doi:10.15364/ris14-0103-03 Vol. 1 No. 3 (2014): 23-42

RJS Online Journal Research in Islamic Studies UNIVERSITI MALAYA

Original Article

Application of methods of Westernmost Point and Multiple Reference Points in determining zone-based prayer time: A study in Selangor

Mohd Paidi Norman[a,*], Mohd Zambri Zainuddin[b], Saadan Man[a]

[a] Department of Fiqh and Usul, Academy of Islamic Studies, University of Malaya, Malaysia

[*] apai_norman@yahoo.com

[b] International Institute of Islamic Thought and Civilisation, International Islamic University of Malaysia

ABSTRACT

The time of a particular prayer (*salat*) must be accurate for a Muslim to be able to perform the act of worship. This is to avoid the prayer from being performed before its stipulated time. The eccentricity of the Earth's orbit and the inclination of its axis alter the time of a particular *salat* every year. The Department of Islamic Development Malaysia (JAKIM) has established the Time Zone Concept for the time of *salat* with specific terms and conditions based on all zones. Scientifically, two types of techniques are used to specify the time of *salat*; the Westernmost Point Technique and the Multiple Reference Points Technique. This study was conducted in order to compare each technique based on the calculation between the variant setting points and the effect on the time of *salat* for the year 2013 in the state of Selangor, Malaysia. This study found that the Multiple Reference Points Technique is more appropriate method in determining the time of *salat* because it represents the whole entire zone.

Keywords: Prayer Time Zones, Multiple Reference Points Technique, Westernmost Point Technique, comparative analysis, Selangor

Introduction

"*Tasyir*" is a term for easiness in Islam, which helps the Department of Islamic Development Malaysia (JAKIM) to introduce the Time Zone Concept; whereas the precise time for the daily prayers (*salat*) in one's zone is based on a fixated place in the particular zone. This has been agreed upon by the Islamic authority of the respective states to act as a reference point in determining the exact and precise time of *salat*.

This initiative was introduced in order to avoid any misconception or discrepancies when determining the time of *salat* in every state in Malaysia. Before the Time Zone Concept was introduced, most of the time of *salat* were to be based on different places, either a city or a number of certain villages.[1]

[1] Md Adnan Md Daud, *Penyelarasan Waktu Solat di Malaysia*. (Putrajaya: JAKIM, n.d.).

However, such indicators cannot be used because the existence of many villages in one's city would result in many different times of *salat*. Thus, having the Time Zone to determine the time of *salat* helps Muslims to determine the correct time based on their zone.

The distribution of prayer zones needs to take into account various factors such as the position of the Sun, as well as the size and shape of the surface of an area included in the prescribed zone which needs to be uniform between each other. Although the method of fixing a prayer zone is verified by the State religious authorities, it is still required that the specific criteria set by JAKIM are referred to. Among the criteria[2] are as follows:

(i) Each prescribed prayer time zone should not exceed two minutes;

(ii) A reference station zone must be within the West in the zone;

(iii) Highland areas such as hills and mountains, or islands would have separate time zones.[3]

The two minutes difference in each zone means that the difference between the East and the West for a particular zone is less than or equal to two minutes. The two minutes have been approved by the majority of the *mufti* who represented the States in Malaysia, as it hardly affects the *tahrim* (the banned) prayer in addition to taking into account the interests and virtues of praying at the beginning of time.[4] However, there are two methods used in Malaysia in determining the reference guide in the matter of prayer time in a zone; namely the Westernmost Point Technique and the Multiple Reference Points Technique.

Prayer Time Zone related issues

If seen in general, these prayer time zones used at present are still not unified with each other, and there are many improvements that need to be done in order to overcome any confusion that may arise. This inconsistency may be due to different geographical factors within an area or a zone.

Generally, an area or a zone is divided by State, district or districts based on the geographical conditions of the area. In the past, settlements were more concentrated in urban areas, towns and villages which become the heart of a region, as compared to the border areas which are mostly forest areas. Prayer times for border areas in a district or zone are not dealt with because most of them have not been explored and therefore are mostly inhabited. Thus, the issue of a need for prayer times at the border areas did not arise at the time.

