

The Effect of Building Regulations in Non-Islamic Contexts on the Mosque Architecture

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ABSTRACT

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The increase of Muslim communities in Western countries has led to an increase in Islamic places of worship. Most Western countries currently lack clear planning policies and building regulations pertaining to Islamic places of worship. Therefore, the problem of this paper is to study the impact of the various planning determinants on mosque architecture in the Western context. The research follows a descriptive-analytical approach by examining the building regulations concerned with regulating the construction of houses of worship in various Western contexts. The research contributed to presenting a set of planning and structural determinants that affect the location and design of Islamic places of worship in the Western context, including determinants related to the site, social, economic, political, and finally environmental. The extracted indicators can be adopted by those interested in drafting laws establishing Islamic places of worship. The research chose a group of samples from mosques and Islamic centers in different countries and tested the validity of these indicators on the samples. The research concluded the importance and necessity of dealing with the urban context of the site and maintaining harmony with the urban environment. Mosques and other places of worship also play an important role in developing the urban character of cities and achieving diversity.

1. INTRODUCTION

Islam occupies a greater position every year in the spaces of Western cities, which made many studies study the social, political, and environmental dimensions of Islamic places of worship in Europe and America [1].

Each society has its own geographical and regional conditions, history, and beliefs that it reflects in the urban space. With each wave of migration of Muslims and others is adding layers of cultural and religious diversity to the fabric of the city. The presence of Muslims corresponds to the need for religious buildings to establish Islamic prayer and to teach the Holy Qur'an, so the urban mosque or religious center is a community building that depicts distinct urban forms of relationships and boundaries [2]. These mosques have come to represent the aspiration of Muslim communities to interact in public and private places in urban areas. Therefore, one of the frequently brought up subjects in public conversations concerning the status of Muslim communities in Western European nations is the construction of mosques. The framework for urban renewal made it possible for housing for Islamic religious and cultural practices to significantly improve. Urban planning discourse has paid less attention to topics like visibility and presence, which are currently the focus of contentious discussions regarding Muslim populations in many cultures [3]. But for the purposes of recognizing Islamic institutions, every western nation has some standards, laws, safety rules, and development goals [4]. Therefore, several policies are adopted in the West, including:

1.1 Western law in dealing with Islamic places of worship (Mosques)

Islamic places of worship are similar to Christian churches and Jewish or Hindu temples as sacred places of worship, and therefore legally equal in treatment with other religions [3]. Laws differ from one country to another. In Belgium, for example, there is no representative body for mosques recognized at the national level, although Islam is a recognized religion. Also, Britain does not support mosques and Islamic schools. As for the Netherlands, it is concerned with Islamic places of worship, and religious pluralism is recognized in the legislation [4].

1.2 Determinants of planning Islamic places of worship

Planning laws in most western cities operate based on not changing the type of use based on the city's master plan. Two mechanisms are usually adopted when initiating the establishment of Islamic places of worship in Western societies, the first: is building without legal permission by adapting old or abandoned religious buildings, such as some churches, into mosques or Islamic centers. The second: building by obtaining legal approvals by constructing the mosque on land designated for religious use in the master plan [5]. There is a third mechanism that is adopted in the event of converting a building using a different (residential/industrial), into a mosque or an Islamic center, and this requires approval for the change of use. For example, in Britain, building controls are obligatory by the Town and County Planning Act

from 1947 to 1990, to obtain legal approvals for any use or change in existing buildings or the construction of a new building [6].

Gale and Thomas point out in Chapter 5 of "Cities and The Politics of Difference", that many houses of worship prefer to be built in shops, traditional structures, and abandoned industrial or commercial buildings where internal divisions allow for a large space for prayer [7]. Islamic places of worship did not appear within the urban context of Western cities except in the form of small prayer halls or the modification of existing buildings, and they were built on the outskirts of cities or cities that were developed after the industrial revolution. For some reason, Islamic rulings related to the direction of the qiblah made mosques their own identity. Also, the styles of Western cities require building codes that differ from the traditional Islamic architecture [8].

2. LAND USE FOR RELIGIOUS PURPOSES

Land uses for religious purposes take many forms, starting with mosques that are established on lands with industrial, commercial, or residential use, whether purchased or rented, then churches or other buildings that have been renovated to serve the religious function, as well as prayer rooms in universities, hospitals, and airports [9]. This is in addition to the neighborhoods that grow around places of worship, which is another form of religious development [10]. Islamic places of worship in and around urban areas and outside includes the following types:

2.1 External roads mosques

It was built on the external roads to avoid noise problems and provide parking, in addition to the problem of ethnic discrimination, such as describing the neighborhood as Turkish, Maghreb, etc., according to the community that resides in the neighborhood, so religious buildings were excluded from the inner urban environment and commercial markets and are often linked to public transport networks, such as the Masjid Al-Uqbah Mosque in Ohio in the United States of America [11]; see Figure 1.



