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Accuracy of Qibla Direction of the Mosque with the Qibla Shadows and Rashdul Qibla Methods

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Abstract

This research aims to find out how accurate the Qibla direction of mosques in Sibolga City is and to find out how the Qibla direction measurement method is used in determining the position of the Qibla direction. The research was conducted using the field research method to find out the maslahah mursalah in the virtue of knowing the Qibla direction and addressing the phenomenon of Qibla shadows and rashdul Qibla. Data collection is done by observation, interview, and documentation of data relevant to the study in this research. From the results of the study, it can be concluded that the accuracy of Qibla direction is seen from how the method of measuring Qibla direction is determined based on the measurement of latitude and longitude of the research location.

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A. Introduction

The determination of the Qibla direction has evolved in accordance with the development of science. In the beginning, the Qibla direction faced west, because Saudi Arabia is west of Indonesia. Thus, this was not done with previous calculations. Therefore, the Qibla direction corresponds to the position of the setting sun. Hence, the Qibla direction is identical to the west.

The geographical position of Saudi Arabia is in the west but it is inclined to face north (northwest). So that some Muslims still tilt the Qibla direction to the north even though the prayer in the mosque is facing the Qibla. Furthermore, the Qibla direction is determined based on the shadow of a stick (istiwa') and a protractor (rubu' mujayyab). Both techniques are based on the direction of the sun's position near the zenith of the Kaaba. This is known as rukyah or direct observation through the shadow of the sun[1].

The development of Qibla direction determination with changes in science and technology provides new knowledge about the provisions of the sun's direction. In this case, the direction of the sun can be done with the guidance of the formulas of the north point

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azimuth, the shadow of the Qibla direction and also rashdul kibla. This method is basically the same as finding the accuracy of the Qibla direction for places or areas that are far from the Kaaba area (Mecca: Saudi Arabia)[2].

Determining the Qibla direction is important. In addition, the accuracy of determining the Qibla direction is related to the method used. Along with the times and technological advances, the method of determining the Qibla direction has changed from traditional methods to modern methods. The hisab method that is carried out is also accompanied by changes ranging from the taqrībi method and also the tahqīqi method. In addition, the coordinate points used are also different. This also applies to the Sibolga City area which has experienced several shifts due to shocks due to earthquakes, although the shift is not too significant, but whether this will affect the latitude and longitude of the place on the position of the Qibla direction in Sibolga City.

Especially in matters relating to the accuracy of the Qibla direction in every mosque in Sibolga City, it is necessary to observe and supervise, and it is necessary to introduce and socialise activities related to straightening and re-correcting the position of the Qibla direction through the phenomenon of the Qibla shadows and rashdul kibla (as appealed by the Ministry of Religion every time rashdul kibla takes place). The existence of accurate data on the Qibla direction of mosques and musholla along with the validation of the Qibla direction is the shared responsibility of Muslims. Because the main thing that is accepted for prayer is to stand upright facing the Qibla.

Qibla direction is a condition for the validity of prayer, so this provision is often ignored by the community. The mosque building must be complete with the provisions of the Qibla direction position. First, by following the existing Qibla direction, this makes the position of the Qibla direction incorrect. Second, facing west. The results showed that the latitude and longitude of the mosques whose data had deviations (°/degree) in Qibla position were about three degrees, but when converted, the km range obtained was about 452.3 km from the Kaaba to the mosques.[3]

This study examines the concept of understanding of mosque managers (nadzir) about the importance of facing the Qibla. This research shows that the view of the mosque management team shows good results to carry out the Sharia, namely by calculating the Qibla

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direction with the hisab team so that the Qibla position is relevant to Islamic astronomy. Then the point of accuracy of Qibla direction in mosques in Yogyakarta is in accordance with the provisions of the calculation in accordance with the maximum conformity of 6' (minutes) of arc, in accordance with the direction that is not in accordance with the mosque.[4]

This research is about the accuracy of the Qibla direction of the mosque using the Qibla shadows method/technique and this research was conducted to review how the people of Garut Regency determine the Qibla direction, then how the provisions of the accurate Qibla direction. By using taqribi and tahqiqi methods. Based on the results of the study, it shows that the appropriate Qibla shadows are 23% or 14 mosques (based on 60 mosques). Factors that affect the suitability/accuracy of the Qibla direction of the mosque include the reason for the view of the Qibla direction, then the influence of the figure and the influence of the tool or method of observation [5].

