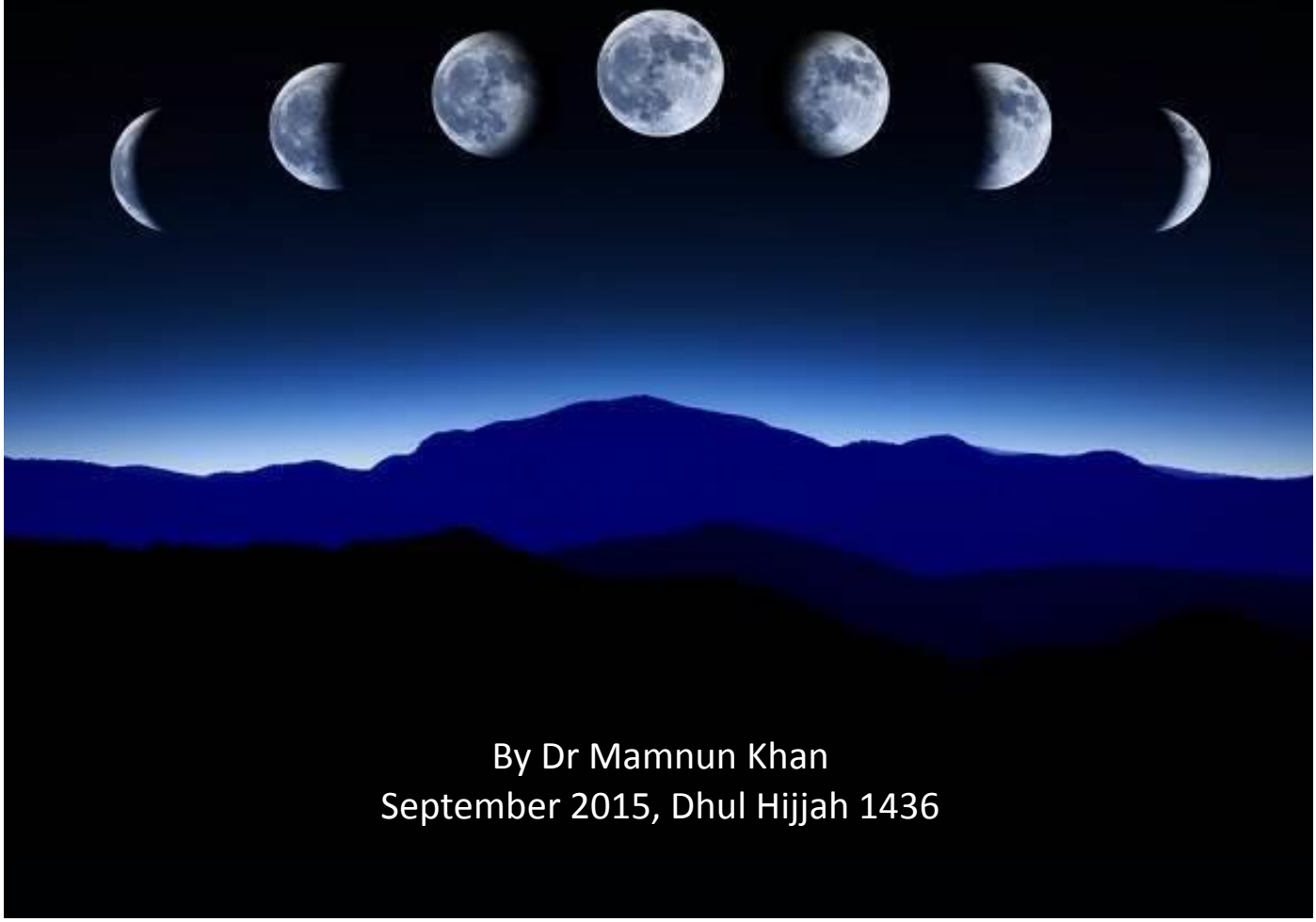
Towards a Unified Approach to Crescent Moon Sighting in the UK



By Dr Mamnun Khan

September 2015, Dhul Hijjah 1436

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This paper uses the terms *hilal* and (new) Crescent Moon sighting interchangeably.
If there are any errors in this paper please let the author know at mamnunkhan123@gmail.com.
Copies of this paper in Bengali and Urdu may be published in due course inshaAllah.