Figure 1. The location of the Masjid Al-Uqbah in the United States of America
Source: [11, 12]

2.2 Mosques of the inner neighborhoods

They are located in residential or industrial neighborhoods and are of several types:

2.2.1 Mosques built for a religious purpose

It has an important role in shaping the urban body of the city,

including the East London Mosque (Whitechapel Avenue), and it represents a typical edifice and landmark that integrates into the urban landscape of the city, and the call to prayer is heard in the neighboring streets as part of the city's sound [13], see Figure 2. The Bilal mosque in the inner city of Harehills in London is one of the mosques in the city center and has an Islamic architectural style that differs from the surrounding area [14], see Figure 3.



Figure 2. East London Mosque (Whitechapel Avenue)
Source: [15]

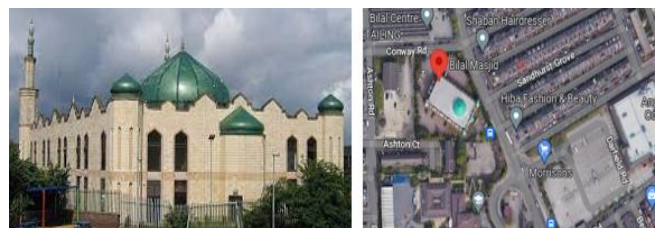


Figure 3. The Bilal Mosque in the city of Harehills, London
Source: [12, 14]

US planning regulations differ from European ones about the form and function of a mosque. Information about the site in the ethnically Muslim Northeastern Ohio region reveals the impact of planning laws on the structures and functions of any mosque, including parking, green spaces, surrounding land use, and zoning codes current. When sufficient spaces are available, they will give a variety of possibilities for the shape, structure, and functional spaces attached (taking into account the law of height and the possibility of adding Islamic elements and other determinants of shape and space) [11].

2.2.2 Functionally adapted mosques converted from a religious use to another religious use

It is intended to use the buildings belonging to different religions to perform the function of the mosque [16]. Adapting religious buildings means reproducing culture in the place. This process occurs as a result of the overcrowding of urban spaces, the lack of land allocated for places of worship for immigrants, the large number of vacant old buildings, the abandonment of some churches, and the lack of funding, which imposes these functional transformations in the building [17]. An example is the Presbyterian Church at St. Andrew's on Ealing Road, London, which has been adapted to fit into a mosque with adjacent ablution facilities and a nursing center [18], see Figure 4.



Figure 4. The converted Presbyterian Church in St. Andrew in London to Bait Al-Ahad Mosque
Source: [18]

2.2.3 Functionally adapted mosques from residential or public use to religious use

These are homes or apartments converted into religious buildings (mosques) and have undergone various degrees of internal and sometimes external adaptations. Abandoned buildings are often transformed for functional uses without legal conditions or restrictions. At the University of Southern California, a concrete building was converted into a mosque by installing a dome and a minaret [19]. The extent of construction work varies in transforming buildings; some of them are minor modifications to enable the building to function as a mosque, such as internal alterations, such as adding signage, a minbar, Quranic verses, floor mats, etc., while others may include expanding the building, increasing the area of the main prayer hall, cladding, and adding religious symbols to the building. The extent to which it is difficult to distinguish the original building [14] Like the Wimbledon mosque in London, its facade has been completely remodeled [20], see Figure 5.



Figure 5. Wimbledon Mosque, London
Source: [20]

The converted mosques are located in the suburbs within mixed-use neighborhoods and shops and are surrounded by areas designated for mixed use of light and heavy industries, intensive institutional and commercial functions, single-family housing and multi-family housing, and few parking spaces with no green spaces and landscaping. Congregants for Friday prayers use the streets around this mosque to park their cars [11].

3. METHODOLOGY

The research adopts a descriptive and analytical approach to the information presented by the literature about Islamic

places of worship, to give a guideline about the most important Building Regulations in non-Islamic (Western) contexts on mosque architecture. The goal of the research will be achieved by extracting the most important vocabulary adopted by Western countries as controls for the establishment of mosques by presenting a theoretical framework that includes the following steps:

- (1) Collecting information related to the planning controls for Islamic places of worship in Western countries from books, references, and various studies.
- (2) Extracting indicators that can be adopted in Western countries as planning controls for the establishment of Islamic places of worship.
- (3) The practical study included a research sample of four mosques designed with clear symbolism and in multi-use areas. The research sample will be subject to a comparative analysis with the indicators extracted from the theoretical framework for the controls of planning Islamic religious buildings, to find out the most important effective indicators in designing mosques and choosing their location in Western countries.
- (4) Discussing the results, analyzing the research samples according to the indicators, and presenting the conclusions for the study.

4. CLASSIFICATION OF PLANNING DETERMINANTS OF ISLAMIC PLACES OF WORSHIP

The site selection process is affected by the determinants of the city's master plan, and the conditions for financing the project, as the distinctive location, requires a high financial cost, as in the location of the Islamic Center in Washington, DC [19]. And to identify the planning determinants in western cities for the establishment of Islamic places of worship, see Figure 6.