B. Methods

Research is a series of scientific activities to get answers to problems to gain new knowledge. The research was conducted using a qualitative method, this describes from the point of view of the person to be studied (informant). The research approach with this research evaluation is a case study approach (field research). The aim is that this research evaluation can collect systematic information data about the activities and characteristics of the research.[6]

The evaluation can describe the data found regarding the explanation of the Qibla Shadows and Rashdul Qibla Method in Determining the Accuracy of Qibla Direction in Sibolga City. This is in accordance with qualitative research that follows a research process that finds descriptive data and analysis data such as written descriptions of people or sources and observed behaviour. The approach used to describe the data that has been evaluated is the hermeneutic approach. The realm of hermeneutics has a very universal nature. Hermeneutics will discuss textual and non-textual data, phenomena related to metaphysics, human behaviour, and nature.[7]

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This research has the object of reviewing how the Accuracy of Qibla Direction Calculation in Sibolga City, then reviewing the Technique or Method of Measuring Qibla Direction with the Qibla Shadow Method and also the Rashdul Kibla Method in determining Qibla Direction, as well as reviewing policies related to Qibla Direction in Sibolga City, Accuracy of Qibla Direction of Mosques registered in Mosque data in each KUA in Sibolga City.

The research background or informants who became the research sample were the Hisab Rukyat Team of the Ministry of Religion of Sibolga City, the Head of the KUA in the Sibolga City District who had a role in collecting data on mosques or Mushalla in Sibolga City. The withdrawal of this sample is done purposively. This technique is used to evaluate the problem that is the basis of research. The location of the research site is related to the research topic. Data collection from research sources there are three events, namely:

1. In-depth interviews using an interview system with an open-ended question format. Data from open-ended interviews are direct quotes obtained from expert/experienced informants, opinions, feelings, and knowledge of the informants.[8] Interviews conducted by researchers to informants are unstructured, free, and open in nature. This is to make it easier for informants to understand the meaning of the questions asked by researchers [9].

2. Observation data is described about the policy or regulation of the Ministry of Religious Affairs regarding the hisab-rukyat of Qibla direction, then the role of the Hisab Rukyat Team in calculating the Qibla direction with the method of the shadow of the Qibla and rashdul Kibla to determine the accuracy of the Qibla direction in Sibolga City.

3. Documentation uses data collection techniques that have been indexed and counted and so on.[10] This documentation is intended in the form of a collection of archival search data or documentation, such as data on mosques and mushalla, geographical data on the region scientifically, in addition to other documentation that has a relationship with research problems.

The basis of analysis is the activity of using data so that the truth or untruth of the initial hypothesis is obtained. Analysis requires imagination and creativity so that the

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researcher's ability to examine a research problem can be tested.[11] Data analysis used in this study is guided by reduction, presentation, and conclusion drawing.

C. Results and Discussion

Accuracy of Qibla Direction in Sibolga City

By conducting field observations and field interviews in several data sources in this study, there are some data generated. For example, the Qibla direction for the Sibolga area is 294° based on satyphonic calculations, but there are some parts in South Sibolga Sub-district that use a Qibla direction of 293.7°. This is due to differences in the latitude and longitude of the place. So that there are several mosques that are estimated to be less precise in the position of the Qibla direction. Meanwhile, in this case, the data of registered mosques from 2022 to date totals 39 mosques. The complete results will be given in the following table.

Table 1. Sibolga Kota Sub-district Mosque Data

No	Mosque Name	Typologies	Year of Establishment	Number of Pilgrims
1	Mesjid Al-Hidayah	Mesjid Jami’	1979	**50-100**
2	Mesjid Budi Sehati	Mesjid Jami’	1970	**50-100**
3	Mesjid Al-Bihar	Mesjid Jami’	1987	**50-100**
4	Mesjid Taqwa Muhammadiyah	Mesjid Jami’	1983	**50-100**
5	Mesjid Al-Hikmah	Mesjid Besar	1982	**50-100**
6	Mesjid Al-Azhar	Mesjid Jami’	1972	**50-100**
7	Mesjid Raudhatul Jannah	Mesjid Jami’	1975	**100-150**
8	Mesjid Agung Sibolga	Mesjid Agung	1945	**150-200**

From the table above, it can be seen that there are 8 mosques in Sibolga Kota Sub-district. Since the year of the establishment of the mosque, if examined, it has been quite long, which means that the position of the Qibla direction of the mosque needs to be reviewed and known. This is to review the mosque which is still actively used by many worshipers. The results of this study are used as a basis for knowing the latitude and longitude position of the place to determine the accuracy of its Qibla direction. In

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addition, the need for data and typology of mosques is a reference for this study to determine the position of the mosque.

