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Integrating *Al-Syāfi'I* Thought and Geospatial Instruments: *Google Earth* as Qibla Calibration Tools in Aceh

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ABSTRACT

In Aceh Province, where the Syāfi'I school of jurisprudence predominates, the principle of jihāt al-Kaaba has traditionally guided Muslim communities in determining the qibla. This study explores the intersection between classical jurisprudential perspectives and contemporary geospatial approaches, focusing on the extent to which mosques across Aceh are aligned with the Kaaba. Empirical data were collected through the measurement of mosque orientations and their comparison with the astronomically determined direction of the qibla. The findings reveal a measurable divergence between traditional mosque alignments and precise geospatial calculations. On average, the surveyed mosques are oriented at 289.9135^0 (289^0 54' 48"), while the exact direction of the jihāt al-Kaaba is 292.5505^0 (292^0 33' 1"). This discrepancy results in a mean deviation of 2.637^0 (2^0 38' 13"), with considerable variation at the individual mosque level. The Great Mosque Sulthan Jeumpa in Bireun demonstrates the highest accuracy, deviating only 0.32^0 (0^0 19' 12"), while the Great Mosque Lhoksukon in North Aceh shows the largest misalignment at 16.98^0 (16^0 58' 48"). These variations highlight the uneven application of qibla determination methods, ranging from traditional observational practices to modern geospatial technologies. The integration of tools such as Google Earth provides communities with not only practical accuracy but also spiritual reassurance, reinforcing confidence in qibla orientation. Ultimately, this study underscores the importance of combining fiqh based principles with

contemporary scientific methods to ensure both symbolic fidelity and empirical precision in religious practice.

ARTICLE INFO

ABSTRAK

Studi ini mengeksplorasi titik temu antara perspektif fikih klasik dan pendekatan geospasial kontemporer, dengan fokus pada sejauh mana keselarasan arah masjid-masjid di seluruh Aceh dengan Ka'bah. Data empiris dikumpulkan melalui pengukuran orientasi masjid dan perbandingannya dengan arah kiblat yang ditentukan secara astronomis. Temuan penelitian menunjukkan adanya selisih yang terukur antara orientasi masjid dan perhitungan geospasial yang presisi. Secara rata-rata, masjid-masjid yang disurvei memiliki orientasi 289,9135^0 (289^0 54′ 48″), sedangkan arah jihāt al-Ka'bah yang tepat adalah 292,5505^0 (292^0 33′ 1″). Ketidaksesuaian ini menghasilkan deviasi rata-rata sebesar 2,637^0 (2^0 38′ 13″), dengan variasi yang cukup signifikan pada tingkat masjid individu. Masjid Agung Sulthan Jeumpa di Bireuen menunjukkan tingkat akurasi tertinggi dengan deviasi hanya 0,320^0 (0^0 19′ 12″), sementara Masjid Agung Lhoksukon di Aceh Utara menunjukkan ketidakselarasan terbesar sebesar 16,980^0 (16^0 58′ 48″). Variasi-variasi ini menyoroti ketidakseragaman penerapan metode penentuan arah kiblat, mulai dari praktik observasi tradisional hingga teknologi geospasial modern. Integrasi perangkat seperti Google Earth tidak hanya memberikan akurasi praktis bagi masyarakat, tetapi juga ketenangan spiritual, sehingga memperkuat keyakinan terhadap orientasi kiblat. Pada akhirnya, studi ini menegaskan pentingnya memadukan prinsip-prinsip fikih dengan metode ilmiah kontemporer demi menjamin kesetiaan simbolis sekaligus presisi empiris dalam praktik keagamaan.

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INTRODUCTION

The Aceh province has historically been regarded as one of the earliest gateways for Islam in Southeast Asia.[1] Its religious life has been strongly influenced by Islamic scholarship, including the science of astronomy, which has traditionally played a central role in ritual practices such as prayer times, the Islamic calendar, and qibla determination.[2] For centuries, Acehnese communities relied on *al-Syāfi'I* concept to establish qibla direction, ranging from observing celestial bodies such as the Sun and Star to applying trigonometric calculations inherited from Islamic astronomers of the medieval period.[3] Meanwhile, rapid technological advancements have introduced various conveniences,[4] such as the Google Earth application,[5] which provides satellite imagery of Earth's real-world surface.[6] This tool is highly effective for determining and aligning with the exact direction of the *'ain* of the Kaaba.[7] This situation reflects disconnection between religious practices and the integration of modern scientific knowledge in daily life. In this context,

[1]Darmadi Johan, "The Keuneunong Dating and Acehnese Society," *Journal of Aceh Studies (Joas)* 1, no. 1 (2024): 21–30.

[2]Roni Hidayat, "Peusijuek Sebagai Kearifan Lokal Aceh Dalam Menghadapi Globalisasi Budaya," *Jipsindo* 09, no. 02 (2022): 134–46.

[3]Ahmad Arief, Kurniati Kurniati, and Misbahuddin Misbahuddin, "Acceptance of Ashab Al-Shafii on the Changes of Qaul Qadim and Qaul Jadid of Imam Shafi'I," *HUNAFA: Jurnal Studia Islamika* 19, no. 2 (2022): 175–91, https://doi.org/10.24239/jsi.v19i2.683.175-191.