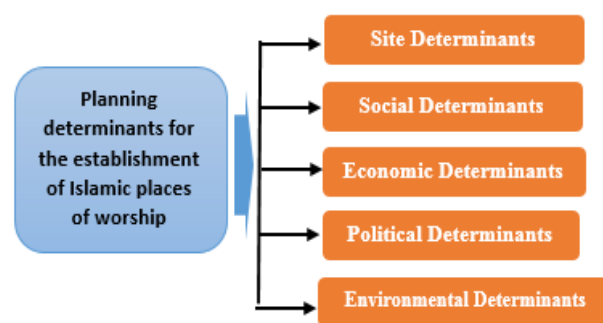


Figure 6. Classification of planning determinants of Islamic places of worship
Source: [21, 22]

4.1 Site Determinants

4.1.1 Suitable land requirements

The planning regulations for the land on which it is proposed to build are different and impose different restrictions related to the building area, the area of the sides that are left as a buffer distance between the mosque and the neighboring buildings, the size and height of the building, and restrictions on the use of religious symbols [21, 22]. The determinants related to the location in Britain and Canada will be clarified as follows, see Table 1.

Table 1. Planning determinants for the establishment of Islamic places of worship in Britain and Canada [11, 21, 22]

Some determinants of Islamic places of worship in Britain& Canada
Significant limitations and legal approvals in Britain about changing the uses of buildings or constructing them and purchasing land for religious purposes. However, Islamic places of worship can be established in Britain and Canada in areas with medium and high activity of light industries or mixed-use, or along arterial roads after obtaining legal approvals.
Local councils set restrictions related to leaving distances around the religious building. For example, in Canada, some municipalities imposed a place for places of worship, either with the area of the residential plot designated for the single-family house, or for two-family houses with an area of 460-840 square meters.
The majority of the obstacles revolve around the size of the building and its associated functions, restricting the height of the minaret, and preventing the call to prayer in particular.
Determinants about building freedom of religious symbols in most British cities, Gale shows that Muslim groups have had a role in local institutional change as well as environmental and material changes. In Canada, there is the freedom to choose and manipulate the facades in the case of adaptive religious buildings, with greater freedom than in other Western countries in dealing with the symbols of religious buildings such as the dome and the minaret in mosques.

4.1.2 The direction of the Qiblah in the new and adapted religious buildings

The prayer hall must follow the direction of the qiblah towards Mecca, which affects the mass of the mosque building in the urban context, and this in turn affects the neighboring residential and commercial buildings [2]. When the qiblah axis coincides with the urban street axis, the building appears in harmony with the street, but if the qiblah axis intersects with the street axis, then either the direction of the prayer hall is placed tilted in the urban context as in the Fadl Mosque in London [14], or the block is carved according to the intersection square with equal lines Exterior with street axis as in Islamic Cultural complex in Tirana. Albania [23], see Figures 7 and 8.



Figure 7. The Fazl Mosque London
Source: [14]



Figure 8. Islamic cultural complex in Albania
Source: [23]

But if an existing building is used and re-adapted as a mosque, then the interior space is treated and directed towards the qiblah, as in the Green Lane Mosque in Birmingham [2], see Figure 9.



Figure 9. Green Lane Mosque in Birmingham
Source: [20]

4.1.3 Traffic volume and parking requirements

Car parking represents one of the important controls from the planning aspect for choosing Islamic places of worship, as it is necessary to provide sufficient parking spaces to accommodate the cars of worshipers during the prayer period, which does not exceed 10 minutes, except for Friday prayers, which extends up to 30 minutes. It also requires taking into account the availability of an adequate road network, public transport services, and metro lines, if any [2]. The Rockdale City Council plan offered some detail on mosque development, with the parking law requiring that it grant "one space for every 10 seats in the case of churches or one space for every 10 square meters of net hall area in the case of mosques". The Development Control Plan (DCP) 20 for public places of worship parking within the local government area of Canterbury provides for one parking space for every 5 people (accommodation capacity) for the first 100, and then one for every 3 people thereafter. Bicycles have at least one space for every 20 visitors [24]. This means that so far there are three aspects in determining the size of car parks for mosques, the first: it depends on the size of the prayer hall, the second: it relates to the number of worshipers, and the third: is different spaces for car parks in the case of mosques that are in open sites or on main roads.

4.2 Social determinants

Mosques have an important role in organizing the social and cultural life of Muslims in Western countries, and they also affect the social life of non-Muslims, through the participation of public places by culturally different groups [25], the social determinants are:

4.2.1 Neighborhood resistance

The objection is about the presence of Islamic places of worship in the neighborhood or its vicinity, so planners in many Western countries have resorted to supporting the construction of religious buildings on vacant lands that fall within industrial or agricultural use [26]. While some politicians and planners in countries such as France, Holland, and Germany tried to adopt the establishment of Islamic centers and institutions that would be open to non-Muslims in residential neighborhoods [27].

