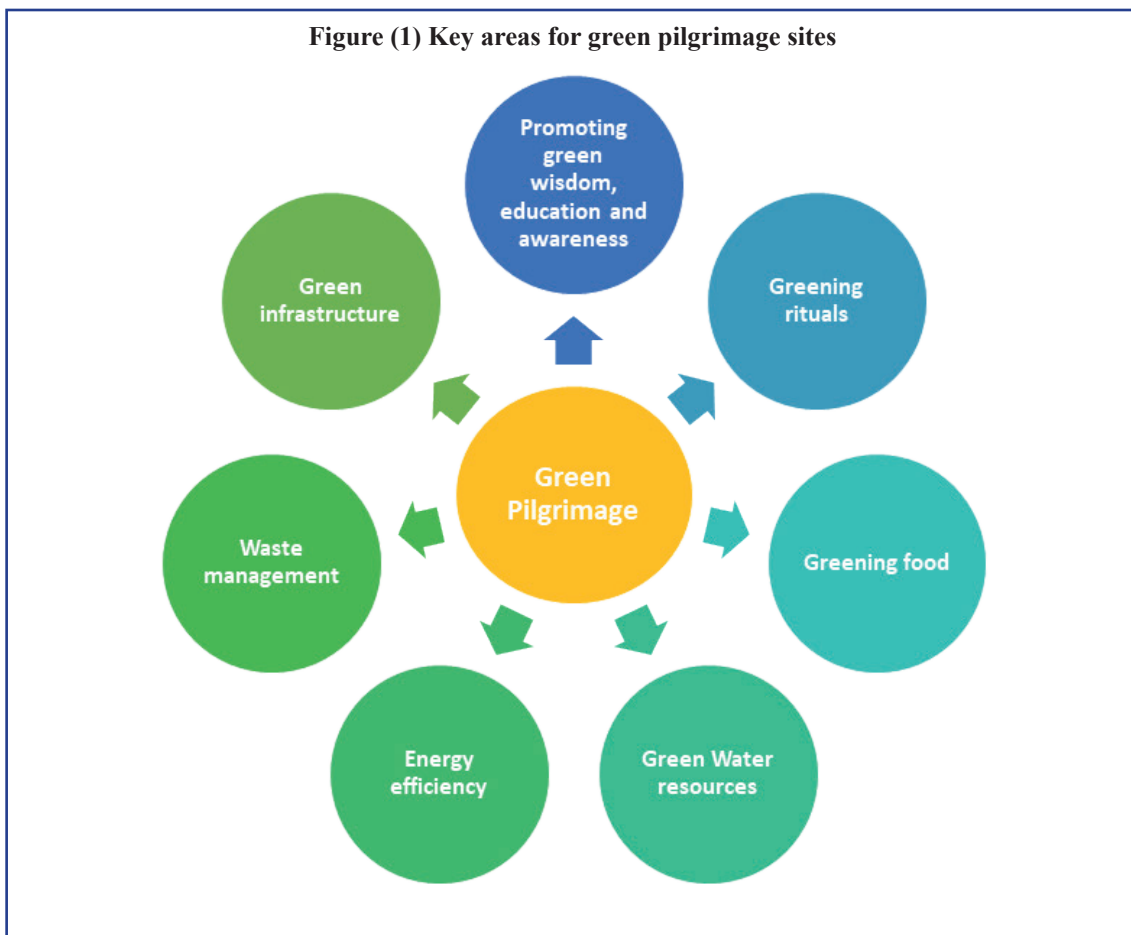
Secall defines pilgrimage as travel that is

oriented towards the divine, towards the sacred space and time lost, [which] turns into a religious tourism trip, as people leave their habitual place of residence for a reason that is not the basic need of subsistence (2003:122).

Heidari *et al.* (2018) describe pilgrims as visitors who are looking ‘at the spiritual beauty of a sacred place rather than aesthetic beauty’ (p.749). In the current study, we believe that pilgrims share common characteristics in that they travel away from their comfort zone for a specific purpose (i.e. seeking spiritual fulfilment).

There are shreds of evidence that lack of proper pilgrimage planning and management can cause negative economic impacts and when this happens it does not contribute to

Figure (1) Key areas for green pilgrimage sites



the overall welfare of the local community (Fernandes *et al.*, 2012); however, when it is suitably planned, the opposite is the case. In 2014, the UNWTO highlighted the importance of pilgrimage as a step towards the overall achievement of sustainable tourism. The UNWTO later indicated (in 2017) that sacred destinations urgently need to be managed carefully to preserve authenticity and integrity while making them accessible for all.

Green Pilgrimage

Green pilgrimage is defined as bringing together the concept of ‘sustainability’ with ‘pilgrimage’ (Agarwala *et al.*, 2019). The purpose of a green pilgrimage is to increase destination capabilities; foster positive and sustainable outcomes for the environment and community; to become a model in preserving the natural resources and decreasing the overall carbon footprint. There is evidence of plastic bottles and rubbish filling pilgrimage routes during peak periods of pilgrim ritual - this increases pollution and negative impacts on the environment (Alliance of Religions and Conservation, 2014).

Shinde (2008), in his study on Tirumala-Tirupati in south India, indicated that the crowd during the pilgrimage is causing stress on the sacred sites’ natural resources. Other previous studies have examined air pollution in Makkah during Ramadan and Hajj seasons, concluding that air pollution is exceeding national and international air quality standards. Therefore, air pollution and road traffic flow need more attention from all stakeholders to maintain human health in the area (Munir *et al.*, 2013). To make sacred sites greener during the pilgrimage, the Alliance of Religions and Conservation (2014) identified seven critical areas, as follows (also see Figure 1):

Promoting green wisdom, education, and awareness:

This includes the promotion of traditional teachings about nature that are included in religion.

Green rituals: Religious rituals can create a mess if not managed carefully in an eco-friendly way.

Greening food: Food can create up to 30% of people’s carbon footprint; planet-friendly food such as locally produced fresh fruits and vegetables can be a healthy choice and support the local economy as well as reducing the negative environmental impact.

Greening water resources: Water in holy places needs

to be conserved; appliances need to be water-efficient

Energy efficiency and transport: Solar and other clean energies need to be used in places that pilgrims visit - for all purposes including transportation.