Table 2. Sibolga Sambas Sub-District Mosque Data

No	Mosque Name	Typologies	Year of Establishment	Number of Pilgrims
1	Masjid Al-Bahri	Mesjid di Tempat Publik	2000	150-200
2	Mesjid Al-Abidin	Mesjid Jami’	2001	50-100
3	Mesjid Al-Mukhlisin	Mesjid Jami’	1982	>200
4	Mesjid Taqwa Sambas	Mesjid Jami’	1979	50-100
5	Mesjid Nurul Bahrain	Mesjid Jami’	1973	>200
6	Mesjid Al-Falah	Mesjid Jami’	1960	>200
7	Mesjid Al-Ikhwan	Mesjid Jami’	1948	50-100
8	Mesjid Nurul Ikhlas	Mesjid Jami’	1978	50-100
9	Mesjid Al-Jihad Sibolga	Mesjid Besar	1948	150-200

From the table above, it can be seen that there are 9 mosques in Sibolga Kota Sub-district. Since the year of the establishment of the mosque, if examined, it has been long enough, which means that the position of the Qibla direction of the mosque needs to be reviewed and known. This is to review mosques that are still active until now and are still used by many worshipers.

Table 3. South Sibolga Sub-District Mosque Data

No	Mosque Name	Typologies	Year of Establishment	Number of Pilgrims
1	Masjid Jami’atul Jannah	Mesjid Jami’	2000	100-150
2	Mesjid Taqwa Jalan Dame	Mesjid di Tempat Publik	2013	150-200
3	Mesjid Ar Ramli	Mesjid Jami’	2014	50-100
4	Mesjid Taqwa Parombunan	Mesjid Jami’	1988	50-100
5	Mesjid I’tidal	Mesjid Jami’	1980	50-100
6	Mesjid Darurrahmah	Mesjid Jami’	1982	50-100

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7	Mesjid Al-Hijrah	Mesjid Jami’	1979	50-100
8	Mesjid Baiturrahmi	Mesjid Jami’	1989	50-100
9	Mesjid Taqwa Aek Habil	Mesjid Jami’	1979	50-100
10	Mesjid Nurul Saa’adah	Mesjid Jami’	1978	50-100
11	Mesjid Al-Muhajirin	Mesjid Jami’	1978	50-100
12	Mesjid Nurulhuda	Mesjid Jami’	1988	50-100
13	Mesjid Istiqomah	Mesjid Jami’	1980	>200
14	Mesjid Riadul Jannah	Mesjid Jami’	1999	50-100
15	Mesjid Rahmat Kenanga	Mesjid Jami’	1980	50-100
16	Mesjid Al-Islah	Masjid Besar	1980	>200
17	Mesjid Nurul Iman	Mesjid Jami’	1950	50-100

From the table above, it can be seen that the number of mosques in Sibolga Kota Sub-district is 17 mosques. From the year of the mosque's establishment, if examined, it has been a long time, meaning that the position of the qibla direction of the mosque needs to be reviewed and known. This is to review mosques that are active until now still used by many congregations.

Table 4. North Sibolga Sub-District Mosque Data

No	Mosque Name	Typologies	Year of Establishment	Number of Pilgrims
1	Masjid Al-Akbar	Mesjid di Tempat Publik	1995	50-100
2	Mesjid Jabar Nur	Mesjid di Tempat Publik	1990	50-100
3	Mesjid Al-Munawar	Mesjid Besar	1978	50-100
4	Mesjid Al-Ikhsan	Mesjid Jami’	1982	50-100
5	Mesjid Al-Mujahidin	Mesjid Jami’	1976	50-100

From the table above, it can be seen that there are 8 mosques in Sibolga Kota Sub-district. Since the year of the establishment of the mosque, if examined, it has been quite long, which means that the position of the Qibla direction of the mosque needs to be reviewed and known. This is to review the mosque which is still actively used by

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many worshipers.

This is based on the results of research that if the position of the Qibla direction is 293.7° - 294°, then the latitude and longitude data of the mosque needs to be taken into account to determine the accuracy of the corresponding Qibla direction data.[12] However, the problem is that most of the 39 mosques in Sibolga City have been established for a long time, if the measurements used are based on the classical method of measuring Qibla direction. In this case, the understanding of the Qibla direction measurement method will be different, even though the Qibla direction hisab-rukyat has more or less its own meeting point. In this study, the researcher will focus more on how to measure with the shadow of the Qibla and also how all layers respond to the phenomenon of rashdul kibla as a way to straighten the Qibla direction again.