4.2.2 Residents' objections

Residents of the residential neighborhood often object to the presence of Islamic religious buildings in their residential

neighborhood as a result of the difference in religion and the sounds that accompany Muslim prayers when announcing the prayer, in addition to the increasing number of cars in their residential neighborhood and the change in the urban character of the region [28]. Many Islamic institutions have resorted to changing this perception of Muslims, so mosques have tried to make their facades glass to enable non-Muslims to see the daily prayers. Some mosques have also added spaces for dialogue and social encounter between different religions to reduce social extremism. Many Islamic organizations are trying to allow non-Muslims to visit mosques to see them and learn about Islam, which happened at the Penzberg Islamic mosque in Germany [29].

4.3 Economic determinants

Financial financing is a decisive factor in deciding on establishing a mosque or an Islamic center, and it has two aspects:

4.3.1 Financing the construction of a mosque or religious institution

According to Western law, governments have no responsibility to finance the construction of churches or any religious building. However, in the early eighties of the twentieth century, and after the increase in Muslim societies, houses of worship became a central role in the efforts of immigrants to provide places for the practice of religious rites, which required officials in the urban renewal departments to reconsider the need to develop a special policy for the establishment of mosques, and this is what happened in the Netherlands. Between the years 1988-1991, a memorandum entitled (Faith in the Future) was submitted to allocate funds for the transfer or renewal of places of worship [30]. The money to build mosques often comes from fundraising activities from worshipers and other local or foreign entities [11]. Mosques and large Islamic centers are usually funded with the support of the Muslim World League and under Saudi supervision and control. The ambassadors of Islamic countries are represented on the board of directors of these religious buildings, and control is always in the hands of the funder. As for prayer rooms, they are bought by the associations that run mosques, and by donations from Muslims and Muslims from Western countries [31]. Exemption from property tax for places of worship is a consideration in the local council's assessment of the financial implications for development [22]. The Omar Mosque in Catania (Sicily) in 1980 was financed by Libya, while the Milan Mosque in 1988 was built by an Italian who converted to Islam and was able to collect funds from the Muslim Student Union [32].

4.3.2 Building maintenance financing

Islamic houses of worship, including mosques, often face financial financing problems to maintain building occupancy. Therefore, mosques in Northern Europe and America are considered part of a system of institutions managed as non-profit organizations by effective financial management. The level of advanced facilities affiliated with the Islamic Center is the financial and service resource for the Center itself. Embedded in support of mosque functions is a sustainable facilities management FM approach, a science that integrates people, place, processes, and technology in support of an organization's primary goals at optimum cost [33], see Figure 10.

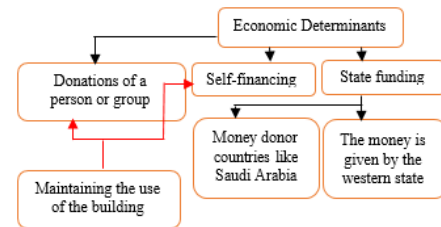


Figure 10. Methods of financial financing for mosques in Western countries
Source: [11, 30-33]

4.4 Political determinants

The ruling authority plays an important role in maintaining the facilities and architecture. The laws of countries in the European Union differ from each other and with the laws of other Western countries. Some countries give flexibility by law that allows freedom of religious and cultural belief in expressing the religious building, while many countries contradict and restrict this and impose strict limits on the form of mosques and religious centers and freedoms of expression in public squares [31].

The relationship between the built environment and politics is a complex one, as the establishment of mosques in the Western context is linked to the strengthening of political relations. The book "New Islamist Architecture and Urbanism" is based on two main hypotheses. The first is the perception of the built environment as constituting society and therefore sets out to reveal the spatial industry of politics. The second is the specificity of urban areas, which requires a spatial analysis of the interaction between place and society, which reveals conflicts, shapes, and spatial scales [34].

Any form of construction proposed in an area where it had not previously existed - constituted a form of symbolic ownership of the land [35]. Therefore, Muslim communities gained opportunities in urban renewal projects in Western countries. Western countries abandoned support for the construction of religious buildings and left the construction of mosques to take place within the framework of urban renewal policies, which gave a greater opportunity to improve Islamic places of worship [3]. The urban space industry is one of the most important urban renewal policies to create vibrant residential neighborhoods and employ diversity to enrich the urban landscape. Economic development is also achieved by diversifying the city's denominations to encourage tourism and investment [36]. Therefore, the urban renewal policies for religious buildings are:

4.4.1 Restoration and transformation of the old building

It is the change of use of the building and the restoration of the old building with a different use. This policy was used in various countries, including the Netherlands, where fifty buildings, including six mosques, were restored. The Al-Fateh Mosque in Amsterdam in the Netherlands was erected in place of the deteriorating catholic church De Zaaier (The Sower) dating back to the period of 1929 when it was bought by the local Turkish Muslim community. Several modifications were made, first, the qiblah direction was towards the entrance, so a wall was built in front of the entrance, and changing its location to another invisible direction so that the entry of the worshipers does not conflict with the prayer. The old entrance has been adapted to a cluster of shops [37], see Figure 11.