[4]Liping Yang et al., "Google Earth Engine and Artificial Intelligence (AI): A Comprehensive Review," *Remote Sensing* 14, no. 14 (2022), https://doi.org/10.3390/rs14143253.

[5]Riza Afrian Mustaqim, "Penggunaan Google Earth Sebagai Calibrator Arah Kiblat," *Jurnal Justisia : Jurnal Ilmu Hukum, Perundang-Undangan Dan Pranata Sosial* 6, no. 2 (2021): 194, https://doi.org/10.22373/justisia.v6i2.11537.

[6]Andrés Velastegui-Montoya et al., "Google Earth Engine: A Global Analysis and Future Trends," *Remote Sensing* 15, no. 14 (2023), https://doi.org/10.3390/rs15143675.

[7]David A King, "The Kaaba and the Sacred Geography of Islam," no. 1982 (2024): 1–116.

leveraging technology like Google Earth emerges as a practical and efficient solution for accurately identifying the direction of the *'ain* al -Kaaba.[8] Such technology allows mosque administrators to verify the Qibla direction with greater ease and precision,[9] minimizing potential errors associated with manual measurements.[10]

Existing studies have largely overlooked the critical aspects of using Google Earth to pinpoint the exact location of the Kaaba, often taking a linear perspective on the technology. Broadly, four key trends can be identified from previous research. The first trend involves studies that focus on the general use of Google Earth, such as,[11] which explores its various features. Other studies examine its application in mapping Earth's surface, including forests,[12] wildfires,[13] vegetation types,[14] and water bodies.[15] The second trend comprises research

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[8]Zahra Ridha Magfirah SR Musdalifah, Thahir Maloko, and Irfan, "Uji Akurasi Pengukuran Arah Kiblat Masjid Di Kecamatan Panakukang Kota Makassar," *HISABUNA: Jurnal Ilmu Falak* 5, no. 2 (2024): 114–35, https://doi.org/10.24252/hisabuna.v5i2.38809.

[9]Masturi et al., "Determination of Qibla Direction and Prayer Times Usisng Microsoft Excell Assisted Spherical Trigonometry Application," 2023, 1–3.

[10]Reza Akbar and Riza Afrian Mustaqim, "Theoretical Study of the Use of the Polaris Star As a Reference for the North Point in Determining the Qibla Direction," *Jurnal Ilmiah Islam Futura* 22, no. 1 (2022): 16–28, https://doi.org/10.22373/jiif.v22i1.9411.

[11]Yang et al., "Google Earth Engine and Artificial Intelligence (AI): A Comprehensive Review."

[12]Vahid Nasiri et al., "Land Use and Land Cover Mapping Using Sentinel-2 , Landsat-8 Two Composition Methods," *Remote Sens.* 14, no. 9 (2022): 1977.

[13]Keval H. Jodhani et al., "Assessment of Forest Fire Severity and Land Surface Temperature Using Google Earth Engine: A Case Study of Gujarat State, India," *Fire Ecology* 20, no. 1 (2024), https://doi.org/10.1186/s42408-024-00254-2.

[14]Shuhua Qi et al., "Bamboo Forest Mapping in China Using the Dense Landsat 8 Image Archive and Google Earth Engine," *Remote Sensing* 14, no. 3 (2022): 1–19, https://doi.org/10.3390/rs14030762.

[15]Richard J. Boothroyd et al., "Applications of Google Earth Engine in Fluvial Geomorphology for Detecting River Channel Change," *Wiley*

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analyzing the use of Google Earth for determining the Qibla direction, such as,[16] which investigates its application for Qibla determination at the West Aceh Mosque.[17] The third trend centers on studies mapping fiqh concepts related to Qibla determination, such as,[18] and,[19] which discusses the views of Islamic scholars from different schools regarding the Qibla definition. Another example is,[20] which compares the opinions of two or three scholars on Qibla direction. Despite these four trends, the visualization and mapping of the Kaaba's precise location using Google Earth remain underexplored.

Most previous studies have primarily focused on the technical accuracy of digital instruments without linking them to the discourse of Islamic jurisprudence practiced within Acehnese society. Conversely, fiqh studies have largely emphasized the syar'i requirements of qibla orientation without incorporating evaluations of modern technologies. As a result, there exists a significant knowledge gap between traditional fiqh

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Interdisciplinary Reviews: Water 8, no. 1 (2021): 1–27, https://doi.org/10.1002/wat2.1496.

[16]K Anaam, M Ilmiyah, and M Z Saajid, "Uji Akurasi Arah Kiblat Masjid Laju Sumenep," *AL-AFAQ: Jurnal Ilmu …* 5, no. 2 (2023): 223–32, https://journal.uinmataram.ac.id/index.php/afaq/article/view/7608%0Ahttps://journal.uinmataram.ac.id/index.php/afaq/article/download/7608/2825.

[17]Riza Afrian Mustaqim and Reza Akbar, "Study on the Causes of Inaccuracy of Qibla Direction of the Great Mosque Baitul Makmur West Aceh," *Jurnal Ilmiah Al-Syir'ah* 19, no. 1 (2021): 30, https://doi.org/10.30984/jis.v19i1.1315.