Towards a Unified Approach to Crescent Moon Sighting in the UK

By Dr Mamnun Khan[1]
September 2015, Dhul Hijjah 1436

In the name of Allah, the Most Merciful, the Most Gracious (*Bismillaahir Rahmaanir Raheem*)

1. Executive Summary

The Moon sighting (*hilal*) problem in the UK is one of the many challenges Muslims face as minorities of majority non-Muslims countries. On one hand, the challenge is to reconcile modern science (the ability to predict the Crescent Moon) with the traditional method of naked-eye sighting. On the other hand, the challenge is to reconcile the diverse religious, ethnic and linguistics loyalties of Muslims of the UK with the need to organise a common approach to leave a legacy for future generations. In evaluating the six options available, this paper finds strong arguments for and against each option. However, in the greater interest of the Muslim public, this paper recommends that effort is made to sight locally first and, in the event that it proves difficult, to refer to the nearest easterly Muslim country, or community, where: 1) there is a proven, scientifically accurate and reliable Moon sighting setup; and 2) there is a well-established/contractually binding process for the news of sighting to reach the UK. This paper finds that this is the most robust method, which, whilst conforming to accepted interpretations of the Quran and Sunnah, takes into consideration our ability to use astronomical data to reduce errors, as well as reflecting the traditionalist background of the Muslims and *'ulama* of the UK. Finally, this paper urgently calls for the establishment of a national Crescent Moon sighting authority based on the highest professional standards to co-ordinate the announcement of the *hilal* across all communities in the UK.

2. Introduction and purpose of paper

This discussion paper was written in light of the continued lack of progress on finding a workable Moon sighting solution in Luton and elsewhere in the UK. Sadly, over the years disagreements have gained a sense of looming anticipation and notoriety in sarcastic terms like "Moon Wars." A focus on divisions verging on acrimony, sneering and confusion, frequently meets many Muslims at the start of what should ordinarily be the most spiritually rewarding and celebratory times of the year. On a structural level, what is unwittingly at stake is the very spirit of trust and a collaborative-consultative (*mashwara*) environment in the diverse British Muslim community. The net impact is self-evidently a tragic failure of Muslim communities to organise and to provide much-needed thought-leadership in areas where it is most needed.

Whilst we see much confusion that often gets even mild-mannered Muslims "Moon-struck" into the frenzy of its politics[2] as one scholar noted, at the same time, to keep harmony we try hard to maintain the validity of all opinions.[3] The phrase "unity is not conformity/uniformity" and the argument of "textual plurality" have increasingly found favour as a coping mechanism of sorts against very visible divisions. Divisions between neighbours, neighbouring mosques and sometimes within the same household are instinctively seen as wrong by most Muslims, even accepting the possibility that the UK may well be "a melting pot of every idea and movement known in Islam."[4] Indeed, this compromise perhaps projects the experiences of many who have worked tirelessly over the years to find a way forward but feel quite dejected by the lack of progress locally and nationally. However, as the Prophetic model encourages us, we must not lose hope in our condition and remain in the act of striving (*mujahadah*). Whilst success/ability (*tawfique*) can only from Allah (Quran,

11:88), as a community we are of course steeped in the virtue of high aspiration (*'uluwwul himmah*) built on knowledge (*'ilm*) and desire (*iraada*) to achieve excellence.

It is worth noting here that whilst scholars and Muslim communities may have differed on many things or may have been aware of differences – historical or otherwise, rarely did this lead to division in their communities when it came to the start of Ramadhan and Eids. Three main reasons accounted for this:

1. Distant sightings could not be communicated to far places because modern telecommunications were not available, and hence the choice to go with reports of a distant sighting was usually limited or did not exist.
2. It was usually left to the authority of a Qadi or local ruler to decide the start of Ramadhan or Eid which ordinary Muslims simply accepted. Today, this authority has significantly fragmented for many reasons.
3. Astronomical calculations were not available to the level of accuracy as they are today as a means to reduce errors.

Whatever the rights and wrongs of the status quo, what is certain is that it cannot be in the interest of Muslims. In light of the Quran and Prophetic model ﷺ that teaches "brotherhood for the sake of Allah" (*ukhuwwah fillah*) and "unity" (*ittihad*) and "community" (*jama'ah*) among neighbours and friends, it is reasonable to expect that at least we observe the most important days of the Islamic calendar together. Indeed, despite differences on many matters of the religion, the division surrounding the start of Ramadhan and Eid among resident neighbours is quite unheard of in history.[5] In practical terms, too, there is a growing need to organise expediently for purposes of planning in schools and work places.

Hence, we firmly believe that renewed effort is needed to evaluate and address this problem at both local and national levels. This paper thus sets out to:

1. Summarise why Moon sighting is an issue, the impacts it has, and the lessons that can be drawn from previous attempts to address the problem (Section 2).
2. Summarise the relevant Islamic details related to Moon sighting (Section 3).
3. Provide an overview of the science of Moon phases (Section 4) and the development of methods for predicting the first sighting of the Crescent Moon (Section 5).
4. Critically evaluate the varied options available (Section 6).
5. Propose recommendations and practical steps for mosque organisations and communities at local and national level to organically bring a binding resolution to this issue in the UK (Section 7).