A numerical overview of the accuracy of the Qibla direction of mosques and musholla in Sibolga City by using the calculation of mosque latitude and longitude data to verify the results of Qibla direction data in Sibolga City. The focus of the research is emphasised on the method of determining the Qibla direction.a The accuracy of Qibla direction data in Sibolga City, so that the stigma and debate about the shifting of the earth due to earthquakes or differences in the methods used in determining the Qibla direction can be used as a means to add scientific treasures.

Qibla Shadows and Rashdul Qiblah Method in Determining Qibla Direction Accuracy in Sibolga City

Currently, there are two types of methods that are often used to determine the Qibla direction, namely Azimuth Qibla, which is the direction or line that shows the Qibla (ka'bah). Azimuth for a celestial body is the angular distance in a horizontal circle measured from the North point to the East to the intersection between the horizon circle and the vertical circle passing through the celestial body. While what is meant by the azimuth of the Qibla is the arc of the ufuk circle or horizon calculated from the North point to the East (clockwise) to the point of Qibla. The north point of the azimuth is 90º, the east point of the azimuth is 90°, the south point of the azimuth is 180º, and the west point of the azimuth is 270º and Rashdul Qibla is the same as the path to the Qibla. Because at that time the shadow of an object that hits a place shows the direction of the Qibla.[13] What is meant by the shadow of the sun in the

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direction of the Qibla is the shadow of an object that stands upright and is in a flat place at a certain time (according to the results of the calculation) shows (directs) the direction of the Qibla. According to Ahmad Izzudin, rashdul qibla is the time when the shadow of an object exposed to sunlight points to the qibla. As in the calendar, the 27th or 28th of May and the 15th or 16th of July each year are designated as "yaumi Rasdhil Qibla", or Azimuth Qibla and Rashdul Qibla, also known as angle theory and shadow theory.

Rashdul Qibla is a method of determining the Qibla direction based on the exact (or near exact) position of the sun at the zenith of the Kaaba, this method is easy and the results obtained are more accurate. Rashdul Qibla is the determination of the time when the shadow of an object exposed to sunlight shows the direction of the Qibla. Rashdul Qibla will occur when the sun is above the Kaaba and when the sun is in the path of the Kaaba. Rashdul Qibla does not occur when the sun is above the local location.

Rashdul Qibla will occur when the sun is above the Kaaba and when the sun is in the path of the Kaaba in this case the question is what time the sun is above the Kaaba and what time the sun is in the path of the Kaaba.[14] The position of the sun above the Kaaba occurs when the sun's declination is equal to the latitude of the Kaaba (21° 25' LU) and when the sun is at the upper culmination point seen from the Kaaba (39° 50' East). [15] Likewise, when the sun is in the path of the Kaaba, the sun's shadow intersects with the direction towards the Kaaba for a location or place, so that at that time any object standing upright at the location in question will immediately indicate the Qibla direction.[16]

There are two types of qibla rashdul: annual rashdul qibla and daily rashdul qibla.[17] Annual rashdul qibla is set on 27/28 May and 15/16 July each year as Yaumur Rashdil Qibla. On each 27 May (leap year) or 28 May (bashithoh year) at 11:57 pm and on 15 July (leap year) or 16 July (bashithoh year) at 12:06 pm. If Makkah time (LMT) is converted to western Indonesian time (WIB), it must be added 4 hours 21 minutes equal to 16:18 WIB and 16:27 WIB. In some references, this rashdul qibla time can be used in several days, starting from 1 day before and 1 day after the date.

This rashdul qibla method is very dependent on the weather because it involves the direction of the shadow of the object produced from sunlight, if the weather is cloudy then the shadow of the object will be difficult to obtain. The calculation carried out at the Great Mosque of Sibolga was founded in 1908 which is located on Jalan Ahmad Yani No. 72

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Sibolga Kota District, Sibolga City, is one of the buildings that has a role in the development and spread of Islam in Sibolga City, this mosque has a central location and is adjacent to the market centre (Old Onan Market). The mosque has an area of ± 4,900 m2 and has undergone restoration in 1976, then in 2005, then renovated again in 2007, and finally in 2014. This mosque is also a place for various religious events and also the centre of worship for the Sibolga community.

Based on the results of interviews conducted by researchers to the management of the Sibolga Great Mosque BKM on how to determine the Qibla direction of this mosque, they answered that this Qibla direction was once determined based on the estimates of the founder of the mosque and by looking at the position of the sunset, but in its development this mosque has measured its Qibla direction which is reviewed directly by the Ministry of Religion of Sibolga City.