However, with the population of Malaysians growing in tandem with the rapid development of the country, many new areas including border areas are being developed

[2] This was determined and decided by the Technical Committee on the Hijri Calendar, Islamic Affairs Division (BAHEIS). BAHEIS is the precursor to JAKIM.

[3] Mustafa Din Subari and Mohamad Saupi Che Awang, "Waktu Solat Setempat: Satu Pemurnian kepada Waktu Solat Berasaskan Zon," Working paper presented at Persidangan Muzakarah Falak, 2011.

[4] Mohamad Saupi Che Awang, "Penyelarasan Ihtiyati dalam Waktu Solat: Pandangan Teknikal," Working paper presented at Muzakarah Jawatankuasa Teknikal Kalendar Islam, Kuala Terengganu, 2005.

into residential areas. This indirectly resulted in the need for a review of the prayer times for each zone, in particular zones which now has a population at the border areas.

Residents who remained at the border areas between zones will experience confusion due to the difference in the time of references. In addition, the differences between East and West in a zone may exceed two minutes due to its large interval. For example, the real dawn on 22 December 2012 for Kuala Langat is 5:51 a.m., but residents had to wait until 5:55 a.m. for prayers because the reference station used is Bagan Nakhoda Omar.[5]

Prayer Time Zone in Selangor

The State of Selangor is one of the States in the Federation of Malaysia, located on the West Coast of Peninsular Malaysia, and borders Negeri Sembilan to the South, Perak to the North, and the Straits of Malacca to the West. Selangor has an area of 8,104 km^2. The State consists of nine districts: Sabak Bernam, Kuala Selangor, Klang, Kuala Langat, Sepang, Hulu Langat, Petaling, Gombak, and Hulu Langat.

The method used in the determination of prayer times based on the zone is the Westernmost Point method, where the selected reference station is the station located at the Westernmost Point. Based on the results of the Coordination Meeting for prayer time zones throughout the country, the prayer times for the whole of Selangor have set a total of two zones.

The zones are Zone 1 which is the Eastern zone, comprised of the districts of Hulu Selangor, Rawang, Hulu Langat, Petaling and Sepang, which are based on the coordinates of the reference point of Gedangsa Village; while Zone 2 which is the Western zone is made up of the districts of Sabak Bernam, Kuala Selangor, Klang, and Kuala Langat which are based on the coordinates of the reference town of Bagan Nakhoda Omar situated in Sabak Bernam.[6]

Westernmost Point Technique

This method is used officially for many States including Selangor. The point or selected reference station is on the Western side of a zone. This is influenced by the movement of the sun rising in the East and sets in the West every day. When the station in the West made reference to time, it assumes that the whole of the zone is also time for *salat*.

This means that people in the Middle-Eastern area have to wait a while for the obligatory prayers as they have to wait for the Western side to reach the time for said prayers. In studying this method, the author selects the reference point used by the Selangor Mufti Department and JAKIM in calculating the prayer time table.

[5] Nurul Asikin Che Daud and Mohamad Saupi Che Awang, "Penambahbaikan Zon-zon Waktu Solat di Malaysia Menggunakan Kaedah Isotime," Working paper presented at Mesyuarat Zon-zon Waktu Solat Seluruh Malaysia, Institut Latihan Islam Malaysia, Bangi, Selangor, 2012.

[6] Wan Kamel Wan Hussain, "Penentuan Waktu Solat dan Zon Waktu," Working paper presented at Seminar Falak Syarie, 2007.

