

## UNDERSTANDING QIBLA ORIENTATION THROUGH THE 'NAGARA' ARTIFICIAL COMPASS: A FALAK LEGAL PERSPECTIVE

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**Abstract:** Facing or directing towards Qibla, which is one of the essential conditions for the validity of prayer, is sometimes challenging and tends to rely on existing directions or estimations. Among the various Qibla direction indicators circulating in society, especially in South Kalimantan, the *Nagara*-made compass was found (from one of the Districts in South Hulu Sungai Regency), which later became known as the *Nagara* compass. The research method used by the author is qualitative research, which produces descriptive data. The type of research is field research, conducted by gathering data by observing the object to be studied, with the researcher as the subject (actor) of the research. The reason for using this type of research is to obtain data in line with the location's data and to avoid invalid data regarding the *Nagara* compass. The data obtained are collected through observation techniques and data analysis through the science of falak. This study proves that the results of the Qibla direction indication by the *Nagara* compass cannot be considered scientifically accurate and cannot be justified scientifically; it can only be used as a mere aid for estimating the Qibla direction.

**Keywords:** Qibla, Compass, magnetic correction.

**Abstrak:** Ketentuan menghadap atau mengarah ke Qiblat yang merupakan salah satu syarat sahnya shalat, terkadang merupakan hal yang sulit untuk dilakukan, dan cenderung memanfaatkan arah yang sudah ada atau dengan taksiran saja. Diantara sekian banyak alat penunjuk arah Qiblat yang beredar di masyarakat, khususnya di Kalimantan Selatan, ditemukan kompas buatan *Nagara* (salah satu Kecamatan di

Kabupaten Hulu Sungai Selatan), kompas ini kemudian lebih dikenal dengan kompas *Nagara*. Metode penelitian yang dilakukan penulis merupakan metode penelitian kualitatif yang menghasilkan data deskriptif. Untuk jenis penelitian yaitu penelitian lapangan. Dengan cara mencari data dengan melihat obyek yang akan diteliti. Dimana peneliti sebagai subyek (pelaku) penelitian. Alasan peneliti menggunakan jenis penelitian ini bertujuan untuk mendapatkan data sesuai dengan data lokasi, serta untuk menghindari data yang tidak valid terhadap kompas *Nagara*. Data yang diperoleh menggunakan teknik observasi dan telaah data melalui ilmu falak. Penelitian ini membuktikan bahwa hasil penunjukkan arah Qiblat kompas *Nagara* secara ilmiah belum dapat dikatakan akurat dan malah belum dapat dipertanggungjawabkan keilmiahannya, dan hanya dapat dijadikan sebagai alat bantu semata, untuk mengira-ngira “*arab*” Qiblat.

**Kata Kunci :** *Qiblat, Kompas, koreksi magnet,*

## INTRODUCTION

Initially, the Qibla (direction of prayer) for the Muslim community during Salah (prayer) was Bait al-Maqdis (the Farthest Mosque in Jerusalem).<sup>1</sup> This was based on the ijtihad (independent legal reasoning) of Prophet Muhammad (peace be upon him) since, at that time, Bait al-Maqdis was considered the most special place while the Kaaba was still surrounded by hundreds of idols.<sup>2</sup>

However, according to some narrations, despite Prophet Muhammad (peace be upon him) always facing Bait al-Maqdis in his prayers, when he was in Mecca, he would simultaneously face the Kaaba as well.<sup>3</sup> Meanwhile, the Jews remarked, "Muhammad contradicts us regarding our religion, yet he follows our Qibla. If it were not for our religion, he wouldn't know where to face in his prayers."<sup>4</sup>

<sup>1</sup> Ahmad Wahidi and Evi Dahliyat Nuroini, "Arah Kiblat Dan Pergeseran Lempeng Bumi: Perspektif Syar'iyah Dan Ilmiah" (UIN-Maliki Press, 2012).

<sup>2</sup> Muhammad Hadi Bashori, *Pengantar Ilmu Falak: Pedoman Lengkap Tentang Teori Dan Praktik Hisab, Arab Kiblat, Waktu Salat, Awal*

*Bulan Qamariah & Gerhana* (Pustaka Al Kautsar, 2015).