Mosque Name : Raya Agung Sibolga
Building Area : ± 2002 m2 Year
Built : 1908
Address : Jl. Ahmad Yani, No. 72, South Sibolga District, Sibolga City

Location/Astronomy Data (May 13, 2023)

City Name : Sibolga
Latitude Venue : 1°42'
Place Longitude : 98°44'
Latitude of Mecca : 21°25'21.14"
Longitude of Mecca : 39°49'34.5"
*Declination : 18°19'04"
Equation Of Time : 0°3’38’’

Equipment Used

Thread : ü
Raqrum Stick : ü
Tools/Write : ü
Waterpass : ü
Compass : ü

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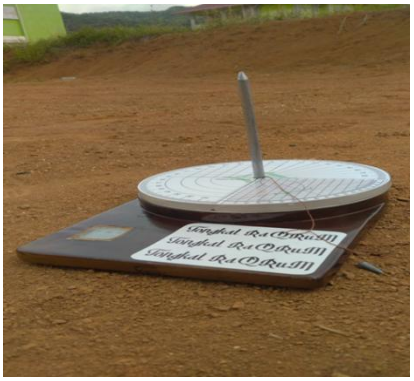

Figure 1 RaqRum Stick

Description: The RaQRum stick is a combination of a rashdul qibla stick and rubu' mujayyab as a tool to see the qibla direction. This tool is composed of a 360° circle, and is equipped with rubu' mujayyab and hadafah components. RaQRum stick is the latest innovation in astronomy that will make it easier to determine the Qibla direction.

Qibla Direction Measurement Results: Right in the direction of the Qibla

Measurement:

1. Looking for the Azimuth Qibla of Sibola City

Longitude	: 98°44'
Latitude Location	: 1°42'
Longitude of Mecca	: 39°49'34.5"
Latitude of Mecca	: 21°25’21.14’’
Declination	: 18°19’04”
Semi Diameter	: 15°49’87”
Equation Of Time	: Semi Diameter0°3’28”

2. a = 90 - D_m
   = 90 - 18°19’04”
   = 71°40’56”

   b = 90 - LT
   = 90 - 1°42’
   = 88°18’0”

Pa = cos b x tan AQ
= cos 88°18’0” x tan 23°45’12.47”
= 0°0’51.61”

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p = Abs ($\tan^{-1}$ ($\frac{1}{Pa}$))

= Abs ($\tan^{-1}$ ($\frac{1}{0°0'61"}$))

= 89°10’43.17”

Ca = Abs ($\cos^{-1}$ ($\frac{1}{\tan a \ x \tan b \ x \ cox \ p}$))

= Abs ($\cos^{-1}$ ($\frac{1}{\tan 71°40'56x \tan 88°18'0x \cos 89°10'43.17")}$)

= 80°47’56.51”

C = ca – p

= 80°47’56.51” - 89°10’43.17”

= -8°22’46.66”

BQ = 12 + $\frac{c}{15}$

= 12 + $\frac{-8°22'.66"}{15}$

= 11°26’28.89”

= BQ – Eq = LMT

= 11°26’28.89” - 0°3’38” = LMT

= 11°22’50.89” = LMT

= LMT + (7 x 15) – BT) : 15 = WIB

= 11°22’50.89” + (7 x 15) - 98°44’) : 15 = WIB

= 11°47’54.89” = WIB

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Figure 2 Calculation of Qibla Direction

After carrying out a series of research procedures and also measuring the Qibla direction of the mosque in Sibolga City. In determining the Qibla direction of the mosque in Sibolga City. The method used is by looking at the position of the setting sun and regarding the accuracy of the Qibla direction used used to be only an estimate of the founder of the mosque After the accuracy of the Qibla direction was carried out, there were several mosque Qibla directions that deviated or did not point to the actual Qibla direction with a difference of 1-3 °.

D. Conclusion

From the results of the research that has been carried out, it can be concluded that the data on mosques in Sibolga City have been collected in general, but still need to be processed and adjusted to the data from interviews with the Heads of KUAs in Sibolga District and Bimas Hisab Rukyat Kemenag Sibolga. From the interviews that have been conducted, it is estimated that there are still mosques that are not in accordance with the Qibla direction of around 1°-2°, especially mosques in the South Sibolga District area. This is due to differences in latitude and longitude, as well as the influence of the Qibla direction measurement method. The results show how accurate the Qibla direction is in Sibolga City based on data collected temporarily from the number of mosques in Sibolga City.

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