Figure 11. Al-Fateh Mosque, Netherlands
Source: [37]



Figure 12. Sehlik Mosque Columbiadamm Street in Germany
Source: [13]

4.4.2 City landscape development

The Dutch Urban Renewal Act set the enhancement of the built environment and social cohesion as an objective and included the incorporation of mosques in its plans. The region has chosen “a practical approach inside an urban arranging viewpoint, identifying issues related to mosques in terms of safety, security, diminishing annoyance to the environment, building up satisfactory parking spaces and developing a comprehensive set of mosque locales in numerous regions of the city” [3]. The sehlik mosque in Germany next to Tempelhof Airport, close to the Berlin Wall, is a landscape of the city [13], see Figure 12.

4.4.3 Urban character change

The urban renewal of Rotterdam in the late 1980s was driven by the desire to improve the living conditions of the residents, improve the areas involved, and get rid of the poor image of the city. Many slums were demolished, and Muslims built religious infrastructure in areas where urban renewal was planned. There has been a rapid increase in Muslim housing among Muslim immigrants and a growing demand for religious housing has emerged. The change in the urban character of the city of Notre-Dame in some of its predominantly Muslim neighborhoods represents an image of the immigrant identity in their new communities [38].

4.5 Environmental determinants

The built environment plays a fundamental role as a factor in climate change, so when the building must deal with the exploitation of natural resources, energy consumption, and waste management in a more environmentally friendly manner. A mosque is a religious building built everywhere on earth because a quarter of the world's population is Muslim. This situation has led to the need to make mosques more sustainable and environmentally friendly [39]. The impact of environmental determinants on Islamic places of worship, including mosques, can be studied as follows:

4.5.1 Building design in accordance with the laws of sustainability

The idea of sustainability and green buildings appeared in

Islamic religious architecture through the adoption of modern innovative strategies that deal with the environment, and the aspects it focuses on range from (environmental consideration, economic consideration, and social consideration). The Cyber Jaya Mosque represents an environmental consideration as it embodies the principles of green design. While the Floating Mosque represents a revolutionary and economic solution to provide sustainable energy through the circulation of seawater within the floor, ceiling, and walls. As for the Green Mosque, it represents both social and environmental considerations, as it is a multifunctional social center that is not only for prayer but also contributes to social support by providing food to the needy by employing agricultural land Nearby [40]. It required many modern mosque designs to respond to the design principles of energy conservation, sustainable design, and low-cost facility maintenance [2].

The study "Mosque design strategy for energy and water saving" presented ways to implement passive design strategies by comparing the basic operational or architectural characteristics of mosques with sustainable building codes. The strategies identified as follows (1) building layouts and their adoption of the dual direction of one direction of the qiblah and the other with the context of the street, (2) Lighting strategy to reduce consumption and use of energy-saving lamps, (3) HVAC strategy, (4) Water conservation strategy, (5) IT strategy [39].

The proposal of Budaiwi and Abdou to divide the prayer hall shows that there are three spaces in the prayer hall, No. (1) located in front of the entrance dedicated to the beginning of the standing of worshipers in the Friday prayer. And number (3) is dedicated to the daily standing row of worshipers. I suppose that the air conditioning and heating are focused on the area (3), as it is far from the openings, followed by area number (2) and then (1). In addition to the use of insulators, the conditioning effort reduces by 13-46% [41], see Figure 13.

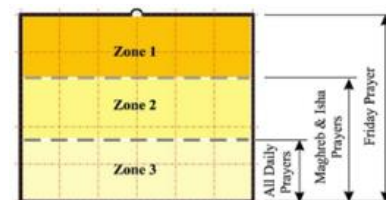


Figure 13. HVAC strategy related to mosque schedules
Source: [41]

4.5.2 Thermal comfort in the design of the building envelope for Islamic places of worship

The spaces of Islamic places of worship are protected from cruel climatic factors through the correct design of the building envelope to realize the right warm performance [42]. The most important problem of poor thermal performance of prayer halls is the large size and capacity of the hall, which requires air conditioning and heating systems with a larger capacity and longer operating times. The poor thermal performance of the casing and inappropriate operating strategies lead to an increase in energy demand, which contradicts the goals of sustainable buildings [41].

The heat load from humans or equipment in mosques is negligible compared to the size of the mosque or the Islamic center and the requirements for thermal comfort associated with the jobs associated with the mosque. The most important factors that must be taken into account are the geographical location, the type of climate, insolation, the overall climate,

and the local climate. The thermal performance of the mosque also depends on the overall performance of the building as the parts of the envelope such as walls, ceilings, windows, and openings work together as a system as a result of the synergy between the elements [42]. One of the studies found that the public works of the mosques constituted 7% of the heat load of the mosques, while the rest of the covering transactions contributed 90% of the total heat load of the mosque [43].