It is understandable that change for communities may feel quite painful at times. Some may well feel a greater pressure to compromise than others in order to achieve a wider consensus. Others may not choose to change. Yet for others still it is, and will remain, a non-issue. Inevitably, this will lead to some distress, and tolerance levels will need to be managed with sensitivity, sincere love (*mahabbah*) and careful diplomacy both locally and nationally. What is certain is that no one can be compelled to accept a particular viewpoint; whatever one chooses there must remain mutual respect and affection for one another.

2.1 Factors that make Crescent Moon sighting an issue in the UK

1. In the UK it is scientifically only possible to sight the Crescent Moon on the 29th day for 3 months of the year (out of the 6 months when the Moon rises from the Northern Hemisphere).

Moreover, the UK's frequent cloudy conditions and in some cases light pollution mean that even when scientifically possible the chances of sighting the Crescent Moon with the naked-eye is very low.

2. At the time of writing, the UK does not have a national Crescent Moon sighting (*hilal*) authority with the mandate to, nor does the UK Government, sanction dates for the start of Ramadhan or the two Eid's.
3. The lack of cross-talk between diverse Muslim communities (due to differing linguistic, sectarian and ethnic loyalties etc.), means that collective approaches in areas of common interest have been less forthcoming.
4. Whilst local naked-eye sighting has been the overwhelmingly prevalent method throughout Muslim history, the popularity of other methods has grown with the development of Moon sighting science, optical instruments/photo-imaging, global telecommunications and mass media. However, their influences have not been properly analysed or managed consistently across communities, giving rise to widespread confusion.
5. There is a poor understanding of developments in *fiqh*, science, and the history of Moon sighting amongst the public.

2.2 The wider impacts of the Moon sighting issue

1. Confusion among ordinary Muslims about how to make sense of conflicting opinions and media reports of sighting/non-sighting and which is the most appropriate/correct opinion.
2. Erosion of confidence in mosque management committees, and confirming external perception of being unwilling to compromise for the greater good, and being out of touch with today's realities.
3. Growth of negative thoughts and suspicion (*zann*[6]) towards people of different cultural/religious identities or mosque-goers of one mosque looking down at another, seeing each other as the "bad guys for not doing Eid with us" as it were.
4. Encourages ingratitude and ungraceful desire to quicken the end of Ramadhan, particularly among the youth.
5. School teachers as well as colleagues in the work place are often mystified as to why children take different days leave to celebrate Eid and have no way of ensuring that they do not truant.
6. Reinforces current stereotype of Muslims as somewhat disorganised in religious matters, and this is often exposed in attempts to explain the disparity to non-Muslims.

2.3 What is at stake and the opportunity to leave an example for future generations?

1. Build intra-community trust, and a collaborative-consultative environment in the diverse British Muslim community.
2. Demonstrate our ability to overcome the general sense of neglect and crisis of the intellect (*'aql*), knowledge (*'ilm*), and faith (*imaan*) in addressing problems of modern life.
3. Leave an example for wider efforts to build cross-community platforms to improve services, avoid duplication of resources and to embed a positive Muslim presence and contribution to wider society.

2.4 Brief review of lessons to be learnt from past efforts to unify Moon sighting in the UK

Over the years many attempts have been made to unify Crescent Moon sighting in the UK. These have ranged from private meetings between mosques and mosque councils, to panel discussions involving prominent scholars and community members, on local radio stations and television. No doubt, many very capable and distinguished figures have contributed with the best of intentions and sincerity. However, in hindsight it is quite clear that these attempts have been, and in fact continue

to be, somewhat constrained by a number of internal weaknesses and unhelpful external influences. In some places, there has been repeated setback and the lack of progress has resulted in an air of dejection and acceptance of the status quo to set in. On the other hand, in some places there have been encouraging outcomes too. The lessons and best practices that they teach must of course be taken on-board to help make progress. Some of these are listed below.