<sup>3</sup> Muhammad Rasywan Syarif, "Problematika Arah Kiblat Dan Aplikasi Perhitungannya," *HUNAF: Jurnal Studia Islamika* 9, no. 2 (2012): 245–69.

<sup>4</sup> Hasrian Rudi Setiawan and Hariadi Putraga, "Stellarium & Google Earth (Simulasi Waktu

Due to this, the Prophet was reluctant to continue following their Qibla, and it is narrated that he once said to the Angel Gabriel, "I wish that Allah would turn me away from the Qibla of the Jews to another Qibla." From then on, he continuously directed his gaze towards the sky, hoping to receive revelation that would establish the change of Qibla towards the Kaaba.<sup>5</sup>

This continued until approximately six months after the migration of Prophet Muhammad (peace be upon him), when the command from Allah SWT came to turn towards the Bait Allah (the Kaaba) during Salah. The command referred to the revelation of verse 144 of Surah Al-Baqarah, which states:

قَدْ نَرَى تَقَلُّبَ وَجْهِكَ فِي السَّمَاءِ فَلَنُوَلِّيَنَّكَ قِبْلَةً تَرْضَاهَا فَوَلِّ وَجْهَكَ شَطْرَ الْمَسْجِدِ الْحَرَامِ وَحَيْثُ مَا كُنْتُمْ فَوَلُّوا وُجُوهَكُمْ شَطْرَهُ وَإِنَّ الَّذِينَ أُوتُوا الْكِتَابَ لَيَعْلَمُونَ أَنَّهُ الْحَقُّ مِنْ رَبِّهِمْ وَمَا اللَّهُ بِغَافِلٍ عَمَّا يَعْمَلُونَ

Indeed, We see the turning of your face towards the heaven. So, We will surely turn you to a Qibla (direction

for prayer) that you will be pleased with. So, turn your face towards the Masjid al-Haram (the Sacred Mosque in Makkah). And wherever you [believers] are, turn your faces towards it (in prayer). Indeed, those who were given the Scripture (Jews and Christians) know that it is the truth from their Lord. And Allah is not unaware of what they do. (Quran, Surah Al-Baqarah, 2:144).

According to the verses and hadiths mentioned above, scholars unanimously agree that facing the Kaaba (*Bait Allah*) is obligatory for those who perform the prayer, as it is one of the conditions for the validity of the prayer.

عن أبي هريرة رضي الله عنه قال : قال النبي صلي الله عليه وسلم : إذا قمت الى الصلاة فاسبغ الوضوء ثم استقبل القبلة وكبر} رواه البخاري

The Prophet Muhammad (peace be upon him) emphasized the importance of facing the Qibla during prayer and instructed the believers to perfect their ablution before turning

Salat Dan Arah Kiblat),” *Kumpulan Buku Dosen*, 2020.

<sup>5</sup> ABD Karim Faiz, “Moderasi Fiqh Penentuan Arah Kiblat: Akurasi Yang Fleksibel,” *JIL: Journal of Islamic Law* 1, no. 1 (2020): 83–99.

towards the direction of the Sacred Mosque in Makkah.

In one of the hadiths narrated by Abu Hurairah, the Prophet (peace be upon him) advised that when preparing to perform the prayer, one should perform the ablution correctly, then face the Qibla and say the takbir.

عن أنس بن مالك رضي الله عنه قال :  
ان رسول الله صلى الله عليه وسلم كان يصلى  
نحو البيت المقدس فنزلت : قد نرى تقلب وجهك  
فى السماء فلنولينك قبلة ترضاها فول وجهك شطر  
المسجد الحرام فمر رجل من بنى سلمة وهم ركوع  
فى الصلاة الفجر وقد صلوا ركعة فنادى ألا ان  
القبلة قد حولت فمالوا كما هم نحو القبلة (رواه  
مسلم

Similarly, in another hadith narrated by Anas ibn Malik, the Prophet (peace be upon him) was praying towards Bait al-Maqdis (Jerusalem) until the revelation came, instructing him to face the Kaaba in Makkah instead. Upon receiving this revelation, the Prophet and his companions immediately changed their direction to face the new Qibla.