The coordinates of the selected points which are the most Western points located within each zone are calculated. For Zone 1, the coordinates of the reference point selected is Gedangsa which is located at latitude 3° 44' N and longitude 101° 23' E; while the coordinates chosen as a reference point for Zone 2 is the town of Bagan Nakhoda Omar which is located at latitude 3° 46' N and longitude 100° 53' E.[7]

Multiple Reference Points Technique

This method requires a few selected points to be used as references. This is because the point or the Westernmost station is not necessarily the furthest Western point for *salat*.[8]

As is known, the Earth orbits the Sun by leaning on its orbital plane. If seen from the point of the movement of the Sun all year round, it is found that the movement of the Sun experiences changes in the path where there is sunset time that leads to the North-West, and at times it leads to the South-West. This is relative to the position of the Earth around the Sun which is tilted at 23.5° on its axis.[9]

Changes in the position of the Sun resulted in the check-in times varying according to the zone and the season. For the purposes of the study of this method, the authors have chosen a number of reference points around the circumference, representing each district in Zone 1 and Zone 2.

The coordinates for every point are obtained from Google Earth, and are selected at random, where the prayer times for every point will be calculated. The following pages contain Table 1 and Table 2.

Table 1 shows the reference points for the districts located in Zone 1, while Table 2 shows the reference points for the districts located in Zone 2. Both tables are data that are used for the Multiple Reference Points Technique.

[7] JAKIM, "Zon-zon Waktu Solat Seluruh Malaysia," Working paper presented at Mesyuarat Zon-zon Waktu Solat Seluruh Malaysia, Institut Latihan Islam Malaysia, Bangi, Selangor, 2012.

[8] Abdul Halim bin Abdul Aziz, "Kajian Terperinci Waktu-Waktu Solat dalam Beberapa Zon di Malaysia," Working paper presented at Persidangan Muzakarah Falak, 2011.

[9] Baharrudin Zainal, *Ilmu Falak Edisi Kedua*. (Kuala Lumpur: Dewan Bahasa dan Pustaka, 2004), p. 60.

Table 1

Reference Points for Zone 1 Using Multiple Reference Points Technique

Location	Latitude	Longitude
Hulu Langat		
Bukit Repin	3° 16’	101° 52’
Kg. Seri Macang	2° 52’	101° 54’
Poyong	3° 3’	101° 59’
Serdang Lama	3° 00’	101° 43’
Sepang		
K. Sepang	2° 35’	101° 43’
Kg. Tanah Liat	2° 58’	101° 35’
Rezab Sg. Buah	2° 52’	101° 48’
UPM	3° 00’	101° 43’
Petaling		
UPM	3° 00’	101° 43’
Bukit Cahaya	3° 12’	101° 26’
Kg. Tanah Liat	2° 58’	101° 35’
Taman Desa Jaya	3° 13’	101° 38’
Gombak		
Bukit Repin	3° 16’	101° 52’
G. Bunga Buah	3° 27’	101° 46’
Sg. Semungkin	3° 9’	101° 49’
Tg. Resam	3° 24’	101° 28’
Hulu Selangor		
Bkt. H Klang	3° 36’	101° 50’
G. Bunga Buah	3° 27’	101° 46’
A	3° 36	101° 22’
Kg. Seri Keledang	3° 47’	101° 19’

Table 2

Reference Points for Zone 2 Using Multiple Reference Points Technique

Location	Latitude	Longitude
Kuala Langat		
Kg. Kokon	2° 52’	101° 17’
Kg. Tambak Pantai	2° 38’	101° 36’
Kg. Tanah Liat	2° 58’	101° 35’
Sg. Labu	2° 48’	101° 41’
Kuala Selangor		
Bkt. Tarek	3° 29’	101° 28’
B	3° 36’	101° 22’
Kem. D	3° 29’	101° 6’
Kg. Kubu Gajah	3° 12’	101° 30’
Kg. Tambak Jawa	3° 10’	101° 19’
Klang		
H. Bkt.Kampas	3° 12’	101° 27’
Kg. Tambak Jawa	3° 10’	101° 19’
Kg. Tanah Liat	2° 58’	101° 35’
Pulau Pintu Gedong	2° 53’	101° 14’
Sabak Bernam		
Bagan Sg. Lalang	3°51’	100°49’
B	3°36’	101°22’
Kem. D	3°29’	101°6’
E	3°42’	101°21’
S. Bernam	3°52’	100°57’

Findings

For Zone 1, certain districts have experienced delayed prayer times when compared to the prayer times at Kg. Gedangsa. Among the districts involved are Petaling which experienced delayed Maghrib and Isya' in January, November and December, dawn in July, and Asr in August and September. Besides Petaling, Gombak district also experienced a delayed time for Isya' in January and dawn in May and June. Sepang district is also not exempted from delay as the time for Isya' in January, and dawn in May and June.