Waste Management: Reducing, re-using and recycling in tandem with composting could save tons of carbon dioxide; in addition, free plastic bags should be banned

Greening buildings and infrastructure: Religious buildings should be adopting sustainable and green infrastructure; also, information about why a particular building is environmentally friendly should be available and communicated to visitors and stakeholders.

The Alliance of Religions and Conservation (2014) recommends several steps that could be taken before the event. These steps are:

- (1) highlighting the reasons for engagement in green pilgrimage;
- (2) involving key stakeholders to share their vision and sign agreements;
- (3) implementing environmental assessment of positive actions;
- (4) having a strategic plan with clear strategic aims, and
- (5) being active members of the green pilgrimage network and sharing green best practices.

These measures are meant to be carried out before the pilgrimage starts. The Vancouver Green City planning guide (2018) added other considerations to be undertaken before the event, such as training staff and volunteers on green issues and encouraging the use of green transportation. During a pilgrimage, stakeholders need to ensure that the pre-planned goals are going as planned and prepare zero waste stations. Post-event evaluation and measuring performance towards green pilgrimage are suggested to be considered after the event, and this should require the involvement of all key stakeholders (The Vancouver Green City planning guide, 2018).

Reflecting on these various examples of best practice, it is recommended that governments, local authorities, and other key stakeholders work together to make their sacred sites greener. This could be done by raising pilgrims’ environmental awareness and encouraging them to be

part of the process by following instructions and taking the good green practices home with them (Alliance of Religions and Conservation, 2014).

The journey of Muslim pilgrimage (i.e., Hajj)

The word Hajj means ‘to attend a journey’ (Adelowo, 2014:395); it is also a pilgrimage made to the Kaaba, the ‘House of Allah,’ in the sacred city of Makka in Saudi Arabia. Muslims around the world travel to Makkah every year during the last month of the Islamic calendar (Dhual-Hijjah) to perform Hajj and visit other sacred areas. Hajj ritual is one of the five pillars of Islam, and it takes about five days to be wholly performed; however, some pilgrims spend more than 40 days in Makkah and the other holy cities in Saudi Arabia (MOHU, 2018).

The Hajj is the second-largest annual gathering of Muslims in the world. During Hajj, pilgrims perform a series of rituals: (1) walking counter-clockwise seven times around the Kaaba (the cube-shaped building and the direction of prayer for Muslims); (2) travelling back and forth between the hills of Safa and Marwah, and (3) going to the plains of Mount Arafat during the day and spending the night in the plain of Muzdalifa. Additionally, they perform a symbolic stoning of the devil by throwing stones at three pillars. After the sacrifice of their animal, the pilgrims are required to shave their heads. Then they celebrate the three-day global festival of Eid al-Adha (Armstrong, 2002).

Although Hajj is required to be performed once in a Muslim’s lifetime, some Muslims perform it more than once. The Saudi Arabian government, in an attempt to manage numbers of pilgrims during the Hajj season, allows the performance of Hajj once every five years for internal pilgrims. For international pilgrims, it depends on the total population of their countries - it is limited based on a ratio of 1000 pilgrims for each million Muslims (MOHU, 2018).

In order to manage crowds during Hajj, in 2007, MOMRA launched projects to prevent future crowd-related accidents (Haase *et al.*, 2016); features of the improvements include an Operations Research (OR)-based Decision Support System (ORDSS) for crowd management, which reduces pilgrim congestion;

however, since 2016, MOMRA was no longer in charge of the scheduling and routing recommendations for the stoning-of-the-devil ritual (Haase *et al.*, 2016). Alsebai (2014) points out that, unfortunately, Makkah, where the Hajj rituals are performed, is not among the Saudi cities where waste is treated; stakeholders have not considered waste management as an essential consideration in managing the Hajj. There are a number of challenges related to pilgrims’ recycling intentions which make it difficult to make it compulsory by law. These challenges are mostly related to the pilgrims’ level of education, socio-demographic factors, ethnicity, and recycling habits.

Because such large number of pilgrims are required to perform prescribed rituals to fulfil Hajj, much stress is placed on the natural resources of the sacred places. Hence, in the current paper, we will focus on the unique characteristics of Muslim pilgrimage (i.e., Hajj) and explore current practices that could be considered as green. Additionally, we will highlight areas that need more attention from stakeholders and suggest a framework of action (before, during, and after Hajj) for a stakeholders to implement green pilgrimage.

Research Approach

The current study adopts a qualitative approach to explore challenges and opportunities of green pilgrimage in Makkah, based on the Hajj key stakeholders’ experiences (Hesse-Biber & Leavy, 2010). Since qualitative studies’ primary purpose is to acquire relatively new, comprehensive knowledge on a specific topic, interviewing and focus group discussions are convenient to match such purpose (Lamont & White, 2005, Heidari, *et al.* 2018). Two unstructured exploratory interviews were conducted with key governmental stakeholders in managing the Hajj event. The exploratory interviews helped to explore stakeholders’ attitudes and form the researchers’ initial insights about how the event of Hajj is managed annually and the critical areas for maintaining a green pilgrimage experience. These interviews also helped in identifying a list of critical stakeholders for the planned focus groups; stakeholders who can give insights into the current research and highlight challenges and opportunities for green Hajj in Makkah.

Data triangulation through focus group discussions, document analysis, and participant observation was used to collect empirical data and interrogate all the crucial aspects of the study topic.

First, participant observations were conducted in August 2018 during the Islamic pilgrimage (Hajj) to take notes on the practical government actions that could be considered primary practices towards green pilgrimage. Second, literature related to green pilgrimage was analysed to highlight issues to be discussed during the focus group discussions - material was identified by groups such as the Alliance of Religions and Conservation, the Green Pilgrimage Network (2014), and the Vancouver Green Event Planning Guide (2018). Third, exploratory interviews were undertaken to scope out themes and topics of investigation, and also to identify participants for follow up focus groups. Fourthly, since knowledge about green pilgrimage in Saudi Arabia is limited, focus groups were used as an unstructured research design (Rabiee, 2004; Byers & Wilcox, 1991). It was hoped that focus groups would open up opportunities for participants to express themselves and highlight potential challenges (Kitzinger, 1995). Based on the information gathered from the exploratory interviews, the snowball purposeful sampling technique was used to identify members of the research focus groups (Patton, 2002).