[18]Sri Wahyuni, Samsuddin Samsuddin, and Ekawati Hamzah, "Qibla Direction Accuracy Analysis Based on Astronomy (Google Earth), Perspective of Islamic Law," *Journal of Islam and Science* 9, no. 1 (2022): 39–45, https://doi.org/10.24252/jis.v9i1.30111.

[19]Ahmad Izzuddin, "The Problems of the Relationship between Science and Religion in Qibla Direction Calibration at the Great Mosque of Demak and Baiturrahman Mosque in Semarang, Indonesia," *Journal of Islamic Law* 3, no. 2 (2022): 111–31, https://doi.org/10.24260/jil.v3i2.823.

[20]Zahara Suciani Putri and Rosyidi. Muhib, "History Development Instruments Measuring The Qibla In Indonesia" 7, no. 2 (2023): 620–29, https://doi.org/10.31943/afkarjournal.v7i2.966.Abstract.

practices and scientific geospatial methodologies. Bridging this gap is crucial, as both religious authorities and the wider community need to understand the relevance of digital instruments within the framework of Islamic law. Accordingly, research that integrates these two dimensions becomes essential in order to produce a comprehensive, contextual, and socially accepted approach for the people of Aceh.

Based on this gap, the present study seeks to address two key research questions. First, how can the integration of *al-Syāfi'I* jurisprudence and geospatial technology (*Google Earth*) be applied to develop a methodology of qibla determination that is both scientifically accurate and normatively acceptable within Acehnese society? Second, to what extent does Google Earth provide empirical precision the framework of *jihāt* al-Kaaba according to the *al-Syāfi'I* school thought? In line with these questions, the objectives of this research are threefold: (1) to evaluate the accuracy of qibla determination using *Google Earth* in Aceh; (2) to interpret the results within the framework of *al-Syāfi'I* jurisprudence in order to ensure normative legitimacy, and to propose an integrative model of qibla determination that combines geospatial precision with fiqh based acceptance, thereby offering a practical and contextually relevant approach for both religious authorities and the broader Acehnese community.

METHOD

This study employs a qualitative descriptive approach supported by quantitative data.[21] The interdisciplinary framework aims to evaluate the accuracy of geospatial instruments, particularly *Google Earth*, in determining the Qibla direction while linking it to the *al-Syāfi'I* fiqh perspective embraced by the Acehnese community. The research was conducted in 20 mosques selected purposively to represent the geographical diversity of Aceh, including coastal areas, lowlands, and mountainous regions. These locations were

[21]John W Creswell, *Research Design; Qualitative, Quantitative, and Mixed Methods Approaches*, 2014.

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chosen as they reflect the variety of traditional astronomy practices as well as the community's actual needs regarding Qibla orientation. The Primary data were collected through field observations by measuring the Qibla direction using *Google Earth* and alongside in depth interviews with religious leaders and community members regarding their understanding of *al-Syāfi'I* fiqh on Qibla. The secondary data were obtained from classical *al-Syāfi'I* fiqh literature, academic journals on astronomy and geospatial studies, and geospatial coordinates extracted from *Google Earth*.

The data qibla direction of each mosque were measured by determining its geographic coordinates using a *Global Positioning System* (GPS)[22] and the *Google Earth* application.[23] The qibla direction was calculated within the application by linking the mosque's location to the coordinates of the Kaaba (21^0 25′ 21″ N, 39^0 49′ 34″ E).[24] These calculated Qibla directions were then compared with the actual qibla orientations of the mosques to determine the angular deviation,[25] representing the difference between the mosque's azimuth[26] [27] and the azimuth of the *jihāt*

[22]Chanchal Shrivastav, Manoj Joshi, and Gaurav Bhadauriya, "Global Positioning System and Associated Technologies in Biodiversity Conservation," no. November (2024), https://doi.org/10.59256/ijire.20240504004.

[23]Velastegui-Montoya et al., "Google Earth Engine: A Global Analysis and Future Trends."

[24]Hakan Temir, "Kutsalın Tezahürü ve Mekânın Etkisi Bakımından İsl a m Öncesi Arap Yarımadasındaki Kâbe/Beytler ?," 2021.

[25]Josephiene M. Schmidt et al., "Deviation of the Orientation Angle of Directional Deep Brain Stimulation Leads Quantified by Intraoperative Stereotactic X-Ray Imaging," *Neurosurgical Review* 45, no. 4 (2022): 2975–82, https://doi.org/10.1007/s10143-022-01801-8.

[26]Azimuth is the horizontal angle, measured clockwise from true north, to a particular object or direction. It is a measurement of horizontal direction on a compass or map, ranging from 0° (North) to 360° (back to North).

[27]Junfeng Li et al., "An Advanced Azimuth Ambiguity Suppression Scheme for Azimuth Multichannel SAR System," *IEEE Geoscience and Remote Sensing Letters* 21, no. January (2024): 1–5, https://doi.org/10.1109/LGRS.2024.3392888.

al-Kaaba. On other hand, a literature review was conducted on Imam *al-Syāfi'I* fiqh texts and those of *al-Syāfi'iyah* scholars to deepen the analysis of the *jihāt* al-Kaaba concept.