Table 3

Zone 1 Areas Experiencing Delayed Time Compared to Kg. Gedangsa

Date	Kg.Gedangsa		Petaling		Gombak		Sepang	
	Maghrib	Isya'	Maghrib	Isya'	Maghrib	Isya'	Maghrib	Isya'
10 Jan	19:20	20:34	19:21	20:35	19:20	20:34	19:21	20:35
11 Jan	19:21	20:34	19:21	20:35	19:21	20:35	19:21	20:35
12 Jan	19:21	20:35	19:22	20:35	19:21	20:35	19:21	20:35
13 Jan	19:22	20:35	19:22	20:36	19:21	20:35	19:22	20:36
14 Jan	19:22	20:35	19:22	20:36	19:22	20:36	19:22	20:36
15 Jan	19:23	20:36	19:23	20:36	19:22	20:36	19:23	20:36
16 Jan	19:23	20:36	19:23	20:37	19:23	20:36	19:23	20:37
17 Jan	19:23	20:36	19:24	20:37	19:23	20:37	19:23	20:37
18 Jan	19:24	20:37	19:24	20:37	19:23	20:37	19:24	20:37
19 Jan	19:24	20:37	19:24	20:38	19:24	20:37	19:24	20:37
20 Jan	19:24	20:37	19:25	20:38	19:24	20:37	19:24	20:38

Each of the districts involved have experienced delayed prayer of one minute in comparison to prayer time at Kg. Gedangsa and Hulu Selangor. This time delay is even more serious when it involves the Maghrib prayer as experienced in the district of Petaling. This is because Maghrib time not only involves prayer time but also the breaking of fast during Ramadan, which in effect would render the fast void if the residents of the district break fast before its actual time.

If the calculated difference between the Westernmost and Easternmost points in Zone 1, the difference of time is four minutes. The difference can be seen in the prayer time table calculated for May, June and July. To obtain the value of the difference, the authors refer to prayer subdivisions (2° 52' N, 101° 54' E) representing the East, and Hulu Selangor (3° 47' N, 101° 19' E) representing the Western area in Zone 1. The difference between prayer time in Hulu Selangor and Hulu Langat is then calculated to determine the difference in time. The difference is clearly inconsistent with the two minutes criteria stipulated by JAKIM as agreed by the State *mufti*.[10]

[10] Mohamad Saupi, "Penyelarasan Ihtiyati."

Table 4

Difference between Eastern and Western Areas in Zone 1

Date	Hulu Langat Kg. Seri Macang (2° 52’ N, 101° 54’ E)		Hulu Selangor Kg. Seri Keledang (3° 47’ N, 101° 19’ E)	
	Maghrib	**Isya’**	**Maghrib**	**Isya’**
1 June	19:19	20:34	19:23	20:38
2 June	19:19	20:34	19:23	20:38
3 June	19:19	20:34	19:23	20:38
4 June	19:20	20:34	19:23	20:38
5 June	19:20	20:35	19:24	20:39
6 June	19:20	20:35	19:24	20:39
7 June	19:20	20:35	19:24	20:39
8 June	19:20	20:36	19:24	20:40
9 June	19:21	20:36	19:24	20:40
10 June	19:21	20:36	19:25	20:40

If seen from the perspective of the value of the difference of latitude and longitude of Zone 1, it is found that the value of the difference between the maximum and minimum is latitude 55' (arc minutes), while the value of the difference between the maximum and minimum longitude is 40' (arc minutes). This difference in latitude and longitude is quite large and is likely to cause the value of differences for prayers at the Eastern and Western points in a zone to be more than the range of two minutes.