These methods allowed the researchers to enter into the networks of critical stakeholders and find participants that might be difficult to identify otherwise (Lamont & White, 2005). Six focus group discussions were held with key stakeholders involved in organising Hajj including the Ministry of Hajj and Umrah (MOHU - Jeddah and Makkah branches) the Municipality of the holy city of Makkah (MOCM) - Saudi security - civil defence, Mass gathering authority) etc..

Each focus group session consisted of 6-8 participants (31-65y) and lasted between 75 and 90 minutes. Overall attitudes and current actions related to green Hajj were captured through discussions round questions such as

What is your environmental policy? Do you adhere to it? How do you monitor it?

Do you use green management approaches:

What are your perspectives towards green pilgrimage?

Do you hire local staff?

What training do you give your staff?

If there is a staff uniform, does this use sustainable materials, e.g., organic cotton?

Do you source supplies locally? (derived from Alliance of Religions and Conservation, 2014).

A code containing letters to denote the first letter of the participant name followed by a number (the number of the focus groups), were assigned to each quote in the transcript to protect the anonymity of the participants.

Written verbatim transcripts were arranged for all focus groups. Transcripts were then analysed using the coding process of dividing data into codes and categories following the steps of Miles and Huberman (1994). Such a process started with identifying a set of broad themes that emerged from the exploratory interviews, documents, and reviewing previous studies. After developing and polishing codes and categories, research findings were presented in the form of concepts and propositions to develop the logical coherence of the research topic (Miles & Huberman, 1994). Propositions are used to describe relationships with concepts (Tesch, 2013), where concepts, on the other hand, are generalised from empirical facts (Taylor & Bogdan, 1998). In the results section, concepts represent the challenges and opportunities of green pilgrimage in Makkah, while propositions characterise the possible relationships between such challenges and opportunities.

To reflecting upon the research findings, a framework of action is developed as an initial step towards implementing a green Hajj strategy in Makkah. It includes strategic objectives and related activities with responsibilities assigned to each stakeholder involved in the Hajj process. In addition, more themes will be discussed in the light of previous literature, so proper discussion and valid conclusion can contribute to the general green pilgrimage body of knowledge.

Results and Discussion - Challenges and opportunities for green Hajj pilgrimage

This section discusses the results of investigating the challenges and opportunities of green pilgrimage and the relationships among them, particularly within the Muslim pilgrimage context (i.e., Hajj). A framework of actions to be considered by Hajj stakeholders will be discussed.

The results found that implementing green pilgrimage in Makkah, although it has some opportunities, is beset with several difficulties that negatively affect the natural resources and the local community benefits. Opportunities and challenges are here divided into seven main groups as discussed below:

- Initiative towards Green pilgrimage,
- Waste management,
- Energy efficiency and Transportation,
- Greening water resources,
- Greening food,
- Green rituals, and
- Promoting green awareness.

Initiatives towards green pilgrimage

Stakeholders involved in Hajj are diverse; MOHU, supervised by the Supreme Hajj Committee, is the primarily responsible institution for planning, evaluating, coordinating, and reporting to the King, the Custodian of the Two Holy Mosques. The Ministry's vision, which is communicated through its website, is focused mainly on providing excellent services to pilgrims and ensures their safety. All companies and establishments involved have to be licensed by MOHU (MOHU, 2018).

The findings of focus groups and participant observation reveal several steps that involve stakeholders who have already started to save the environment and community and move forward towards green pilgrimage. One of the main contributions in greener management of pilgrimage is the establishment of research centres. This has already started to take place through the Hajj and Umrah Institute at Umm Al-Qura University in Makkah. Much research done in this area is related to managing waste, recycling, water consumption, and improving waste to energy

facilities (Ouda & Cekirge, 2013; Alsebai, 2016; Ouda *et al.*, 2016). More has to be done about other aspects of green practices, such as studying and monitoring the behaviour of pilgrims concerning the generation of solid waste, and pilgrims' attitudes towards taking part in the implementation of green pilgrimage. It is also worth mentioning here that a focus group participant indicated that

There is an institute for Hajj related research. However, data and results are not well disseminated to the audience (S6).

Therefore, broader dissemination of the outcomes of such research and studies on green pilgrimage is strongly recommended.

A recently proposed initiative of one of the critical areas green pilgrimage (i.e., promoting green awareness) was introduced in 2016 in Makkah involving several Hajj stakeholders (i.e., Umm Al-Qura University, MOHU, and the Custodian of the Two Holy Mosques Institute for Hajj Research and Umrah (CIHUR). The focus of the initiative was

raising pilgrims' awareness of the importance of sorting solid waste, particularly in Menna camps to reuse, recycle and reduce the environmental stress on such a sacred place (F2).

One hundred and fifty thousand folded brochures about green Hajj camps in Arabic, English, and Urdu languages were distributed in camps during Hajj in addition to the distribution of large green waste containers (this was also confirmed through participant observation). Pilgrims cooperated in screening waste at this time by sorting the solid waste into two types, dry and organic. The ratio of sorting solid waste reached 19.5%, 12.9%, 12.7% of the total solid waste plastic generated by Egyptian, Australian and Pakistani pilgrims, which was a good sign of the success of the project (Alsebai, 2016).

Participants in focus group four confirmed,

Cooperation with food charity organisations to donate excess food was also initiated five years ago as a part of the waste recycling plan adopted by the Ministry of Hajj bureau in cooperation with Makkah Council. However, managing excess food is still a challenge as it exceeds the ability of current charities (S4).

Therefore, the ministry needs to expand its cooperation with food charities to maximise the positive economic and social benefits and reduce negative environmental impacts.

Participants in focus group three indicated that there are other green initiatives and campaigns conducted by different stakeholders, such as the Municipality of the Holy City of Makkah, separate from the MOHU. A participant emphasised that

Efforts to promote green management should be consolidated to achieve sustainable outcomes (S4).

These findings are underscored in prior studies, which stress that all stakeholders should agree on the purpose and consequences of green events to ensure lasting benefits (Watt, 2006). Otherwise, efforts will be scattered and wasted. Hence, we believe that the first step towards greening Hajj is 'Green collaboration' which refers to stakeholder collaboration in terms of objectives and goals towards implementing green practices. Indeed, such initiatives are considered promising opportunities, and MOHU needs to support more of them to gradually implement green pilgrimage in Makkah.