استقبال القبلة شرط من شروط  
صحة الصلاة بالكتاب والسنة والإجماع

Mean: Facing the Qibla is one of the essential requirements for the validity of prayer, as mentioned in the Quran, Hadith (sayings of the Prophet Muhammad), and Ijma (consensus of scholars).

Based on the verses and hadiths mentioned above, scholars unanimously agree that facing the Kaaba is a compulsory act during prayer, as it is one of the essential requirements for the validity of the prayer. Therefore, Muslims are required to face the Qibla while performing their daily prayers as an expression of unity and devotion to Allah.

For people around the Masjid al-Haram (the Sacred Mosque), the issue of Qibla (direction for prayer) poses no problem. However, for those who are far away from Mecca, this command sometimes raises issues and disagreements.

Now, the question arises, should one precisely face the Kaaba, or is it permissible to face its approximate direction? In this matter, it is essential to understand that Islam is not a difficult or burdensome religion. Allah says in Surah Al-Baqarah (2:286), "Allah does

not burden a soul beyond that it can bear."

Moreover, regarding the Qibla, we are commanded to face the Kaaba using the term "*syathrah*" (meaning direction or orientation). Therefore, it is evident that for someone who can directly see the Kaaba, it is obligatory for them to try to precisely face the Kaaba.<sup>6</sup> On the other hand, for someone who cannot directly see the Kaaba due to obstacles or distance, it is sufficient for them to face its general direction.

However, to attain the rewards and blessings of worship, we should strive to face a direction that is closer to the precise direction of the Kaaba. If we have found a direction based on scientific knowledge, for example, we should use that direction until a more accurate result is obtained.

This is in accordance with Allah's command in Surah Az-Zumar (39:17-18), which means, "...So give good tidings to My servants, who listen

to speech and follow the best of it. Those are the ones whom Allah has guided, and those are people of understanding."

Certainly, to reach a conclusion about which direction is closest to the truth, we need to examine the data, methods used, and the sources of information used to determine that direction.<sup>7</sup>

Among the various tools for determining the Qibla direction available in society, particularly in South Kalimantan, a compass called "*Nagara*" is found in one of the sub-districts of South Hulu Sungai Regency. This compass is now more commonly known as the "*Nagara*" compass.

The *Nagara* compass is a compass used to determine the Qibla direction. It has a red arrow that points directly to the Qibla when placed in position. The compass is produced in *Nagara*, which is also commonly known as the "*Nagara* Compass."<sup>8</sup>

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<sup>6</sup> Dwi Putra Jaya, "Dinamika Penentuan Arah Kiblat," *JURNAL ILMIAH MIZANI: Wacana Hukum, Ekonomi, Dan Keagamaan* 4, no. 1 (2018): 63–76.

<sup>7</sup> Dhiauddin Tanjung, "Urgensi Kalibrasi Arah Kiblat Dalam Penyempurnaan Ibadah Salat,"

*Al-Manabij: Jurnal Kajian Hukum Islam* 11, no. 1 (2017): 113–32.

<sup>8</sup> Moedji Raharto and Dede Jaenal Arifin, "Telaah Penentuan Arah Kiblat Dengan Perhitungan Trigonometri Bola Dan Bayang-Bayang Gnomon Oleh Matahari," *Jurnal Fisika*

One of the well-known compasses used for determining the Qibla direction is the "Nagara" compass. It is specially designed to assist Muslims in easily and accurately finding the Qibla direction. The *Nagara* compass utilizes modern technology, combining magnetic sensors with digital technology. The illustration below depicts the *Nagara* compass.



The system used by the *Nagara* compass to determine the Qibla direction is one of the simplest among many compasses. Simply placing the *Nagara* compass at the desired location will cause the red arrow on the compass to immediately point towards the Qibla direction.

The practicality of the *Nagara* compass is due to the simplicity of the device itself and the traditional method it employs. The absence of numerical degrees or cardinal directions on the

compass plate makes it straightforward. The arrow is directly oriented towards the Qibla.

At first glance, the *Nagara* compass appears very practical and easy to use. However, its lack of numerical markings and cardinal directions on the plate makes it difficult to determine the exact Qibla direction. Additionally, the direct pointing of the arrow towards the Qibla at the compass's location does not provide information about the exact degree or angle at which the Qibla direction is determined by the compass maker.