4.5.3 Building materials

For the most part, local building materials are utilized in Islamic places of worship. Usually, mosques are modified and adapted from one religious function to another, taking the same local building material as the area in which the building was found. For example, many of America's modified mosques are the oldest structures of all types of mosques and take the same building material of wood, concrete, or bricks as the buildings of the beginning of the twentieth century. As for the newly built mosques after the eighties, they take modern

materials of concrete and glass, or they take the same traditional material of the country of origin, such as bricks [11].

Technology was used to enhance the interaction of mosques with Western contexts and for coexistence between cultures, thus enhancing the understanding of Islam as an open culture that accepts and deals with others. The term Islamic centers was used more than mosques because they interact in their form, plan and details of the outer shell with the western urban context. The unfamiliar ideas of mosques that used the technological factor as an influential factor in the idea, subjected the idea to the interaction of four factors: culture, the designer's aspirations, technology, and climate [40].

5. EXTRACTING INDICATORS OF PLANNING ISLAMIC PLACES OF WORSHIP

Through the literature that touched on the issue of Islamic places of worship and mosques in the West, the most prominent indicators were extracted, see Table 2:

Table 2. Table illustrating indicators for planning Islamic places of worship in the Western context

Main Variable	Secondary Variable	Indicators of Building Regulations
Site Determinants	Providing suitable land	Construction of mosques on external roads Mosques built for a religious purpose Functionally adapted mosques converted from a religious use to another religious use Functionally adapted mosques from residential or public use to religious use The religious building is in harmony with the context of the area and the street The religious building differs from the urban context as a result of the deviation of the building line towards the qiblah
	The direction of the in the new and adapted religious buildings	Sculpt the block of the religious building according to the square of the intersection between the qiblah direction line and the street direction line Treatment of interior space in adaptive buildings by directing the interior space to the qiblah direction
	Traffic volume and parking requirements	Providing parking for the religious building Use the surrounding streets for parking Use of nearby car parks Use of public transport services and metro lines
Social Determinants	Neighborhood resistance	Construction of mosques within lands of industrial or agricultural use Establishing Islamic centers and institutions that are open to non-Muslims Objection to a fundamental change in the use of buildings
Economic Determinants	Financing the construction of a mosque or religious institution	Funding by parties belonging to the Islamic world Self-financing
	Building maintenance financing	Funding from the western government Institutions system in construction facilities management Self-financing
Political Determinants of Power	Strict restrictions on the appearance of mosques, religious centers, and freedom of expression in public squares	Freedom of religious belief and its architectural representations Restoration and transformation of the old building City landscape Ddevelopment Urban Character change
	The Potential of Urban Renewal	
Environmental Determinants	Designing religious buildings according to the laws of sustainability	Dual direction between the qiblah and the street The lighting strategy by minimizing consumption and using energy-saving lamps HVAC strategy Water conservation strategy IT strategy Geographical location Climate type Insolation Overall climate Local climate
	Thermal comfort in building envelope design for religious buildings	
	Building materials used in religious construction	Using the same materials as the previous building (Adaptive Mosques) Use of modern materials (Designer Mosque) Using sustainable materials with the environment (Modern Mosques)

6. DETERMINING PRACTICAL STUDY SAMPLES

Four research samples of mosques in different countries were selected, all in mixed-use neighborhoods, to apply indicators to them. Unifying the standard for the presence of mosques in neighborhoods will give results that benefit residential neighborhoods with binding limitations more than mosques on external roads or converted buildings for which preconditions cannot be set.

Case 1: Penzberg Islamic Forum / Germany-2005

The mosque is located in Germany, in a village near the Alps, in a mixed-use area near which there is a shop with apartment buildings. The building is designed to be a mosque with a distinct identity from the urban surroundings, with a modern-style minaret that deals with Arabic calligraphy, and the facade of the mosque is transparent, using 60% of glass to achieve communication with the outside. The direction of the qiblah is to the southeast on the shorter side that is transparent in the outer shell, and the mosque deviates slightly from the urban context. There is a dedicated parking lot for the mosque. The mosque faced objections from the villagers for being in a residential area, but the mosque's contemporary architecture attempted to promote integration with the community. The cost was 3,209,500 USD. The mosque is used to develop the landscape and the ancient character of the village. The design deals with the introduction of a large amount of daylight, from the side between the concrete panels, into the prayer hall through the blue glass, and in the staircase area. The roof contains solar panels. It also contains external screens to indicate the time of the call to prayer [44], see Figure 14.