Waste management

A tremendous amount of waste is an ultimate consequence of massive event gatherings such as sports and festivals, especially when food and drinks are involved (Zelenika *et al.*, 2018). The situation is worsening in the case of Hajj as pilgrims stay in the sacred places for a few days with three meals per day. One of the most significant challenges that faces the municipality of the holy city of Makkah is the transfer of solid waste, especially transferring wastes through congestion (Alsebai, 2016). It was indicated by a participant that

Waste management during Hajj is considered very challengeable, particularly with the high temperature that sometimes reaches over 40 degrees (A1).

To solve the problem of solid waste removal during congested periods, the Municipality has initiated two solid management systems to minimise and accommodate the massive amount of waste during peak times; the

first system is building over ground and underground pressurised waste storage

To solve this issue, we built underground pressurised storages (approx. 130), we also have 1200 over ground pressurised storages (K1).

Another participant added

It covers 30% of the total waste, therefore, we created two mobile stations in (Azizia and Moaisem) to ease the movement of trucks instead of going to throw in the landfills, yet, these bins also become loaded with massive amounts of waste, which reach Approximately 46 000 Tons of waste (M1).

The second approach is:

establishing a smart waste system to track, supervise and monitor garbage trucks, and street vacuum cleaners (F1).

Solid waste management / removal is considered an initial and essential step towards green practices. The accumulation of waste in landfill is the main critical reason behind environmental problems, such as water and soil contamination, via leaching of heavy metals and air pollution via emission of greenhouse gases (Zelenika *et al.*, 2018). It is also vital to divert waste from landfill in the form of recycling and composting, which can help mitigate the negative impacts of waste and recover useful materials from landfill.

Despite the massive efforts established by the Municipality to remove and manage the substantial waste surplus, the challenge is to deal with the reasons behind the enormous increase of solid waste and deal with this in a greener way. The findings of the focus groups revealed that the amount of solid waste produced by each pilgrimage is the major challenge facing the involved stakeholders, especially the Municipality. An executive in the Municipality of the Holy city of Makkah has emphasised that

The issue of the waste surplus will not be solved unless a smart green plan to minimise the waste from the source (i.e., inside the sacred place) is established (S1).

The respondent also elaborated that the average waste per pilgrim reaches 3 Kilos of garbage.

We should work on reducing the number of products that enter the places (S1).

Hence, we come to conclude that waste reduction or prevention is one of the critical steps towards green practices of solid waste management. Waste is costly as it is the disposal of something that has / had value in the first place as it was purchased and moved at a cost (Ahmad *et al.*, 2013). Added to that, Solid Waste Management (SWM) is a significant operational practice and requires stakeholders to utilise more sustainable practices. By implementing green SWM, a clear message could be efficiently delivered to pilgrims about the benefits of green practices (Laing & Frost, 2010). The findings indicate that more consolidated efforts towards communicating the benefits of green practices for the environment, community, and economy should be implemented.

Recycling: Solid waste recycling is one of the traditional ways of SWM and among the initial steps towards green practices (Hottle *et al.*, 2015). Prior studies have demonstrated its efficiency in reducing CO² emissions (Hottle *et al.*, 2015). Although there are no formal plans from MOHU concerning recycling, different suggestions were made by the Hajj research institute regarding using metal cups instead of plastic ones.

We have thought about replacing the plastic cups with metal ones, but this needs more funds and is not currently possible (T3).

The Hajj event offers an excellent opportunity to encourage the generation of recyclable waste as it has a long duration for each patron, especially in the Menna Campus, where most of the trash is plastic, paper, and organics. However there are other materials that would be more difficult to recycle. For example, a study by Alsebai (2018) examines pilgrims' awareness and attitude regarding home-generated medical waste. This study found that the amount of home-generated solid medical waste generated during the Hajj event is high.

Although there are efforts from MOHU and MOCM concerning the development of a waste management plan, there should be a zero waste station provided for every 500 attendees during Hajj at peak times. Prior studies emphasise the critical role of volunteers in mastering,

controlling, and monitoring the process of sorting and recycling solid waste (Zelenika *et al.*, 2018). Volunteer contribution to the mastery of green practices during Hajj is essential. Hence, at least two trained staff or volunteers should be assigned to each zero-waste station (The Vancouver Green Event Planning Guide, 2018).

Energy efficiency and transportation

Gas emission: This is among the critical environmental problems that face authorities and stakeholders involved in managing massive crowd events. The findings of a study by El Hanandeh (2013) emphasise that the Hajj event is a significant global contributor to greenhouse gas emissions. To solve this critical issue and to keep the air of Makkah healthy and clean, the Saudi government has invested in scientific research via the establishment of the CIHUR. One of the central units in this institute is an air pollution research unit, which is responsible for monitoring and reducing air pollutants in the two holy cities (Makkah and Madina).

Transportation: A study by Habeebulla (2013) attempted to explore air pollutants near the holy mosque in Makkah. The study found that a significant source of contaminants was road traffic - re-suspended and windblown dust and sand particles. To reduce the negative impact of pollutants from traffic, MOHU has emphasised the use of Buses, which are energy star rated. Respondents also affirmed that all cars used during Hajj are periodically examined for gas emission to reduce pollution; this is also contributing positively to reducing car related damage to the environment.

Transportation is available for pilgrims; buses and trains are examined regularly for being environmentally friendly (F6).

Another study by Hameed and Habeebulla (2013) to measure the level of air contamination around the holy mosques has revealed that anthropogenic activities are main variables for controlling air bio-contamination around the sacred mosque. Hence, environmental awareness programs should be delivered to pilgrims via their campaigns. These programs can help reduce the negative impacts of human activities on the environment (Sola, 2014). This should be a relatively easy process, since pilgrims are keen and open to absorb knowledge

about environmental awareness (Alsebai, 2018). The Indonesian Ministry of Religious Affairs, for example, has introduced wide-bodied aircraft to reduce the number of individual flights carrying pilgrims to the Hajj (Alliance of Religions and Conservation, 2014).

Greening water resources

Free Zamzam drinking water faucets are currently available for pilgrims inside and around the Holy mosque; however, according to one of the participant,

There are no awareness campaigns of how to save water and how to effectively manage water, plastic cups and bottles (S5).