Table 4.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 1

	Latitude	Longitude
Maximum	3.78333°	101.98333°
Minimum	2.86667°	101.31667°
Difference (arc minutes)	55’	40’

To overcome the delay in time, the authors propose that Zone 1 adopts the method of Multiple Reference Points instead of the Westernmost Point, in which this suggestion would include the entire zone. In order to overcome the size of a relatively large Zone 1, the authors propose that Zone 1 is divided into three sub-zones, where the District of Hulu

Selangor is Zone 1.1, the districts of Petaling and Gombak make up Zone 1.2, while Hulu Langat and Sepang are placed in Zone 1.3.

Table 5

Breakdown of Proposed Districts For Zone 1

Zone 1.1	Zone 1.2	Zone 1.3
Hulu Selangor	Petaling Gombak	Sepang Hulu Langat

Table 6

Time Difference between East and West of Zone 1.1

Date	**Hulu Selangor** Bkt. H. Kelang (3° 36’ N, 101° 50’ E)		**Hulu Selangor** Kg. Seri Keledang (3° 47’ N, T 101° 19’ E)	
	Maghrib	**Isya’**	**Maghrib**	**Isya’**
1 June	19:20	20:35	19:23	20:38
2 June	19:21	20:36	19:23	20:38
3 June	19:21	20:36	19:23	20:38
4 June	19:21	20:36	19:23	20:38
5 June	19:21	20:36	19:24	20:39
6 June	19:21	20:37	19:24	20:39
7 June	19:21	20:37	19:24	20:39
8 June	19:22	20:37	19:24	20:40
9 June	19:22	20:37	19:24	20:40
10 June	19:22	20:38	19:25	20:40

Table 6.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 1.1

	Latitude	**Longitude**
Maximum	3.78333°	101.83333°
Minimum	3.47000°	101.31667°
Difference (arc minutes)	20’	31’

Table 7

Time Difference between East and West of Zone 1.2

Date	Gombak Bukit Repin (3° 16’ N, 101° 52’ E)		Petaling Bukit Cahaya (3° 12’ N, 101° 26’ E)	
	Maghrib	**Isya’**	**Maghrib**	**Isya’**
1 June	19:20	20:35	19:21	20:36
2 June	19:20	20:35	19:22	20:36
3 June	19:20	20:35	19:22	20:37
4 June	19:20	20:35	19:22	20:37
5 June	19:21	20:36	19:22	20:37
6 June	19:21	20:36	19:22	20:37
7 June	19:21	20:36	19:23	20:38
8 June	19:21	20:36	19:23	20:38
9 June	19:21	20:37	19:23	20:38
10 June	19:22	20:37	19:23	20:39

Table 7.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 1.2

	Latitude	**Longitude**
Maximum	3.15000°	101.86667°
Minimum	2.96667°	101.43333°
Difference (arc minutes)	11’	26’

Table 8

Time Difference between East and West of Zone 1.3

Date	Hulu Langat Poyong (3°3' N, 101° 59' E)		Sepang Kg. Tanah Liat (2° 58' N, 101° 35' E)	
	Maghrib	**Isya'**	**Maghrib**	**Isya'**
1 June	19:19	20:34	19:20	20:35
2 June	19:19	20:34	19:21	20:35
3 June	19:19	20:34	19:21	20:36
4 June	19:20	20:34	19:21	20:36
5 June	19:20	20:35	19:21	20:36
6 June	19:20	20:35	19:21	20:36
7 June	19:20	20:35	19:22	20:37
8 June	19:20	20:36	19:22	20:37
9 June	19:21	20:36	19:22	20:37
10 June	19:21	20:36	19:22	20:38

Table 8.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 1.3

	Latitude	**Longitude**
Maximum	3.05000°	101.98333°
Minimum	2.58333°	101.58333°
Difference (arc minutes)	28'	24'

Zone 2

For Zone 2, studies have shown that certain districts have experienced delays in prayer times if seen from the point of difference in time with the town of Bagan Nakhoda Omar. Prayer times for Sabak Bernam determined using the method of Multiple Reference Points experienced a delay time of one minute compared to the town of Bagan Nakhoda Omar as seen on 11, 15 and 19 June 2013. The district of Klang is also one of the districts affected by this problem, which can be seen between 25 May and 6 June, at which the time of Fajr was late by one minute compared to Bagan Nakhoda Omar.