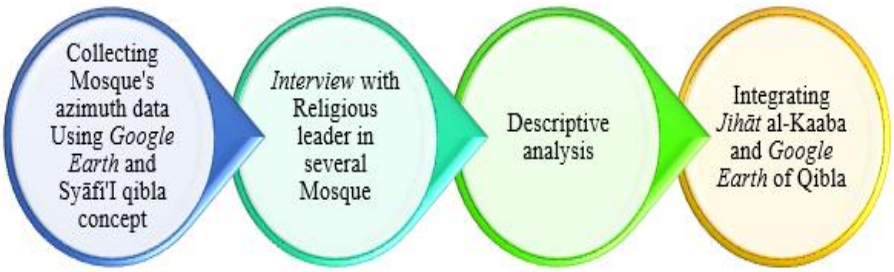

Figure 1. Research Frame Work

The **Figure** 1. Demonstrates the process of data collecting was collected using documentation and interview approach. The analysis was conducted using technical geospatial, normative fiqh, and integrative analysis approach. The technical geospatial analysis compared Qibla and mosques direction through *Google Earth* to assess their accuracy. Additionally, normative fiqh analysis interpreted the measurement results based on the concept of *jihāt* al-Kaaba to evaluate their conformity with *al-Syāfi'I* concept. The integrative analysis then connected the technical and normative dimensions to develop a fixed understanding of Qibla determination that is both religiously legitimate and scientifically precise.

RESULTS AND DISCUSSIONS

Field observations reveal that none of the grand mosques (Masjid Raya) in the 20 districts/ cities of Aceh province are aligned directly towards the Kaaba. This indicates a significant gap between the theoretical concept of *jihāt* al-Kaaba of *Syāfi'I* jurisprudence and its practical application in determining the Qibla direction within the region.

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Table 1. Aceh Province Mosque Azimuth[28]

NO	Name	Mosque's Azimuth	Jihāt al-Kaaba
1	Islamic Center Lhokseumawe Mosque	288.020	292.110
2	Great Mosque Lhoksukon, North Aceh	275.190	292.170
3	Great Mosque Baitul Yakin, East Aceh	295.630	292.190
4	Great Mosque Tamiang Hulu, Aceh Tamiang	292.960	292.570
5	Great Mosque Sulthan Jeumpa Bireun	291.850	292.170
6	Great Mosque Ulee Glee, Pidie Jaya	284.190	292.230
7	Great Mosque Al-Falah Sigli, Pidie	291.380	292.170
8	Mesjid Great Mosque Lambaro, Aceh Besar	286.950	292.180
9	Great Mosque Baiturrahman, Banda Aceh	290.850	292.160
10	Great Mosque Baiturrahim Sultan Hasanal Bolkiah Brunei, Aceh Jaya	285.150	292.720
11	Ahlus Sunnah Wal Jamaah Mosque, South Aceh	295.610	292.070
12	Great Mosque Nurul Makmur,Aceh Singkil	288.020	292.630
13	Great Mosque At-Taqwa, Southeast Aceh	291.840	292.970
14	Great Mosque Ruhama, Center Aceh	291.930	292.490
15	Babus Salam Mosque, Bener Meriah	289.830	292.420
16	Great Mosque Ash-Shalihin, Gayo Lues	280.900	292.760
17	Great Mosque Baitul a'la, Kabupaten Nagan Raya	293.190	292.840
18	Great Mosque Baiturrahim, Simeulue	293.350	292.810
19	Great Mosque Babus Salam, Kota Sabang	291.320	292.950
20	Great Mosque Darul Falah, Kota Langsa	290.470	292.400

The Table 1. Indicates that the azimuth orientation of major mosques in Aceh ranges from 280.90^0 to 295.63^0, with the lowest

[28]Data Collecting using *Google Earth* App.

value recorded at Ash-Shalihin Grand Mosque in Gayo Lues and the highest at Baitul Yakin Grand Mosque in East Aceh. Similar orientations are observed in several mosques, such as the Islamic Center Lhokseumawe and Nurul Makmur Grand Mosque in Aceh Singkil, both aligned at 288.02^0. Meanwhile, the iconic Baiturrahman Grand Mosque in Banda Aceh occupies a mid range position with an azimuth of 290.85^0. On other hand, the *jihāt* al-Kaaba orientation of major mosques across Aceh is remarkably varied. Such uniformity reflects a high level of precision in qibla determination, despite the geographical diversity of the mosques across various districts.

The lowest orientation value is observed at the Ahlus Sunnah Wal Jamaah Mosque in South Aceh (292.07^0), while the highest is recorded at the Great Mosque At-Taqwa in Southeast Aceh (292.97^0). Other mosques with relatively higher values include the Great Mosque Ash-Shalihin in Gayo Lues (292.76^0) and the Great Mosque Baitul A'la in Nagan Raya (292.84^0). In contrast, the province's most iconic landmark, the Great Mosque Baiturrahman in Banda Aceh, shows a *jihāt* al-Kaaba value of 292.16^0, closely aligning with the overall average.