Other participants indicated that currently, there is no policy related to reducing water waste or raising pilgrims' awareness of using water in a greener way. However, a participant indicated

The Saudi water company developed a type of faucet using a technology that is reducing water consumption (A3).

MOHU could adopt this technology as a step towards conserving water in the area of the Holy mosque.

Interestingly, some countries such as Indonesia encourages its pilgrims to reduce their consumption of water during their trip to Makkah. Indonesian believers are encouraged to stay in Saudi Arabia for fewer days to reduce their impact on energy and water consumption (Alliance of Religions and Conservation, 2014).

Greening food

Another challenge that is related to the surplus of waste is the tremendous amount of food and drink that is distributed to pilgrims inside the camps. This food surplus is considered a significant hurdle to waste removal by the municipality. We realise that the amount of garbage is vast because the amount of food is also huge. Hence, we found that one of the possible solutions to minimise waste could be to reduce the amount of food entering the sacred places.

Participants indicated that steps were taken towards reducing food waste by offering pilgrims ready-made

meals or dry food; however, not all international and internal pilgrim campaigns agreed to follow this strategy. This might be attributed to the fact that the ready meals might not suit the pilgrims' taste. One interviewee emphasised that the campaigns should provide food that satisfies the pilgrims' taste according to their culture and background; however, this is also challenging. According to one of the participants,

MOHU has tried hard to increase the quality of food and achieve 45% of feeding pilgrims their favorite food, so all is consumed without food waste (H2).

It was also indicated that

Some frozen meals are used to feed international pilgrims during their trip to Jeddah airport as they have up to 8 hours waiting time for their flights (A3).

These efforts are considered as steps forward toward ensuring that food waste is managed effectively and indeed facilitating the implementation of green pilgrimage in the area of greening food. However, more efforts should be made toward the prevention of food waste. In particular, MOHU and MOMRA need to maximise their efforts on green waste management practices, which involve two stages: waste prevention and waste transformation. Waste prevention is concerned with reducing both the volume of waste and its pollutant contents (Jaron & Kossmann, 2018). This result is emphasised as one of the solutions to minimise the number of products (e.g., meals), which are distributed for free to the pilgrims. The second stage (waste transformation) is concerned with transforming the waste into usable products (Jaron & Kossmann, 2018). Overall, less waste means better utilisation of inputs resulting in lower use of raw materials and reduced waste disposal costs (Hart & Ahuja, 1996).

A study by Papargyropoulou *et al.* (2014) differentiated between waste prevention and waste management. Accordingly, waste prevention refers to activities that prevent the generation of waste in the first place, for instance, the reduction of food surplus. However, waste management involves handling food waste once it has been generated, such as composting and anaerobic digestion. Hence, both MOHU and MOMRA should collaborate and integrate their efforts to plan and execute

waste prevention strategy to reap its benefits for citizens, society, and the environment.

Using local products: participants indicated that while all food during Hajj is produced locally, there are not enough local products to meet demand during Hajj, and there are no policies or formal plans related to using Saudi produce.

We hope that the MOHU takes local products and handcraft into consideration and adopt a plan for it (M2).

The findings demonstrate the lack of strategy to maximise the use of local products. Hence, we recommend that the MOHU and the Ministry of commerce should collaborate to encourage Saudi entrepreneurs to contribute to the process of greening food.

Greening rituals

Since religious rituals can create major issues if not managed carefully and in an eco-friendly way, MOHU has identified areas that need attention during Hajj. The key issues in terms of ritual logistics include safety and security, lost pilgrims, Carrying Capacity in camps in Menna and Aljamarat, and animal sacrifice (slaughtering) as discussed below:

Safety and security: The phenomenon of crowdedness during Hajj critically influences most of the participants, is seen as being a major challenge by most of the stakeholders involved, and is considered as a hurdle to the implementation of green practices. This is attributed to the fact that a massive number of pilgrims who gather in a limited space can negatively influence the environment. The findings reveal that pilgrims' safety and security during peak times is a strategic objective of critical priority to the government. Hence, the government has invested in research to explore technological solutions that can explore crowd behaviour, density, and flow (Seddeik & Shambour, 2019; Seddiq *et al.*, 2019).

The findings of this study reveal that there are six campaigns or organisations responsible for pilgrims from all over the world. The relevant campaigns are responsible for delivering food and accommodation for the pilgrimage. In 2018, MOHU reported the arrival of

2.3 Million external legal pilgrims and 759,000 internal legal pilgrims to the sacred places to perform the Hajj rituals. In addition, there is an estimation of 222,000 illegal pilgrims who enter Makkah a month before the Hajj season, so they avoid the security and Hajj permission controls which are considered important for providing safety, security, and control. Interestingly, such illegal pilgrims used to be more than a million a few years ago, but due to security regulations and control, this number has decreased. Participants indicated that as long as illegal pilgrims arrive in Makkah, officers cannot ask them to leave before completing their Hajj.

Not all pilgrims come through campaigns, so individual pilgrims considered a huge challenge for the Hajj ministry (A5).

These illegal pilgrims are affecting the carrying capacity of sacred places and can lead to security problems if things are not well managed. The main aim of MOHU is to ensure the safety of pilgrims in all locations during Hajj and confirming that systems such as services for lost pilgrims are managed effectively.

Moreover, the respondents also emphasise that stakeholder conflict of interest is one of the reasons which impedes the implementation of green practices. Since the main objective of the Saudi authority is to ensure that pilgrims are safe, guaranteeing this objective intersects with other stakeholders' purposes, such as going green. This finding confirms prior studies that emphasised the role of stakeholder collaboration to support the green image and to implement green practices of business. Mair and Frost (2010) stress that to organise events, stakeholders successfully should have consistent themes and objectives. Respondents also noted that the lack of communicating efforts related to the green event is impeding the application of green event practices.

Lost pilgrims: MOHU deals with lost pilgrims through offices outside the holy mosque. Interviewees indicated that to maintain pilgrim security, they divide lost pilgrims into two categories: first, pilgrims who have information about their accommodation, this category is easy to handle. In such a case, security describes the location if it is close, but if it is far, they provide transportation for them. Second, pilgrims who have no information about their accommodation and in that case, security officers

check their electronic bracelets for information and transfer them to their location. There is a future vision in using such bracelets more by adding the pilgrims' health condition information and using it to obtain information about the number of pilgrims in each location at a specific time which should facilitate managing the carrying capacity (Almowaten, 2016).