Table 9

Zone 2 Area (Sabak Bernam) Experiencing Delayed Time Compared to Bandar Nakhoda Omar

Date	Bandar Nakhoda Omar		Sabak Bernam (multiple points)	
	Zohor	Isya'	Zohor	Isya'
9 June	13:17	20:42	13:18	20:42
10 June	13:17	20:42	13:18	20:42
11 June	13:18	20:42	13:18	20:43
12 June	13:18	20:42	13:18	20:43
13 June	13:18	20:43	13:18	20:43
14 June	13:18	20:43	13:19	20:43
15 June	13:18	20:43	13:19	20:44
16 June	13:19	20:43	13:19	20:44
17 June	13:19	20:44	13:19	20:44
18 June	13:19	20:44	13:19	20:44
19 June	13:19	20:44	13:20	20:45
20 June	13:20	20:44	13:20	20:45

In addition, the difference between the two districts during dusk was a total of four minutes as observed over a few days in June and July. This means that the residents of the Klang have to wait for four minutes for the breaking of fast. This is in contradiction to the Prophet's advice to hasten the breaking of fast as soon as the sun sets.

Kuala Langat also faces the same problem, as observed in June and July where the time difference for dusk was a total of four minutes, in addition to one minute difference observed at dawn. Multiple Reference Points Technique is seen as a useful method to overcome this delay.

Table 10

Zone 2 Areas (Klang and Kuala Langat) Experiencing Delayed Time Compared to Bandar Nakhoda Omar

Date	Bandar Nakhoda Omar			Klang			Kuala Langat		
	Fajr	Maghrib	Isya'	Fajr	Maghrib	Isya'	Fajr	Maghrib	Isya'
1 June	5:41	19:25	20:39	5:42	19:22	20:37	5:41	19:21	20:36
2 June	5:41	19:25	20:40	5:42	19:22	20:37	5:41	19:22	20:36
3 June	5:41	19:25	20:40	5:42	19:22	20:37	5:42	19:22	20:37
4 June	5:41	19:26	20:40	5:42	19:22	20:37	5:42	19:22	20:37
5 June	5:41	19:26	20:41	5:42	19:23	20:38	5:42	19:22	20:37
6 June	5:42	19:26	20:41	5:42	19:23	20:38	5:42	19:22	20:37
7 June	5:42	19:26	20:41	5:42	19:23	20:38	5:42	19:23	20:38
8 June	5:42	19:26	20:41	5:42	19:23	20:38	5:42	19:23	20:38
9 June	5:42	19:27	20:42	5:42	19:23	20:39	5:42	19:23	20:38
10 June	5:42	19:27	20:42	5:42	19:24	20:39	5:42	19:23	20:39

The difference between the East and West areas were found to be too large for a zone in which the value of the difference reaches six minutes. This can be observed for dusk between 22 and 23 June, Isya' between 10 and 14 July, and dawn in January. The value of this difference is large enough to render prayers void when performed outside the actual time for prayers.

Table 11

Difference between Eastern and Western Areas in Zone 2

Date	Kuala Langat Sg. Labu (2° 48' N, 101° 41' E)			Sabak Bernam Bagan Sg. Lalang (3° 51' N, 100° 49' E)		
	Fajr	**Maghrib**	**Isya'**	**Fajr**	**Maghrib**	**Isya**
4 Jan	5:56			6:02		
5 Jan	5:57			6:02		
6 Jan	5:57			6:03		
13 June		19:22			19:28	
14 June		19:22			19:28	
15 June		19:23			19:28	
16 June		19:23			19:28	
17 June		19:23			19:28	
18 June		19:23			19:29	
19 June		19:24			19:29	
20 June		19:24			19:29	
21 June		19:24			19:29	
22 June		19:24			19:30	
23 June		19:24			19:30	
10 Jul			20:42			20:48
11 Jul			20:42			20:48
12 Jul			20:42			20:48
13 Jul			20:42			20:48
14 Jul			20:42			20:48

If studied from the point of difference in the value of latitude and longitude between the maximum and minimum on the other hand, the value of the difference obtained is relatively large, where the difference in values for latitude reached 74' (arc minutes) or 1° 14', whilst the value difference in longitude obtained is 52' (arc minutes). The value of this difference in latitude and longitude shows that the size for Zone 2 is large.