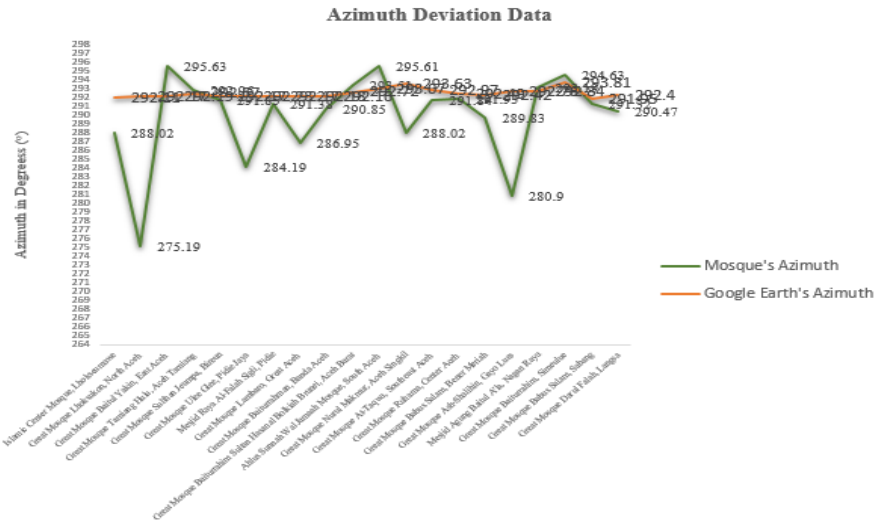

Figure 2. Azimuth deviation between Aceh Province's Mosque and *Google Earth*

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The Figure 2. Demonstrates the qibla orientations of mosques across Aceh Province ilustrates a measurable divergence between the existing mosque alignments and the precise astronomical direction toward the al-Kaaba (*al-jihāt*). Empirical data indicate that the mean azimuth of the surveyed mosques is 289.9135^0 (289^0 54′ 48″), whereas the *Google Earth* determined direction of the *jihāt* al-Kaaba is 292.5505^0 (292^0 33′ 1″). This discrepancy yields an average deviation of 2.637^0 (2^0 38′ 13″), suggesting that while the majority of mosques are closely aligned with the al-Kaaba, systematic errors in azimuth persist across the region. The degree of deviation varies significantly at the individual mosque level.

The Great Mosque Sulthan Jeumpa in Bireun exhibits the smallest recorded deviation, amounting to only 0.32^0 (0^0 19′ 12″), which reflects a high degree of azimuth alignment accuracy. In contrast, the Great Mosque Lhoksukon in North Aceh displays the largest deviation of 16.98^0 (16^0 58′ 48″), representing a substantial misalignment from the canonical direction. Such variation underscores the uneven application of qibla determination methods, ranging from traditional observational techniques to more recent geospatial calculations.

The results of study demonstrates that all the district mosques in Aceh Province experience relatively significant deviations in their qibla direction. On the other hand, the use of technology plays a crucial role in calibrating the qibla direction of district mosques across Aceh. The misalignment of qibla directions can be attributed to several factors, including the understanding of the *jihāt* al-Kaaba concept, the use of technology, and construction factors.

The challenges faced by the community reflect disparities in the use of technology and the risks that may arise in future human resource development. The difficulties mosques encounter in determining the *jihāt* al-Kaaba highlight the challenges of ensuring the accuracy of the qibla. Such conditions may undermine confidence in the obligation to face the qibla with precision. The findings suggesting that the people of Aceh

face difficulties in applying the *jihāt* al-Kaaba concept may stem from the fact that the use of Google Earth is a new experience in classical fiqh. Religious institutions and leaders have not yet been prepared to transform the traditional method of determining the *jihāt* al-Kaaba to a technological approach.

The concept of the *jihāt* al-Kaaba, or the concept of facing the Qibla directly towards the al-Kaaba building, originates from the interpretation of the term "*Masjid al-Harām*" in the Quran Surah Al-Baqarah: 150:

وَمِنْ حَيْثُ خَرَجْتَ فَوَلِّ وَجْهَكَ شَطْرَ ٱلْمَسْجِدِ ٱلْحَرَامِۚ وَحَيْثُ مَا كُنتُمْ فَوَلُّواْ وُجُوهَكُمْ شَطْرَهُۥ لِئَلَّا يَكُونَ لِلنَّاسِ عَلَيْكُمْ حُجَّةٌ إِلَّا ٱلَّذِينَ ظَلَمُواْ مِنْهُمْ فَلَا تَخْشَوْهُمْ وَٱخْشَوْنِي وَلِأُتِمَّ نِعْمَتِي عَلَيْكُمْ وَلَعَلَّكُمْ تَهْتَدُونَ

And from wherever you go out for prayer, turn your face toward al-Masjid al-Haram. And wherever you believers may be, turn your faces toward it in order that the people will not have any argument against you, except for those of them who commit wrong; so fear them not but fear Me. And it is so I may complete My favor upon you and that you may be guided.