Strengths	Weaknesses
In some places, understanding of the science and *fiqh* of Moon sighting has improved.	Efforts have largely been regional and outside of an inclusive national framework from the outset.
Recent breakthroughs in major cities were possible as a result of: • decision makers understanding the opportunity and cost of inaction • good mediation with alternate viewpoints supported • a degree of professionalism • focus was on finding a good outcome for Muslims	Attempts to reconcile different opinions have tended to succumb to long-standing linguistic, sectarian and ethnic loyalties which have not helped to dispassionately understand the issue in more detail. And often in some towns visible divisions quickly flares up the animosity and resentment that already exists.
Some of those involved in bringing about change and unity have shown remarkable perseverance over the years.	Often a perceived fear of reputational damage, perception of what others may think or the implication that errors were made in the past have hindered change, or a willingness to accept the outcome of a consultation process.
Consultations have successfully engaged the right people and not left key decision makers out of the process.	Stakeholders as non-specialists in either the science or the *fiqh* have got involved in consultations rather than being kept informed. A general lack of skills in stakeholder diplomacy and situational management of conflicting loyalties has not helped either.
	Debates have not been consistently followed up with the hard work to educate the public about the science and *fiqh* of Moon sighting.

Table 1. Summary of some of the main lessons from attempts to unify Moon sighting.

3. The links between the Hijri calendar, Islamic obligations and Moon phases

Many links exist between the Moon and historical events and the timing of religious obligations of Muslims. The lunar calendar was already in use at the time of the Prophet ﷺ, though it was not until the Prophet's emigration (*hijra*) to Medina that marked the beginning of the Islamic Hijri calendar. At the time of the Prophet ﷺ, the Arabs, for convenience, had a practice of adding days to the end of the lunar month to align it with non-Islamic festivals that were based on the Solar calendar (known as an "Intercalated Lunar Calendar"). However, it meant that Islamic dates lost their specified revelatory time – months that were meant to be sacred were postponed for example. For this reason, the Prophet ﷺ prohibited the practice, as mentioned in Sura Al-Tawbah (Quran, 9:37).

In the Quran, Allah makes references to the Moon such as in Sura Al-Ya Sin, richly annotated here in Tafsir Jalalayn (translation of the Quran is shown in **bold**):

"A Sign – evidence of Allah's immense power – **for them is the night: We peel the day away – separate it – from it and there they are, in darkness. And the Sun runs to its resting place.** The Sun is a Sign for them on its own, or it is an aspect of the previous Sign. The Moon is also a Sign**. That is the decree of the Almighty** in His kingdom, **the All-Knowing** of His creation. **And We have decreed** twenty-eight **set phases for the Moon** (read as *al-qamara* and *al-qamaru*) **each month until it ends up looking like an old palm spathe.** It is concealed for two nights if the month is thirty days and one night if it is twenty-nine, and then it appears to the eye like a curved, yellow palm spathe**. It is not for the Sun to overtake the Moon** in the night **nor for the night to outstrip the day** – and come before the end of the day; **each one** – each luminous body: the Sun, Moon, stars **– is swimming in a sphere** – an orbit. The form of the verb used here is that usually reserved for sentient creatures" (Quran, 36: 37-40).[7]

In Sura Al-Baqarah, Allah says: "The month of Ramadhan in which was revealed the Quran, a guidance for mankind and clear proofs for guidance and the criterion. So whoever witnesses (*shahida*) the month should fast it" (Quran, 2:185).

Allah also says: "They ask you [Muhammad ﷺ] about the Crescent Moons (*ahilla*). Say: These are signs to mark fixed periods of time for mankind and for the pilgrimage" (Quran, 2:189)

There are many links with the life of the Prophet ﷺ too. For example, in one incident a group of Makkans asked the Prophet ﷺ to show them a miracle as a proof of his Prophethood, so he ﷺ showed the temporary splitting of the moon (Al-Bukhari, book 58, *hadith* no. 211 and others). This occurrence is mentioned at the beginning of Sura Al-Qamar (Quran, 54:1-2). Moreover, in a well-established Sunnah, the Prophet ﷺ is known to have frequently fasted the nights of the 13th, 14th and 15th of every month – these are known as the "White fasts" (*ayyam al-bidh*), when the Moon is at its brightest. Similarly, the 1st of Ramadhan signifies the first day of fasting, the 1st of Shawwal is Eid al-Fitr and the 10th of Dhul-Hijjah signifies Eid al-Adha, and so on.