Table 11.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 1

	Latitude	**Longitude**
Maximum	3.86667°	101.68333°
Minimum	2.63333°	100.81667°
Difference (arc minutes)	74’	52’

To solve the problem of delay experienced by a number of areas compared to Bandar Nakhoda Omar, the authors propose that the Multiple Reference Points Technique is adopted. Due to the large time difference which can reach up to six minutes, the authors propose that Zone 2 is divided into three sub-zonesin order to meet the two minutes criteria.

Table 12

Breakdown of Proposed Districts For Zone 2

Zone 2.1	**Zone 2.2**	**Zone 2.3**
Sabak Bernam	Kuala Selangor	Kuala Langat Klang

Table 13

Time Difference between East and West of Zone 2.1

Date	Sabak Bernam E (3° 42' N, 101° 21' E)			Sabak Bernam Bagan Sg. Lalang (3° 51' N, 100° 49' E)		
	Fajr	**Maghrib**	**Isya'**	**Fajr**	**Maghrib**	**Isya'**
4 Jan	5:59			6:02		
5 Jan	6:00			6:02		
6 Jan	6:00			6:03		
13 June		19:25			19:28	
14 June		19:25			19:28	
15 June		19:26			19:28	
16 June		19:26			19:28	
17 June		19:26			19:28	
18 June		19:26			19:29	
19 June		19:26			19:29	
20 June		19:27			19:29	
21 June		19:27			19:29	
22 June		19:27			19:30	
23 June		19:27			19:30	
10 Jul			20:45			20:48
11 Jul			20:45			20:48
12 Jul			20:45			20:48
13 Jul			20:45			20:48
14 Jul			20:45			20:48

Table 13.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 2.1

	Latitude	**Longitude**
Maximum	3.86667°	101.3667°
Minimum	2.48333°	100.8167°
Difference (arc minutes)	23'	33'

Table 14

Time Difference between East and West of Zone 2.2

Date	Kuala Selangor Sg.Labu (3° 29' N, T 101° 28' E)			Kuala Selangor Kem. D (3° 29' N, 101° 6' E)		
	Fajr	**Maghrib**	**Isya'**	**Fajr**	**Maghrib**	**Isya'**
4 Jan	5:59			6:00		
5 Jan	5:59			6:00		
6 Jan	5:59			6:01		
13 June		19:24			19:26	
14 June		19:24			19:26	
15 June		19:25			19:26	
16 June		19:25			19:26	
17 June		19:25			19:27	
18 June		19:25			19:27	
19 June		19:26			19:27	
20 June		19:26			19:27	
21 June		19:26			19:28	
22 June		19:26			19:28	
23 June		19:26			19:28	
10 Jul			20:44			20:46
11 Jul			20:44			20:46
12 Jul			20:44			20:46
13 Jul			20:44			20:46
14 Jul			20:44			20:46

Table 14.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 2.2

	Latitude	**Longitude**
Maximum	3.6°	101.5°
Minimum	3.1667°	101.1°
Difference (arc minutes)	26'	24'

Table 15

Time Difference between East and West of Zone 2.3

Date	Kuala Langat Sg. Labu (2° 48' N, 101° 41' E)			Klang Pulau Pintu Gedung (2° 53' N, 101° 14' E)		
	Fajr	**Maghrib**	**Isya'**	**Fajr**	**Maghrib**	**Isya'**
4 Jan	5:56			5:58		
5 Jan	5:57			5:59		
6 Jan	5:57			5:59		
13 June		19:22			19:24	
14 June		19:22			19:24	
15 June		19:23			19:25	
16 June		19:23			19:25	
17 June		19:23			19:25	
18 June		19:23			19:25	
19 June		19:24			19:26	
20 June		19:24			19:26	
21 June		19:24			19:26	
22 June		19:24			19:26	
23 June		19:24			19:26	
10 Jul			20:42			20:44
11 Jul			20:42			20:44
12 Jul			20:42			20:44
13 Jul			20:42			20:44
14 Jul			20:42			20:44