Carrying capacity in Menna: In focus group one, participants revealed that the pilgrim camps in Menna are a project that was adopted by the MOHU in 1997. The lodge in Menna has a fixed carrying capacity. In specific, there area of one tent is 16m², and the total carrying capacity for the whole camp is limited to accommodate 1.4 million pilgrims. However, the MOHU is aware that

Both international and internal campaigns are using all spaces available for praying and hospitality to squeeze more pilgrims in (M1).

This means that an area that should take 100 pilgrims is taking up to 500 pilgrims. The rest of the pilgrims are accommodated in small hotels and different accommodation units in Makkah,

Such units have to obtain the proper licenses for operating during Hajj season (S2).

The MOHU has been trying to find solutions for creating a space in Menna's camps. Focus group 2 participants indicated that future projects are aiming at doubling the carrying capacity by replacing single beds with bunk beds. Such an idea of providing bunkbeds was implemented with 460,000 Asian pilgrims in 2018, and

The outcome of its implementation was promising (S2).

A study by Seddeik and Shambour (2019) utilised a heuristic-based approach to better distribute the groups of pilgrims over the tents in Menna. The findings reveal that the proposed algorithm provides satisfactory distribution for Menna tents. Hence, the Saudi government is investing in innovative research to expand the capacity of the sites to accommodate more pilgrims.

Carrying capacity in Aljamarat. This site is where the Devil stone-throwing takes place, in Menna. The Saudi government has improved the carrying capacity of the stone-throwing area so that it can accommodate up to 300,000 pilgrims per hour:

This is controlled by advanced cameras to avoid congestions and injuries among pilgrims (A5).

Despite continuous improvement to the site and its infrastructure, stampedes during crowd movements are serious incidents that need to be dealt with seriously (Illiyas *et al.*, 2013; Hasse *et al.*, 2016). Hence, Saudi authorities developed a comprehensive crowd management program, which emphasises the development of an optimised schedule for the pilgrims performing the stoning ritual. This schedule describes specific routes and time slots for all registered pilgrim groups. This enables the enforcement of one-way flows toward and from the ritual site (Hasse *et al.*, 2016). This strategy reduces congestion and crowding.

However, respondents in focus group four indicate that pilgrims do not always commit to the announced throwing times of their group; some of them go at different times according to what suits them. The interruption in the schedule happens because of two reasons, either

Mistaken beliefs about the exact times of throwing stones, particularly among Asian pilgrims who listen more to their religious Imams or leader (S4),

or their preference

To go individually rather than with their group (A2).

This is challenging as it requires increased awareness of beliefs in terms of the Hajj ritual in addition to ensuring pilgrims' commitments to their assigned time of throwing.

Currently, there are cameras on-site in Aljamarat that are directly connected to the Hajj operation room,

If the number of pilgrims exceeds the carrying capacity of the site, orders are given to ... not to allow any pilgrims to go to the devil stoning site (Z4).

In responding to optimising the services provided in Menna, one of the research projects has utilised IoT technology to create 'smart camps.' By using sensors, essential data to automatically adjust the comfort level of the camp and optimise the available resources (energy and water) usage, in addition to keeping the camp-site safe and secure, could be achieved (Seddeik & Shambour, 2019).

One of the main challenges facing MOHU in managing carrying capacity is the phenomenon of beggars. Based on participant observation, the presence of beggars all over the sacred places is evident. These people are utilising the Hajj events either to generate money from pilgrims or to sell small products illegally. In this regard, respondents in focus group six have pointed out that MOHU recently formed a committee to record, manage, and monitor all phenomena during the event. This is important, since the presence of beggars can affect the Ministry's efforts in strictly maintaining carrying capacity during the Hajj performance.

Animal sacrifice (Slaughtering): Slaughtering of an animal sacrifice is a ritual that has to be performed during Hajj, and thus, a large number of goats and sheep are slaughtered annually during this event

This is because each pilgrim has to sacrifice for himself a sheep or a goat (O6).

People in Saudi Arabia used to slaughter an estimated of 2.5 million animals in celebrating the Feast of the Sacrifice (Eid Aladha) (Amtul, 2014). This enormous demand can create extraordinary slaughtering logistics over the course of several days (Brooke, 1987). To manage

Table 1a: Before Hajj

Objectives	Action	Potential implementation parties
Promoting green Education and awareness	Communicate the Hajj green vision on the MOHU website as well as all stakeholder websites	MOHU / Pilgrims affairs office / Travel agencies / (GPH)
	Encourage handicrafts which will increase economic benefits to the local community	MOHU
	Map and identify locations of green equipment and services (The Vancouver Green event planning guide, 2018)	MOHU / Pilgrims affairs office / Travel agencies
	Ensure items for sale / giveaway and containers are made from recyclable or reusable materials (The Vancouver Green event planning guide, 2018)	Ministry of Commerce and Industry (MOCI) / Ministry of Labour (MOL)
	Recruit volunteers interested in green and sustainability issues (The Vancouver Green event planning guide, 2018). Advanced training on green responsible practices can be arranged for them	MOHU / Pilgrims affairs office / Travel agencies / MOL
Energy efficiency and transport	Improve energy conservation policies	MOHU / GPH
	Consider installing solar power in the Holy Mosque and surroundings. In addition to the Hajj sacred places such as Menna and Arfat	MOHU / GPH
Green infrastructure and accommodation	Improve the ecological footprint of buildings in the Holy Mosque and Hajj sacred places by developing a sustainable management plan.	MOHU / Pilgrims affairs office
	All new buildings should be eco-friendly from the planning stage, such as the new buildings in Menna	MOHU / GPH
	Publish or distribute a handbook on making your place in Makkah greener - to be distributed among Hajj campaigns to facilitate raising pilgrim awareness before their arrival to Makka.	MOHU / Pilgrims affairs office
	Use eco light bulbs; cut down heating and air-conditioning; install solar energy, insulate buildings more efficiently; establish policies about purchasing of furniture, carpets, paint, etc.; introduce composting	/ MOHU / Pilgrims affairs office
	Establish trusted green building certification criteria systems	Supreme committee of tourism and antiquities / MOHU
	Ask hotels to do an environmental audit and see whether they can improve their footprint	MOHU / Pilgrims affairs office / Travel agencies
	Produce a green map of pilgrim routes showing where pilgrims can find more eco-friendly hotels (Alliance of Religions and Conservation, 2014)	MOHU / Ministry of Transportation (MOT)
Waste Management	Ban free plastic bags and replace them with recycled paper or cloth bags so negative impacts on the environment could be reduced	MOHU / Pilgrims affairs office / Tourism agencies
	Develop Zero waste plan and hire waste and recycling service providers,	MOHU / GPH / Pilgrims affairs office
	Ensure there are enough toilets for pilgrims and investigate how some could be bio-toilets where the waste is used to fertilise the land or provide energy (Alliance of Religions and Conservation, 2014)	MOHU / GPH / Pilgrims affairs office