The concept of the *jihāt* al-Kaaba, or the concept of facing the Qibla directly towards the al-Kaaba building, originates from the interpretation of the term "*Masjid al-Harām*" which contains the phrase "*Masjid al-Harām*". This understanding stems from the opinion of Imam *Al-Syāfi'I*,[29] who stated that the Qibla is the *jihāt* (direction) of the Kaaba, and to face the Qibla means to face directly towards the Kaaba building, whether one is able to see the Kaaba or is located far from Mecca and cannot see the Kaaba directly.[30] Imam[31] stated that facing the Qibla during prayer is a

[29]Al- and Imam Muhamad bin Idris Shafi'ī, *Al-Umm*, 1987; Muhyiddin Abi Zakriyya An-Nawawī, "Minhāj At-Thālibīn," 2005; Muhammad bin Ahmad bin Muhammad bin Al-Mahallī, "Kanzu Al-Rāghibīn Bi Syarh Minhāj at-Thālibīn," 2001; Syamsuddin Muhammad bin Abil'Abbas Ahmad bin Hamzah Ibnu Syihabuddin Ar-Raml, "Nihāyatu Al-Muhtāj Ilā Syarh Al-Minhāj," in *J.3*, 1967, 220; Syaikh Abdurrahman Al-Juzairī, "Fikih Empat Madzhab," in *1*, 1994, 1–17.

[30]King, "The Kaaba and the Sacred Geography of Islam."

[31]Muhyiddin Abi Zakariyya an-Nawawi, "Terjemahan Majmu' Syarh Muhazzab Bag 4," in *J.4*, vol. 4, 2007, 812–15.

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prerequisite for the validity of the prayer, and the qibla is the *jihāt* al-Kaaba. Other *al-Syāfi'i* scholars[32] have expressed the same view, as noted by,[33] who emphasized that facing the qibla, according to Imam *al-Syāfi'i* , is a condition for the validity of prayer, a stance also supported by.[34] According to[35] facing the qibla is essential for the validity of prayer, with two exceptions where it is permitted not to face the qibla which is during travel or when in a state of fear.[36]

In the *Fath al-Wahhāb*, *al-Ansarī* the prevailing opinion is that facing the qibla must be directly aligned with the al-Kaaba building.[37] He stated that for those who can "*ensure*" their position is exactly aligned with the al-Kaaba building either by seeing it or by physically touching it "*for those who cannot see, such as the blind*" just as people near the al-Kaaba do, it is essential to confirm that the Kaaba is directly in front of them. Further explained that if the rows of congregational prayer exceed the area covered by the al-Kaaba building, the prayer is considered invalid.[38] For those far from the Kaaba, the length of the rows does not affect the validity of facing the qibla.[39] Imam *Al-Syāfi'i* in[40] stated that Allah has provided guidance through signs He

[32]Yasrul Huda, Jajat Burhanuddin, and Mahmood Kooria, "Strengthening the Shafii'i Madhhab; Malay Kitab Jawi of Fiqih in the 19th Century," 2023.

[33](Al-Asqalanī, 1997)

[34]Al-Mahallī, "Kanzu Al-Rāghibīn Bi Syarh Minhāj at-Thālibīn."

[35]Zakariyya Al-Ansarī, "Fath Al-Wahhāb Bi Syarh Minhāj Al-Thulāb," 1998.

[36]Abi bakar Utsman ibnu Muhmmad Syaththa Dimyathi Al-Bakri, *I'ānatu at-Thālibīn*, 1995.

[37]Al-Ansarī, "Fath Al-Wahhāb Bi Syarh Minhāj Al-Thulāb."

[38]Al-Mahallī, "Kanzu Al-Rāghibīn Bi Syarh Minhāj at-Thālibīn."

[39]Philipp Bruckmayr, "Facing Mecca from Java: Two Treatises on the Establishment of the Qibla, and Their Scholarly and Social Context," *Islamic Law and Society* 31, no. 1–2 (2024): 102–35, https://doi.org/10.1163/15685195-20220001.

[40]Ahmad Nabil Amir, "Imam Al-Nawawi: Riwayat Ringkas Tentang Latar Pemikiran Dan Pengaruhnya," *International Journal of Islam and*

created for them, as well as the intellect bestowed upon them to find the direction of the *Baīt al-Harām* and *Masjid al-Harām*[41]. Therefore, every person who prays, whether it be obligatory or voluntary prayer, the prayer of the deceased, *sujd al-shukr* or *sujd al-tilāwah* must strive to face the *Baīt* Allah, except in two circumstances where Allah has granted concession: during a state of fear (*khāuf*) or on traveling. Nevertheless, whenever one intends to perform *al-Salāh*, one must always strive to face the qibla precisely.

The study also revealed that the absence of astronomical experts during mosque construction is another significant factor affecting the accuracy of the qibla direction. In many cases, the construction of district mosques in Aceh still relies on simple measuring tools rather than modern instruments such as theodolites.[42] The modern technology offer a very high degree of accuracy in measuring azimuth,[43] often expressed in *arcseconds* or *arcminutes*. For instance, *Google Earth,* modern digital theodolites can achieve accuracy levels ranging from 1 to 10 *arcseconds*[44] and, the modern compass operates based on the Earth's magnetic field,[45] which means it points to magnetic north rather than true geographic north[46]. This difference, known as

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Contemporary Affairs 2, no. 1 (2023): 17–38, https://doi.org/10.61465/jurnalyadim.v2.77.

[41](Al-Shafi'ī, 1987)

[42]Rinaldo Paar et al., "Technological Development and Application of Photo and Video Theodolites," *Applied Sciences (Switzerland)* 11, no. 9 (2021), https://doi.org/10.3390/app11093893.