## METHOD

This research aims to investigate the use of the navigation device '*Nagara*' in determining the Qibla direction based on the perspective of Islamic astronomy. To achieve this objective, the research will adopt a qualitative approach with data collection techniques involving document analysis and compass measurements.

This study will adopt a qualitative research design, which allows

for a deep understanding of the usage of the 'Nagara' navigation device in determining the Qibla direction from the perspective of Islamic astronomy. The qualitative approach will help explore detailed perspectives and insights from Islamic astronomy experts regarding the calculations of the Qibla direction. The data sources for this research will come from two main sources, namely documents related to the usage of the 'Nagara' device.

Data collection will be conducted in two stages. The first stage involves document analysis, where data will be gathered from literature, scientific articles, and other reliable sources related to the 'Nagara' navigation device. The second stage involves compass measurements with research participants, where the focus will be on calculating the 'Nagara' device based on Islamic astronomy principles.

To enhance the validity and reliability of the research, the researcher will use data triangulation by comparing and confirming findings from various data sources. Additionally, the entire

research process will be documented in detail to ensure transparency and reproducibility of the research outcomes.

By adopting a qualitative research method and gathering data from various sources, this study is expected to contribute significantly to the understanding of the usage of the 'Nagara' navigation device in determining the Qibla direction from the perspective of Islamic astronomy. The findings of this research are anticipated to support further developments in the field of Islamic astronomy.

## RESULT AND DISCUSSION

Among the various compasses available, the *Nagara* compass utilizes the simplest system for determining the Qibla direction. Using the *Nagara* compass is straightforward; one only needs to place it in the desired location to find the Qibla direction instantly, as indicated by the red arrow on the compass.<sup>9</sup>

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<sup>9</sup> Bashori, *Pengantar Ilmu Falak*; Arwin Juli Rakhmadi Butar-Butar, "Kajian Ilmu Falak Di Indonesia: Kontribusi Syaikh Hasan Maksum

Dalam Bidang Ilmu Falak," *Dalam Journal of Contemporary Islam and Muslim Societies* 1, no. 1 (2017).

Aside from its practicality and ease of use, the *Nagara* compass has no numerical markings for degree units or cardinal directions on its plate.<sup>10</sup> Its surface is plain and devoid of any writing, making it difficult to determine the exact Qibla direction. Moreover, the direct pointing of the arrow towards the Qibla at the compass's location does not provide information about the degree at which the compass maker determined the Qibla direction, whether from the North to the West or from the West to the North. As a result, its accuracy cannot be scientifically justified.

Considering the operation of this compass system, a significant weakness is apparent in the arrow's direction. The *Nagara* compass's fundamental weakness lies in the accuracy of its arrow's indication.

It can be deduced from the compass's operation that, before creating the *Nagara* compass, the maker determined the Qibla direction that would be indicated by the red arrow on the compass plate, and the placement of

the red arrow was merely estimated based on previous examples.

Previously, to determine the Qibla direction using the *Nagara* compass based on the science of Hisab (Islamic astronomy),<sup>11</sup> it could be found through calculations using the formula  $\frac{1}{2} ABC$  with the following location data:  $2^{\circ} 42'$  South latitude and  $115^{\circ} 05'$  East longitude.

$$\begin{aligned} \frac{\cos \frac{1}{2} (a-b)}{\operatorname{Tg} \frac{1}{2} (A+B)} &= \frac{\operatorname{Cotg} \frac{1}{2} C}{\cos \frac{1}{2} (a+b)} \\ \operatorname{Tg} \frac{1}{2} (A-B) &= \frac{\operatorname{Cotg} \frac{1}{2} C}{\sin \frac{1}{2} (a-b)} \\ \operatorname{Tg} \frac{1}{2} (A-B) &= \frac{\operatorname{Cotg} \frac{1}{2} C}{\sin \frac{1}{2} (a+b)} \\ B &= \frac{1}{2} (A+B) - \frac{1}{2} (A-B). \\ a &= 90^{\circ} - (-2^{\circ} 42') = 92^{\circ} 42' \\ b &= 90^{\circ} - 21^{\circ} 25' = 68^{\circ} 35' \\ c &= 115^{\circ} 05' - 39^{\circ} 50' = 75^{\circ} 15' \\ \frac{1}{2} a - b &= 92^{\circ} 42' - 68^{\circ} 35' = 24^{\circ} 07' : \\ &= 12^{\circ} 03' 30'' \\ \frac{1}{2} a + b &= 92^{\circ} 42' + 68^{\circ} 35' = 161^{\circ} 17' : \\ &= 80^{\circ} 38' 30'' \\ \frac{1}{2} C &= 75^{\circ} 02' : 2 = 37^{\circ} 37' 30'' \\ \log \cos \frac{1}{2} (a - b) &= 9.99031018 \\ \log \cos \frac{1}{2} (a + b) &= \underline{9.21114315} - \\ &10.77916703 \end{aligned}$$