Table 1b: During Hajj		
Objectives	Action	Potential implementation parties
Promoting green wisdom	Raise the issue of pilgrims' responsible actions and provide incentives for positive practices whenever possible.	MOHU / GPH / CIHUR
	Engage with pilgrims: Produce a well-written Green Guide and a green map for Pilgrims	MOHU / GPH / CIHUR
	Locate, produce and distribute a theology of the environment for Islam as a basis for action	MOHU / GPH
	Increase staff responsible practices about green action (using green transportation, reduce waste, calculate their footprint...etc)	MOHU / GPH
	Organise environmental monitoring by students of flora, fauna, and pollution, especially in holy areas	MOHU / GPH
	Green volunteering: Develop eco-volunteering possibilities for pilgrims.	MOHU / GPH / CIHUR
	Green messaging through media: Assess how to engage with local and national media and social media	MOHU / GPH
Energy efficiency and transport	Use green energy which would minimise negative impacts on the environment	MOHU / GPH
	Establish pledges, eco-certification schemes, and awards	MOHU / GPH
	Encourage walking, cycling, and using public transport through travel agencies, tour groups, or tour leaders.	MOHU / GPH
	Consider using shuttle buses powered by green energy.	MOHU / GPH
	local authority and local environmental Non-governmental organisations need to cooperate to improve the green transport network in Makkah	MOHU / GPH
	Replace diesel-powered buses with buses powered by hydrogen fuel cells (Alliance of Religions and Conservation, 2014).	MOHU / GPH
	Pilgrimage organisers must ensure that they request energy-efficient or energy star rated products (Cars, lights, appliances) for their event.	MOHU
Green water resources	Provide more tap water stations so bottled water is reduced. This would help in minimising waste and its management and hence impact positively on the economy and the environment	MOHU / GPH
	Ensure that appliances are water-efficient	MOHU / GPH
	Conserve Zamzam Water	MOHU / GPH
Green food	Source food locally and plan for its waste in a green way - consider using a food recovery model (The Vancouver Green event planning guide, 2018) to maximise economic benefit and reduce negative environmental impact.	MOHU / GPH / Internal and international pilgrims campaigns
	Look at all pilgrim hospitality and retail outlets to see if the sourcing is ethically and environmentally sound	MOHU / GPH / Internal and international pilgrims campaigns
	Develop a green award scheme for places that promote green eating and standards	MOHU / GPH
	Build links to organic farms	MOHU / GPH / Internal and international pilgrims campaigns
	Maximise cooperation with food charity organisations to donate excess food. (Alesebai, 2014)	MOHU / Internal and international pilgrims campaigns
	Recommend that pilgrims and residents cut down meat consumption to reduce pressure on natural habitats, reduce pollution, and help combat climate change.	MOHU / Internal and international pilgrims campaigns
Green rituals	Pilgrimages at special times can be focused on protecting the environment, where pilgrims clear litter or engage in other ways to protect the holy site.	MOHU / GPH / Internal and international pilgrims campaigns
	Join or set up green award schemes.	MOHU / GPH
Green Waste management	Organise clean-up days to help city authorities and be an example for people not to throw rubbish onto the street.	MOHU / MOHCM / GPH / Internal and international pilgrims campaigns
	Consider stainless steel cups and provide traditional, eco cleaning products so plastic cups are replaced	MOHU / GPH / Internal and international pilgrims campaigns. / CIHUR
Green recycling	Establish waste stations on-site and encourage pilgrim exchange of plastic bottles and cans - get a locally made city souvenir instead	MOHCM
	Disseminate information about the waste management plan	MOHU / GPH / MOHCM / Internal and international pilgrims' campaigns. / CIHUR

Table 1c: After Hajj

Objectives	Action	Potential implementation parties
Undertake green actions evaluation	Evaluate green actions and responsible practices that took place during the Hajj season and disseminate information related to achievements to stakeholders	MOHU / GPH / Internal and international pilgrims campaigns
Support green eco research and development	Invest in Eco research and development.	MOHU / GPH / CIHUR
Encourage green innovation	Support innovative environmentally friendly projects and adopt a strategy of continuous calls for projects about innovative green Hajj practices.	MOHU / GPH / CIHUR
Disseminate green economic benefits	Calculate the waste recycled and communicate how much it contributes to the economy in numbers.	MOHU / CIHUR

this process in a greener way, the Saudi government has established a plan to distribute meat from slaughtered animals to people in need. Participants in focus groups two and four indicate that the meat is distributed among the poor population of Makkah, and the rest is exported to poorer areas in the world. Since pilgrims need to slaughter a sheep to complete their Hajj rituals in Menna, the Saudi government has

[made an] *agreement with the Islamic Bank to complete all slaughtering in a greener way (A4).*

This link with the Islamic Bank is important; it was noted in participant observation that pilgrims pay the required money for slaughter, only through organised Kiosks in Makkah, and all related requirements are done professionally by members of the Islamic bank. These procedures are fundamental in the reduction of solid and organic waste related to the slaughtering and are considered a major improvement in the greening of the pilgrimage approach in Makkah.

Promoting green awareness

Hajj is considered a life trip that allows learning to happen through its phases, starting from thinking about performing, planning, processing, and learning about the Hajj rituals. In this context, Muslim pilgrims share many common characteristics in that they travel away from their comfort zone for a specific purpose (i.e., seeking spiritual fulfilment). Hence, there is space for stakeholders to involve some learning about green Hajj and raise pilgrims' awareness about their visit footprint and motivate them to follow the green rules to face the

global environmental challenges. This would also allow them to reflect upon their learned skills. Generally, promoting green awareness among events is done by staff and volunteers during the event (Alliance of Religions and Conservation, 2014). A participant indicated that this can be a challenge in Hajj, since

One of the challenging barriers for managing the Hajj season is the lack of trained staff and volunteers (A6).