Figure 14. Map showing the location of the Penzberg Mosque, Germany
Source: [44, 45]

Case 2: Madina Masjid and Sheffield Islamic Centre/ Sheffield, South Yorkshire, England, (known as the Woolley Road Mosque) -2006

It was built to reduce the number of small religious buildings used by Muslims to pray throughout Sheffield. The new building is in a mixed-use area, surrounded by housing and public buildings. The Mosque Development Committee produced a detailed report detailing the condition of the mosque, including demographic data, future population projections (for the growing number of young Muslims in the area), and monitoring data detailing the number of individuals using the existing mosque at certain times. Funds for the new building were raised through donations from within the local community (raising nearly £500,000) out of the total estimated development costs (£3.5 million). The mosque did not receive any government support. There have been some donations from local non-Muslims, churches, and religious groups. There was significant political influence and support for the proposed mosque. There are more technical objections to the development of mosques in general than to other developments. Its aim is not only to provide a religious

building as an alternative to small houses of worship but also to encourage expression and architectural symbolism in minority places of worship in public areas and squares [46], see Figure 15.



Figure 15. Map showing the location of the Madina Masjid, England
Source: [45, 46]

Case 3: Outaouais Islamic Center/Canada-Gatineau, Quebec, (known as the Gatineau Mosque)- 2008

The building is located in Canada in a mixed-use area, surrounded by housing and public buildings. It consists of several two-story blocks of different shapes and proportions connected by a high, geometric portico with an arched entrance topped by an open square minaret. The building is designed to be a mosque with a distinct identity from the urban surroundings.

The construction uses red bricks and window frames made of yellow bricks. The prayer hall reflects the relationship between the brickwork colors because it is high and at an inclined angle towards Mecca. The direction of the qiblah is to the northeast, where the prayer hall faces towards Mecca, while the rest of the building is in harmony with the urban context. There is a dedicated parking lot for the mosque. The mosque has faced local objections, but Canada's religious freedom policy is good at dealing with religions. It is used to develop the landscape of the city. It does not use modern technologies for conditioning and power generation [47], see Figure 16.



Figure 16. Map showing the location of the Outaouais Islamic Center, Canada
Source: [45, 47]

Case 4: Cambridge Central Mosque / Cambridge City, England-2019

Located on the busy Mill Road in a predominantly residential area, its design is inspired by British Islamic and religious architectural traditions. It was designed to be a cultural bridge between East and West, and one of the most important principles of this design is to spread the culture of sustainable construction, which should be a feature that distinguishes the current era. It has an underground garage that can accommodate 80 cars, and there is special parking for bicycles to facilitate environmentally friendly access to the mosque. Total cost: £23 million (raised from donations made by Dr. Timothy Winter, a convert to Islam over 40 years ago) [48]. Sustainability is achieved through various technologies,

including:

- (1) The use of wood in the design structure is an idea and a structural material, which is a sustainable material.
- (2) Use of local bricks.
- (3) The openings are designed to obtain natural daylight without the need for artificial lighting in the daytime, and they are designed as channels for ventilation of the building hidden in the interior design.
- (4) Electricity for lighting, cooling, and heating of the building is provided by generating electricity using the photovoltaic cells located on the roof of the mosque.
- (5) Energy is generated through high-efficiency heat pumps in the basement, where these pumps extract heat energy from groundwater, and this energy is used to cool or heat the mosque and its contents.
- (6) Gray water and rainwater are collected and reused for flushing toilets and irrigating the garden.
- (7) Interest in planting facades and ceilings as an

aesthetic element and heat treatment [48], see Figure 17.



Figure 17. Cambridge Central Mosque, England

Source: [48]

7. THE RESULTS OF APPLYING THE INFORMATION OF THE RESEARCH SAMPLES IN THE INDICATORS TABLE

The information from the research samples will be applied to the table of extracted indicators, see Table 3:

Table 3. A table showing the results of applying the information of research samples in the indicators table

Main Variable	Indicators of Building Regulations	Case 1	Case 2	Case 3	Case 4
Site Determinants	Construction of mosques on external roads				
	Mosques built for a religious purpose	•	•	•	•
	Functionally adapted mosques converted from a religious use to another religious use				
	Functionally adapted mosques from residential or public use to religious use				
	The religious building is in harmony with the context of the area and the street		•		•
	The religious building differs from the urban context as a result of the deviation of the building line towards the qiblah	•			
	Sculpt the block of the religious building according to the square of the intersection between the qiblah direction line and the street direction line			•	•
	Treatment of interior space in adaptive buildings by directing the interior space to the qiblah direction				
	Providing parking for the religious building	•	•	•	•
	Use the surrounding streets for parking				
Social Determinants	Use of nearby car parks				
	Use of public transport services and metro lines				
	Construction of mosques within industrial or agricultural use	•			
	Establishing Islamic centers and institutions that are open to non-Muslims	•	•	•	•
Economic Determinants	Objection to a fundamental change in the use of buildings				
	Funding by parties belonging to the Islamic world	•			
	Self-financing	•	•	•	•
	Funding from the western government				•
Political Determinants of Power	Institutions system in construction facilities management				
	Freedom of religious belief and its architectural representations	•	•	•	•
	Strict restrictions on the appearance of mosques, religious centers, and freedom of expression in public squares				
	Restoration and transformation of the old building				
	City landscape development	•		•	
	Urban character change		•		•
Environmental Determinants	Dual direction between the qiblah and the street	•	•	•	
	The lighting strategy by minimizing consumption and using energy-saving lamps	•			•
	HVAC strategy				•
	Water conservation strategy				•
	IT strategy				
	Geographical location	•	•	•	
	Climate type		•		•
	Insolation	•	•		•
	Overall climate	•	•	•	•
	Local climate	•	•	•	•
	Using the same materials as the previous building (Adaptive Mosques)				
	Use of modern materials (Designer Mosque)	•	•	•	•
	Using sustainable materials with the environment (Modern Mosques)				•