<sup>10</sup> Taufiqurrahman Kurniawan, "Ilmu Falak Dan Tinjauan Matlak Global" (MPKSDI

Yogyakarta, 2010); Riza Afrian Mustaqim, *Ilmu Falak* (Syiah Kuala University Press, 2021).

<sup>11</sup> Mustaqim, *Ilmu Falak*.

$$\begin{aligned} \log \cotg \frac{1}{2} C &= \underline{10.11305885 +} \\ \log \tg \frac{1}{2} (A + B) &= 10.89222588 \\ \frac{1}{2} (A + B) &= 82^\circ 41' 47'', 13 \\ \log \sin \frac{1}{2} (a - b) &= 9.31995391 \\ \log \sin \frac{1}{2} (a + b) &= \underline{9.99418102 -} \\ 9.32577289 & \\ 9.32577289 \quad \log \quad \cotg \quad \frac{1}{2} & \\ C &= \underline{10.11305885 +} \\ \log \tg \frac{1}{2} (A - B) &= 9.43883174 \\ \frac{1}{2} (A - B) &= 15^\circ 21' 33'', 71 \\ \frac{1}{2} (A + B) - \frac{1}{2} (A - B) &= 82^\circ 41' 47'', 13 \\ &- 15^\circ 21' 33'', 71 \\ B \text{ (Qiblat)} &= 67^\circ 20' 13'', 42 \text{ to } 67^\circ 20' \\ &\text{from north to west or } 22^\circ 39' 46'', 58 = \\ &22^\circ 40' \text{ from west to north.} \end{aligned}$$

Let's solve the trigonometric equations step by step:

Given trigonometric equations:

$$\begin{aligned} 1. \quad \cos(\frac{1}{2}(a-b)) * \tg(\frac{1}{2}(A+B)) &= \\ \cotg(\frac{1}{2}C) / \cos(\frac{1}{2}(a+b)) * \sin(\frac{1}{2}(a-b)) & \\ 2. \quad \tg(\frac{1}{2}(A-B)) &= \cotg(\frac{1}{2}C) / \\ \sin(\frac{1}{2}(a+b)) & \end{aligned}$$

Given values:

$$\begin{aligned} a &= 92^\circ 42' \text{ (92 degrees 42 minutes)} \\ b &= 68^\circ 35' \text{ (68 degrees 35 minutes)} \\ c &= 75^\circ 15' \text{ (75 degrees 15 minutes)} \end{aligned}$$

Now, let's calculate the intermediate values:

$$\begin{aligned} 1. \quad \frac{1}{2}(a-b) &= (92^\circ 42' - 68^\circ 35') = 24^\circ 07' \\ &\text{(24 degrees 07 minutes)} \end{aligned}$$

$$\begin{aligned} \text{Therefore, } \frac{1}{2}(a-b) &= 12^\circ 03' 30'' \text{ (12} \\ &\text{degrees 03 minutes 30 seconds)} \end{aligned}$$

$$\begin{aligned} 2. \quad \frac{1}{2}(a+b) &= (92^\circ 42' + 68^\circ 35') = 161^\circ \\ &17' \text{ (161 degrees 17 minutes)} \end{aligned}$$

$$\begin{aligned} \text{Therefore, } \frac{1}{2}(a+b) &= 80^\circ 38' 30'' \text{ (80} \\ &\text{degrees 38 minutes 30 seconds)} \end{aligned}$$

$$3. \quad \frac{1}{2}C = 75^\circ 02' \text{ (75 degrees 02 minutes)}$$

$$\begin{aligned} \text{Therefore, } \frac{1}{2}C &= 37^\circ 37' 30'' \text{ (37} \\ &\text{degrees 37 minutes 30 seconds)} \end{aligned}$$