Staff and volunteers are considered as human capital that once trained; can potentially raise green awareness. Lia and Liu (2019) note that human capital can prevent the implementation of green practices in events. Their study, which investigates the barriers to green event management in Macao, highlighted that the shortage of human capital has long been identified as a critical barrier for the tourism industry in general and the development of the event industry in particular. Respondents in focus groups one and two emphasised that the lack of human capital was not only a barrier in implementing green practices but also a challenge in managing the whole event.

The MOHU used to utilise for volunteers and seasonal staff to help during the Hajj season. A participant noted,

Volunteers are invited to participate either in organising pilgrims' flows or to help in supporting special assistance and raising health awareness (M1).

Other participants indicated that

Volunteers and seasonal staff are considered a challenge for the MOHU as such staff is hard to train and lack the required experience (A2).

However, during the focus group discussion, it was revealed that no training programs are provided for these volunteers because

The Ministry of Hajj staff are assuming the selection process guarantees that the volunteers are already educated, skilled and qualified for helping during the Hajj season (S4)

Participants in focus group five indicated that only two years ago, the MOHU stopped dealing with temporary staff in jobs related to service evaluation and replaced them with permanent staff that receive the appropriate training for such purposes. Ninety-four experienced members of the team are responsible for evaluating and mentoring of the Hajj services provided by the international and internal pilgrim organisers daily. Evaluation is undertaken electronically through online forms for separate Hajj services (i.e., accommodation and transportation). There is also the Hajj management institute where different workshops and training courses take place for better management of the Hajj event. This is considered a potential opportunity for promoting green awareness.

Prior studies have emphasised the role of technologies such as exploratory data visualisation techniques to improve the services delivered in pilgrimage (Alharthi & Gutub, 2017). Technologies such as mobile applications are widely used during the Hajj season; however, mobile apps are mainly utilised for management and safety purposes by facilitating guidance and allocating Hajj places. A participant added,

Hajj platforms are currently used for management; however, there is space for modifying such platforms for spreading green awareness (S4).

'Be a supporter' is a recently developed application where volunteers can register to support pilgrims and help in providing services related to general guidance or medical services. Hence, volunteers can also be trained to promote green awareness among pilgrims.

This study has shown that various green pilgrimage practices are already being carried out by the Saudi government and MOHU. However, such practices can be taken to a higher level by adopting the suggested measures (see Framework of Action in Table 1).

The suggested framework of actions outlines the green pilgrimage related activities, and implementation responsibilities in three different periods (Before, during, and after Hajj). The implementation of the entire suite of actions would supplement and enhance the ability of the Saudi government and the MOHU to conserve the Holy Mosque and other sacred palaces in Makkah and generate benefits for the environment and the local community.

The implementation and financing of this green pilgrimage could be a complicated process that requires collaborations of all stakeholders, including pilgrims themselves. Environmentally friendly schemes need to be communicated to all parties, who would then realise the economic benefit for them of increased green practices (Mair & Jago, 2010; Alliance of Religions and Conservation, 2014).

Conclusion and Recommendations

This study seeks to achieve a better understanding of challenges and practical applications of green pilgrimage. More particularly, it investigates the challenges and opportunities of green pilgrimage within the context of Muslim Hajj in Makkah, Saudi Arabia, and suggests a framework of action for green pilgrimage that can help in realising its potential implementation opportunities.

The challenges and opportunities of applying green Hajj in Makkah have been classified into seven main groups; Initiative towards Green pilgrimage, Waste management, energy efficiency and transportation, Greening water resources, Greening food, Green rituals, and Human capital. While the study findings illustrate several steps taken by key stakeholders concerning the seven areas of green pilgrimage, without a holistic approach to the concept, many challenges are still standing in the way.

Examples of the critical areas that have been assessed for environmental impacts in previous Hajj seasons are waste management, recycling, managing Zamzam water, and other water resources, managing carrying capacity and, green transportation. The aim needs to be reducing negative impacts and increasing positive outcomes for achieving a more holistic green Hajj.

The study calls for an urgent plan to consider green pilgrimage as a concept for the next Hajj and to focus on

overcoming the challenges to green pilgrimage in Saudi Arabia. Emphasis should be made on the importance of environmental health and the excellent use of the natural environment to improve the sustainability of the place (Sola, 2014), particularly in Makkah, the main destination for the Muslim Hajj.

This study proposes a framework of actions that covers green Hajj objectives, activities, and potential implementation parties (before, during, and after Hajj). MOHU, central governments, local authorities, and other key stakeholders should adopt the proposed framework of action for making their sacred sites greener. Roles have to be assigned to each stakeholder involved in the management of Hajj, and evaluation criteria have to be precise. Besides, the MOHU needs to communicate and promote green Hajj education to all stakeholders involved, including pilgrims; hence everyone gets to know their role in help Saudi Arabia to lead the world when it comes to green Hajj. It is also essential for the MOHU to support more green initiatives and facilitate the dissemination of research outcomes and studies on green pilgrimage.

The findings of the current study are considered a benchmark for other religious gatherings or mass events. Due to the limited literature on green event practices in general and green pilgrimage in particular, the results of this paper have furnished a road map for green pilgrimage practices and thus have added to the body of knowledge in such a research area.

This study is considered a step towards a better understanding of how the Hajj event could be environmentally friendly. The study contributes to the current discussion of green event management literature and also provides a relevant and practical blueprint for practitioners. Furthermore, implications for academics, policymakers, and related stakeholders are discussed. Recommendations are provided for better application of green Hajj in Saudi Arabia and, particularly, the Holy City of Makkah.

Since green pilgrimage research is scarce, future research must explore the levels of recycling knowledge of pilgrims and their behaviour towards sorting and recycling - actions taken toward green practices. Further

research should also explore the infrastructure in Makkah and other religious sites / destinations. The allocation of specific responsibilities for each key stakeholder involved in Hajj, as suggested by this study, and finding ways for monitoring their accomplishments concerning the assigned green pilgrimage tasks is another fruitful area of research. Such a flow of research would enhance our understanding of the practical implementation of green pilgrimage and facilitate the connections between theory and practice.

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