8. RESULTS AND DISCUSSION

After presenting and analyzing the literature that focused on the issue of mosque planning in the Western context and extracting five paragraphs related to planning controls for Islamic places of worship (location-related determinants, social determinants, economic determinants, political determinants, and finally environmental determinants), secondary paragraphs were extracted for each determinant, which can be adopted by those interested in establishing laws for the establishment of places of Islamic worship in the Western context. The proposed table needs to complete the

secondary paragraphs and a study of the case of sustainable mosques to apply the paragraphs on the environmental aspect to them. Various research samples were selected and examined in the table to determine how to solve the problems and obstacles faced by mosques in the five presented paragraphs. It was noted that each paragraph presented by the research must have its own table, as adapted mosques need indicators and determinants that differ from those that have large areas, such as mosques on external roads and those in residential neighborhoods. The social objections are great in the case of mosques in residential or mixed-use neighborhoods, see Table 4.

Table 4. Discuss the results of the research samples

Main Variable	Indicators of Building Regulations
Site Determinants	<p>All the research samples were selected for mosques designed to facilitate the neutralization of the condition of air conditioning and the restoration of buildings or mosques on external roads to obtain more accurate results. All research samples had their car parks, and they also deal with different shapes with the direction of the qiblah, either direct with the street or the prayer hall block deviates from the original block of the mosque that is with the street, or it is carved with the road in a form that does not contradict the context of the site.</p> <p>The Madina Masjid Mosque and the Cambridge Central Mosque are considered large blocks within the urban site, it may seem that they do not fit into the context of the residential neighborhood, but modern urban proposals encourage making the neighborhoods mixed-use and enable filling urban voids with blocks that give visual harmony.</p>
Social Determinants	<p>In most of the samples, there were objections to the presence of mosques in the western residential neighborhoods. It was noted that the modern designed mosques such as (Penzberg Islamic Mosque) and (Cambridge Central Mosque) found greater social acceptance among Western society than those designed with clear Islamic symbolism. For example, the Cambridge Central Mosque in the residential neighborhood of an urban development area did not meet any objections as a result of its sustainable design, which ensures interaction with the environment. The glass facades in both the Penzberg Islamic Forum and the Cambridge Central Mosque made it possible to view the Muslim prayer from the western street and created a clear dialogue language and visual architectural continuity with the context of the site. Spaces for non-Muslims were included in the Islamic centers, but technical objections appeared that supported the modern and advanced design more than the rest of the protests in Sample No. (2).</p>
Economic Determinants	<p>All samples are based on fundraising from financial donations made by Muslims and non-Muslims. And it lacks supporting jobs to provide funds to sustain the work of the building.</p>
Political Determinants of Power	<p>All samples have freedom of formal and symbolic expression, and most countries have come to believe in freedom of expression in public areas. Governments have also taken advantage of religious pluralism to develop public areas.</p>
Environmental Determinants	<p>Most mosques do not use the principles of sustainability that have been proposed, due to the high costs that they require and the careful studies that they require. However, in the case of the fourth sample, sustainability and natural energies were used in the operation of the building. This confirms the inclusion of religious buildings in the principles of global sustainability through the rationalization of energy consumption and self-sufficiency.</p>

9. CONCLUSIONS

The study concluded the following:

- (1) The emergence of technical and formal objections is more than an objection to the site of the mosque.
- (2) Mosques and other places of worship play an important role in developing the urban character of cities and achieving diversity.
- (3) There is a relationship between the location of the mosque and the number of social objections. Locations far from neighborhoods reduce the problems of social objections, unlike those in residential neighborhoods.
- (4) There is a relationship between financial funding and the location of the mosque; those in the residential neighborhoods get financial support from donations, unlike those in the outer neighborhoods that may get support from other sources.
- (5) There is a relationship between the shape of the mosque and the development of the city's landscape. The

mosques with clear symbolism lead to a clear expression of the plurality of religions in the place. As for mosques that use modern technologies or contemporary forms, they give a contemporary form and space to the mosques' architecture.

Sustainable mosques lead to good dealings with the surroundings and reduce formal and locational objections resulting from the presence of mosques between residential neighborhoods, in addition to providing healthy conditions for the internal space, depending on their location in terms of providing and generating energy.

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