4. Calculate the logarithmic values using the given formulas:

$$\log \cos \frac{1}{2}(a-b) = 9.99031018$$

$$\log \cos \frac{1}{2}(a+b) = 9.21114315$$

$$\log \cotg \frac{1}{2}C = 10.11305885$$

$$\log \tg \frac{1}{2}(A+B) = 10.89222588$$

$$\log \sin \frac{1}{2}(a-b) = 9.31995391$$

$$\log \sin \frac{1}{2}(a+b) = 9.99418102$$

Now, calculate  $\frac{1}{2}(A+B)$  and  $\frac{1}{2}(A-B)$ :

$$\begin{aligned} \frac{1}{2}(A+B) &= 82^\circ 41' 47.13'' \text{ (82 degrees} \\ &\text{41 minutes 47.13 seconds)} \end{aligned}$$

$$\log \cotg \frac{1}{2}C = 10.11305885$$

$$\log \tg \frac{1}{2}(A-B) = 9.43883174$$

$\frac{1}{2}(A-B) = 15^{\circ} 21' 33.71''$  (15 degrees 21 minutes 33.71 seconds)

Finally, calculate B (Qiblat):

$B$  (Qiblat) =  $67^{\circ} 20' 13.42''$  (67 degrees 20 minutes 13.42 seconds) or

$B$  (Qiblat) =  $22^{\circ} 39' 46.58''$  (22 degrees 39 minutes 46.58 seconds) (rounded to the nearest minute) depending on whether the angle is measured from the North to the West or from the West to the North.

Based on the calculations, we can determine that the Qibla direction in the *Nagara* area is  $67^{\circ} 20'$  from North to West and  $22^{\circ} 40'$  from West to North. However, the direction indicated by the arrow of the *Nagara* compass does not align with the aforementioned Qibla direction.

It is well-known that the compass needle or magnetic needle does not always point towards the True North at a specific location. This is due to the fact that the magnetic poles of the Earth do not coincide with the geographic poles (True North and True South). The deviation of the compass needle from the geographic North to South at a given location is referred to

as the magnetic variation or magnetic declination.

To determine the true geographic North direction using a compass at a particular location, it is essential to correct for the magnetic declination of that location. In the general area of South Kalimantan and potentially in *Nagara*, this magnetic correction typically ranges from  $1.5^{\circ}$  to  $1^{\circ} 30'$ . However, the *Nagara* compass does not appear to account for this magnetic correction.

The deviation of the compass needle from the True North direction can be attributed to the misalignment between the magnetic poles of the Earth and the geographic poles. The compass needle is usually marked in red and points towards the geographic North, which is known as the magnetic North pole. The deviation of the compass needle to the left or right from the True North direction is expressed as Negative Declination (Declination West) or Positive Declination (Declination East).

In conclusion, when using a compass to determine the true geographic North direction at a specific

location, it is crucial to consider the magnetic declination of that location. For more precise purposes, such as astronomy, determining the True North direction should be done through astronomical observations, and the use of the compass should be free from magnetic interference, particularly from objects or places containing iron and the like.

Based on the author's observations of several collected *Nagara* compasses, it is noted that the direction indicated by the arrow points to approximately  $65^{\circ} 30'$  from North to West and  $24^{\circ} 30'$  from West to North. Thus, there is a difference of about  $1^{\circ} 30'$  compared to the calculations based on Islamic astronomy principles. This difference may vary and could be smaller or larger depending on the circumstances.

This discrepancy is due to the traditional calculation system and data used by the compass maker. The placement of the red arrow pointing to the Qibla direction is merely estimated based on previous examples, making it

scientifically challenging to justify its accuracy.

As a result of the estimated placement of the red arrow pointing to the Qibla direction, the Qibla direction may differ between different *Nagara* compasses produced at the same time, as well as between compasses produced at different times.<sup>12</sup>

At first glance, there may not be an apparent difference between the Qibla directions indicated by one *Nagara* compass compared to another, or between the *Nagara* compass and the true Qibla direction. However, a more precise examination using tools such as Theodolites or a simple string hanging method based on right-angled triangle formulas would reveal differences or deviations in the Qibla direction indicated by the *Nagara* compass.