[43]Linbin Zhang et al., "Optimal Azimuth Angle Selection for Limited SAR Vehicle Target Recognition," *International Journal of Applied Earth Observation and Geoinformation* 128, no. November 2023 (2024): 103707, https://doi.org/10.1016/j.jag.2024.103707.

[44]Kristine Mae Paboreal Dunque et al., "Obstacle Detector and Qibla Finder for Visually Impaired Muslim Community," *IFMBE Proceedings* 79 (2021): 55–71, https://doi.org/10.1007/978-3-030-62045-5_6.

[45]Donghua Zhao et al., "A Multiscale Transform Denoising Method of the Bionic Polarized Light Compass for Improving the Unmanned Aerial Vehicle Navigation Accuracy," *Chinese Journal of Aeronautics* 35, no. 4 (2022): 400–414, https://doi.org/10.1016/j.cja.2021.04.028.

[46]D. A. Ushakov, I. E. Lebedev, and V. E. Pavlov, "Influence of Orientation Errors Associated With the Use of a Magnetic Compass on the

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magnetic declination, varies depending on the location on Earth's surface and must be accounted for to achieve accurate results.[47],[48] Additionally, compasses are highly sensitive to magnetic interference from surrounding objects, such as metal, electrical sources, or other magnetic materials, which can cause deviations in direction.[49] The precision of a compass is also influenced by its quality; standard compasses may have a margin of error of several degrees, while professional-grade compasses can achieve greater accuracy with an error margin below one degree. However, in practical applications for determining the qibla direction, the precision of a compass is often insufficient, as even a minor error of a few degrees can result in a significant deviation from the correct qibla direction, particularly over long distances from the al-Kaaba.

The study reveals that determining the qibla direction in grand mosques across 20 districts and cities in Aceh Province still relies on traditional methods rather than leveraging modern tools like *Google Earth*. However, its a powerful application that provides a 3D representation of the Earth through satellite imagery. It integrates satellite photos, aerial views, and GIS data into an interactive 3D globe, allowing users to explore cities and landscapes from different angles. One of *Google Earth*'s standout features is its ability to provide precise geographic coordinates,

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Accuracy of Determining the Position of the Paleomagnetic Pole and the Amplitude of Paleosecular Variations," *Geodynamics and Tectonophysics* 15, no. 2 (2024), https://doi.org/10.5800/GT-2024-15-2-0752.

[47]Dunque et al., "Obstacle Detector and Qibla Finder for Visually Impaired Muslim Community."

[48]Anisah Budiwati, Muhammad Wahyu Firdaus, and Galih Cipto Raharjo, "Integration Method for Measuring Qibla Direction (Comparative Analysis of Google Earth and Mizwala)," *Indonesian Journal of Interdisciplinary Islamic Studies* 5, no. 3 (2022): 147–64, https://doi.org/10.20885/ijiis.vol.5.iss3.art2.

[49]Yahya Tawil, "A Hardware Implementation Of An Open-Source Qibla Direction Finder With Tilt Compensation Using 9-DOF IMU And GPS," *2023 Innovations in Intelligent Systems and Applications Conference, ASYU 2023*, 2023, 1–3, https://doi.org/10.1109/ASYU58738.2023.10296590.

making it an excellent tool for identifying specific locations with high accuracy. When it comes to determining the qibla, the application can pinpoint the al-Kaaba as a reference point and align it with the mosque location. Using its ruler tool, users can draw a direct line from the mosque to the al-Kaaba coordinates, offering a straightforward and highly accurate method for setting the qibla direction.

The previous studies have highlighted the potential of *Google Earth* for various visual mapping applications, including land mapping,[50] water resource mapping, forest mapping,[51] and qibla direction mapping.[52] However, existing research lacks an in-depth analysis of its application in mapping the qibla direction based on the concept of *jihāt* al-Kaaba.[53] This study reveals a significant challenge for the future of qibla jurisprudence in Aceh. Despite rapid technological advancements, the Acehnese community continues to face difficulties in accurately implementing the concept of *jihāt* al-Kaaba using azimuth concept[54]. In addition, this study extends

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[50]Binh Pham-Duc et al., "Trends and Applications of Google Earth Engine in Remote Sensing and Earth Science Research: A Bibliometric Analysis Using Scopus Database," *Earth Science Informatics* 16, no. 3 (2023): 2355–71, https://doi.org/10.1007/s12145-023-01035-2.

[51]Nasiri et al., "Land Use and Land Cover Mapping Using Sentinel-2 , Landsat-8 Two Composition Methods."

[52]Andi Jusran, "Analisis Keakuratan Arah Kiblat Masjid Di Kecamatan Tanete Riattang Barat Kabupaten Bone," *Al-Bayyinah* 3, no. 1 (2019): 93–107, https://doi.org/10.35673/al-bayyinah.v3i1.319; Wahyuni, Samsuddin, and Hamzah, "Qibla Direction Accuracy Analysis Based on Astronomy (Google Earth), Perspective of Islamic Law."

[53]Kusdiyana et al., "A Comparative Study of Islamic Astronomy and Jurisprudence on the Qibla Direction of Historical Mosques in Cirebon Indonesia," *Jurnal Ilmiah Mizani* 11, no. 2 (2024): 450–63, https://doi.org/10.29300/mzn.v11i2.4902.