Table 15.1

Difference of Maximum and Minimum Latitude and Longitude for Zone 2.3

	Latitude	**Longitude**
Maximum	3.2°	101.68333°
Minimum	2.633°	101.23333°
Difference (arc minutes)	34'	27'

Conclusion

The practice of determining prayer times in Selangor using the Westernmost Point Technique is not suitable as it results in delay of prayer times as observed at certain districts of the state. The Multiple Reference Points Technique provides a more convincing outcome compared to using the Westernmost Points Technique in the context of the determination of prayer times.

If seen from the point of maximum and minimum values of the difference in latitude and longitude of a zone, it proves that the size of a zone plays a very important role in the context of setting the prayer time for an area. Theories that say that the difference in the value of the latitudes between East and West in a zone must not exceed 1° and longitude difference do not exceed ½° or 30' (arc minutes) to secure a two-minute difference is accurate. It has been observed that areas that do not meet these requirements have a time difference of more than two minutes between East and West in a zone.

The size of Zones 1 and 2 in Selangor have resulted in the difference of time that exceed two minutes between East and West, reaching between four to six minutes in some cases. As a result, the authors propose that each zone (Zones 1 and 2) be broken down into three smaller sub-zones. Although the breaking down of these zones should overcome the difference of time of a zone, it cannot resolve the problems pertaining to time delay. To this end, it is proposed that the breaking down of these zones is applied together with the method of Multiple Reference Points.

However, the criteria of two minutes difference could not be applied in several large areas such as Hulu Selangor and Sabak Bernam. This is because the difference in the values of the latitude and longitude for both districts do not meet the conditions set. This causes the difference of time to be around three minutes in these areas. Therefore, the authors propose the introduction of a new zone, i.e. Zone 3, be considered for application in a large district.

References

Abdul Halim bin Abdul Aziz, “Kajian Terperinci Waktu-Waktu Solat dalam Beberapa Zon di Malaysia,” Working paper presented at Persidangan Muzakarah Falak, 2011.

Baharrudin Zainal, *Ilmu Falak Edisi Kedua*. (Kuala Lumpur: Dewan Bahasa dan Pustaka, 2004).

JAKIM, “Zon-zon Waktu Solat Seluruh Malaysia,” Working paper presented at Mesyuarat Zon-zon Waktu Solat Seluruh Malaysia, Institut Latihan Islam Malaysia, Bangi, Selangor, 2012.

Md Adnan Md Daud, *Penyelarasan Waktu Solat di Malaysia*. (Putrajaya: JAKIM, n.d.).

Mohamad Saupi Che Awang, “Penyelarasan Ihtiyati dalam Waktu Solat: Pandangan Teknikal,” Working paper presented at Muzakarah Jawatankuasa Teknikal Kalendar Islam, Kuala Terengganu, 2005.

Mustafa Din Subari and Mohamad Saupi Che Awang, "Waktu Solat Setempat: Satu Pemurnian kepada Waktu Solat Berasaskan Zon," Working paper presented at Persidangan Muzakarah Falak, 2011.

Nurul Asikin Che Daud and Mohamad Saupi Che Awang, "Penambahbaikan Zon-zon Waktu Solat di Malaysia Menggunakan Kaedah Isotime," Working paper presented at Mesyuarat Zon-zon Waktu Solat Seluruh Malaysia, Institut Latihan Islam Malaysia, Bangi, Selangor, 2012.

Wan Kamel Wan Hussain, "Penentuan Waktu Solat dan Zon Waktu," Working paper presented at Seminar Falak Syarie, 2007.