To clarify further, the deviation or inclination of approximately 1.5 degrees may not be clearly visible, but when a long string or rope is pulled, the difference becomes more apparent as the string or rope widens.

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<sup>12</sup> Sayful Mujab and M. Rifa Jamaludin Nasir, "Ilmu Falak (Dimensi Kajian Filsafat Ilmu),"

*AL-AFAQ: Jurnal Ilmu Falak Dan Astronomi* 2, no. 2 (2020): 1–18.

Considering the deviation based on Islamic astronomy principles, the following explanation can be provided:

Based on the Earth's circumference of 40,000 km, 1 degree of longitude is approximately 40,000 divided by 360 degrees, which equals 111.111 kilometers (rounded to approximately 111 kilometers).

For lines of latitude running from North to South, the value of 1 degree remains around 111 kilometers. However, for lines of longitude running from West to East along the equator, the value of 1 degree varies depending on the distance from the equator. The farther away from the equator, the smaller the unit in kilometers, and vice versa, with the formula 1 degree of parallel = 111 kilometers x cosine of the latitude.

Thus, for the deviation or discrepancy of determining the Qibla direction using the *Nagara* compass at the location of Banjarmasin of 1 degree 30 minutes, the deviation in the lines of longitude (North-South) is approximately 166.5 kilometers. This result is derived from 1 degree 30 minutes multiplied by 111 kilometers,

resulting in 166.5 kilometers from the actual Qibla direction or the position of the Kaaba.

Furthermore, on the lines of latitude (West-East), the deviation or discrepancy is approximately 155 kilometers, as calculated below:

$$\begin{aligned} 1 \text{ degree of parallel} &= 111 \\ \text{kilometers} \times \text{cosine of the latitude} \\ \text{of Mecca} \\ &= 111 \times \cos 21 \text{ degrees } 25 \\ \text{minutes} \\ &= 111 \times 0.9309496381 \\ &= 103.3354098 \text{ kilometers} \end{aligned}$$

This means that 103.3354098 kilometers x 1 degree 30 minutes = 155 kilometers from the actual Qibla direction or the position of the Kaaba.

It can be imagined how significant the deviation or discrepancy is if the *Nagara* compass is used as a guide to determine the Qibla direction, a value that is difficult to tolerate for the accuracy of the Qibla direction.

Although this distance may not seem too far at first glance, according to actual calculations, it is

indeed a considerable distance. The 166.5 kilometers distance from the Mecca region is a straight-line distance, not the road distance measured for motor vehicles, as the path is not straight. Even though the streets in Mecca may appear straight, it is only an approximation in our perception, while the actual measurements may differ.

Moreover, the *Nagara* compass is not only used in the *Nagara* region but throughout Kalimantan, and some people even take it to Java Island, claiming that the *Nagara* compass's Qibla direction indication is accurate. However, such a conclusion raises doubts about the accuracy of the data.

Considering the significant discrepancies and the potential inaccuracy of the *Nagara* compass's Qibla direction indication, it is crucial for users, especially those relying on precise Qibla direction, to exercise caution and consider alternative methods, such as astronomical calculations or the use of more advanced navigation

devices, for accurate determination of the Qibla direction.

## CONCLUSION

Based on the previous discussion, it is evident that the Qibla direction indication provided by the *Nagara* compass cannot be considered scientifically accurate, and its reliability cannot be substantiated. The compass may serve as a basic tool to estimate the Qibla direction, but it cannot be fully relied upon for precise and scientifically sound results.

The traditional design and rudimentary construction of the *Nagara* compass, coupled with the lack of specific markings or calibrated measurements, contribute to its limitations in providing accurate Qibla directions. The placement of the red arrow pointing to the Qibla is based on approximate assumptions rather than precise calculations, resulting in discrepancies between the compass reading and the actual Qibla direction.

Moreover, the *Nagara* compass does not account for magnetic declination, which is a crucial factor affecting the accuracy of any compass

readings. The presence of magnetic variations in different regions further compounds the uncertainties in the Qibla direction determined by the *Nagara* compass.

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