[54]Donghui Wei et al., "Optimum Tilt and Azimuth Angles of Heat Pipe Solar Collector, an Experimental Approach," *Case Studies in Thermal Engineering* 55, no. December 2023 (2024): 104083, https://doi.org/10.1016/j.csite.2024.104083; Eunwoo Park et al., "Azimuth Mapping of Fibrous Tissue in Linear Dichroism-Sensitive Photoacoustic Microscopy," *Photoacoustics* 31, no. February (2023): 100510, https://doi.org/10.1016/j.pacs.2023.100510.

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previous research on the jurisprudential concept of Qibla direction, as explored by.[55] However, prior studies have not addressed the application of the *jihāt* al-Kaaba in determining the qibla direction for mosques. Moreover, research on *Google Earth* use in determining qibla direction has been largely limited to satellite imagery for mapping land and forest conditions.[56] While some studies have used *Google Earth* to generally determine qibla direction,[57] none have specifically examined the implementation of the *jihāt* al-Kaaba concept through this tool.

The results of qibla determination via *Google Earth* are not only scientifically valid but also consistent with *al-Syāfi'I* jurisprudence called *jihāt* al-Kaaba as practiced in Aceh. This creates a strong bridge between religious tradition and modern science. For Acehnese Muslims, who predominantly adhere to the *al-Syāfi'I* school, *Google Earth* can be understood not merely as a technical tool but as a medium of worship that carries syar'i legitimacy. Additionally, it thus serves as an educational instrument that strengthens communal confidence that their prayer practices remain within the bounds of Islamic law while

[55]David A. King, "The Culmination of Islamic Sacred Geography," *Geography and Religious Knowledge in the Medieval World*, 2021, 179–88, https://doi.org/10.1515/9783110686159-008; David A King, "From Petra Back to Mecca-From 'Pibla''' Back to Qibla,'" 2017, www.davidaking.org; Izzuddin, "The Problems of the Relationship between Science and Religion in Qibla Direction Calibration at the Great Mosque of Demak and Baiturrahman Mosque in Semarang, Indonesia"; Muhammad Syazwan Faid et al., "Development of Qibla Direction Determinant Using Sun Shadow," *Online Journal of Research in Islamic Studies* 9, no. 2 (2022): 95–108; Putri and Rosyidi. Muhib, "History Development Instruments Measuring The Qibla In Indonesia."

[56]Jodhani et al., "Assessment of Forest Fire Severity and Land Surface Temperature Using Google Earth Engine: A Case Study of Gujarat State, India."

[57]Mustaqim and Akbar, "Study on the Causes of Inaccuracy of Qibla Direction of the Great Mosque Baitul Makmur West Aceh"; Budiwati, Firdaus, and Raharjo, "Integration Method for Measuring Qibla Direction (Comparative Analysis of Google Earth and Mizwala)"; Mustaqim, "Penggunaan Google Earth Sebagai Calibrator Arah Kiblat."

also achieving greater directional precision. Conceptually, this theoretical framework demonstrates that the integration of *al-Syāfi'I* fiqh and geospatial tools represents not just accommodation but also actualization. Fiqh provides the normative legitimacy for ensuring correct qibla orientation, while geospatial science ensures that such orientation can be determined with measurable accuracy and emphasizes the capability of concretely illustrating the concept of *jihāt* al-Kaaba within the Acehnese context.

CONCLUSION

In conclusion, the people of Aceh consistently uphold the principle of *jihāt* al-Kaaba as articulated in the *Syāfi'I* school of thought when determining their qibla orientation. This adherence reflects not only their strong attachment to classical jurisprudential traditions but also their collective commitment to religious conformity. At the same time, the introduction of modern geospatial technologies, particularly *Google Earth*, has provided a valuable complementary tool. The ability of *Google Earth* to present a realistic and detailed visualization of the Kaaba allows individuals and communities to strengthen their conviction that they are indeed facing the correct *jihāt* al-Kaaba.

Additionally, the qibla orientations of mosques across Aceh Province ilustrates a measurable divergence between the existing mosque alignments and the precise astronomical direction toward the al-Kaaba (al-jihāt). Empirical data indicate that the mean orientation of the surveyed mosques is 289.9135^0 (289^0 54′ 48″), whereas the geospatially determined direction of the jihāt al-Kaaba is 292.5505^0 (292^0 33′ 1″). This discrepancy yields an average deviation of 2.637^0 (2^0 38′ 13″), suggesting that while the majority of mosques are closely aligned with the al-Kaaba, systematic errors in orientation persist across the region. The degree of deviation varies significantly at the individual mosque level. The Great Mosque Sulthan Jeumpa in Bireun exhibits the smallest recorded deviation, amounting to only 0.32^0 (0^0 19′ 12″), which reflects a high degree of alignment accuracy. In contrast, the Great Mosque Lhoksukon in North Aceh displays the largest deviation of 16.98^0 (16^0 58′ 48″), representing

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a substantial misalignment from the canonical direction. Such variation underscores the uneven application of qibla determination methods, ranging from traditional observational techniques to more recent geospatial calculations.

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