It is not surprising, then, that we find in *hadith* literature clear instructions from the Prophet ﷺ exhorting believers to make effort to track the course of the Sun and Moon for timekeeping purposes.[8] For instance, we find many *ahadith* explaining the Sunnah of seeking the start of Ramadhan and Eid (text/*matn* of *hadith* is highlighted):

حَدَّثَنَا يَحْيَى بْنُ بُكَيْرٍ، قَالَ حَدَّثَنِي اللَّيْثُ، عَنْ عُقَيْلٍ، عَنِ ابْنِ شِهَابٍ، قَالَ أَخْبَرَنِي سَالِمٌ، أَنَّ ابْنَ عُمَرَ ـ الـ ر ضـى لـ ه ع نهما ـ قَالَ سَمِعْتُ رَسُولَ اللَّهِ صـ لـى ع لـ يا لله و سـ لم يَقُولُ **"إِذَا رَأَيْتُمُوهُ فَصُومُوا، وَإِذَا رَأَيْتُمُوهُ فَأَفْطِرُوا، فَإِنْ غُمَّ فَاقْدُرُوا عَلَيْكُمْ لَهُ"**

وَقَالَ غَيْرُهُ عَنِ اللَّيْثِ حَدَّثَنِي عُقَيْلٌ وَيُونُسُ لِهِلاَلِ رَمَضَانَ

"Observe fast on sighting it (the Crescent Moon) and break (fast) on sighting it (the Crescent Moon), but if the sky is cloudy for you, then complete the number (of thirty)" (Al-Bukhari, book 31, *hadith* no. 124).[9]

وَحَدَّثَنِي عَنْ مَالِكٍ، عَنْ رِوْثَ بْنِ زَيْدٍ الدِّيلِيِّ، عَنْ عَبْدِ اللَّهِ بْنِ عَبَّاسٍ، أَنَّ رَسُولَ اللَّهِ الـ لهـ صـ لـى ع لـ يه و سـ لم ذَكَرَ رَمَضَانَ فَقَالَ **"لاَ تَصُومُوا حَتَّى تَرَوُا الْهِلاَلَ وَلاَ تُفْطِرُوا حَتَّى تَرَوْهُ فَإِنْ غُمَّ عَلَيْكُمْ فَأَكْمِلُوا الْعِدَّةَ ثَلاَثِينَ"**

"Do not start the fast or break it until you see the Crescent Moon. If the Crescent Moon is obscured from you, then complete a full thirty days" (Muwatta Imam Malik, book 18, *hadith* no. 635).[10]

Ahadith likes these linking the Moon phase to the start of fasting and Eid are multiply transmitted in the major collections of *hadith*. They point to what is known as the "*Ikmaal* (completing) principle": completing 30 days of the month in case the Crescent Moon is not observed on the 29th day due to obscurity or otherwise.

As such, in the classical textbooks of *fiqh*, too, the method for starting the Islamic month has been documented. The traditional method is to look for the new Crescent Moon with the human eye after sunset on the 29th of the Islamic month (the 29th day is known as the "day of uncertainty" or *yawm al-shakk*). If it is not possible to sight the new Crescent Moon, jurists have specified a number of conditions for accepting reports of sightings (see Table 1). If the Crescent Moon is sighted (commonly known as the *hilal*[11]) then the new month starts from the next day. Otherwise, 30 days of the month are completed, since a lunar month is either 29 or 30 days long.

At the state level, to ensure the integrity of the Islamic months, and reduce errors and deception a number of sultanates/dynasties/empires officially adopted the convention of requiring a large group of witnesses when visibility conditions were clear. For example, the Abbasid's under Harun al-Rashid are known to have adopted the view of its chief Qadi, Abu Yusuf (735/9-798), which meant that mass sightings of greater than 50 witnesses became state policy, and this number was increased in places where false testimonies were common.[12]

Fiqh discussions also take into consideration the need to minimise errors and improving confidence that the sighting of the new Crescent Moon is accurate and conforms to the Sunnah of the Prophet ﷺ as understood and practiced by the Companions (*radiAllahu 'anhum*). In this regard, a useful concept has been applied called *matla*. According to Sheikh Afifi al-Akiti, "Technically, "*Matla*" when found by itself in *fiqh* discussions concerning Moon sighting refers to "*matla' mahall al-ru'ya,*" "sighting-zone of the area" (or equally acceptable, "sighting-zone of the region"). Thus "*ittihad al-matla*" means "the local sighting-zone" (or equally correct, "the same sighting-zone"); and "*ikhtilaf al-matali'" means* "a different sighting-zone"."[13]

Some scholars have argued for a universal horizon (*ittihad al-matla*), but historically the most practicable view was the difference of horizons (*ikhtilaf al-matli*).[14] In modern times, the preference of many jurists has subtly shifted away from both of these positions towards following an easterly/earlier sighting but not a westerly/later sighting given the Earth's rotation.

Many jurists in the past had a good grasp of astronomy (*'ilm al-falak*) – Al-Biruni (973-1048), Al-Qarafi (1228-1285), Ibn Taymiyyah (1263-1328), Al-Subki (1284-1355) to name a few. Astronomy was taught in *madaaris* like that of Harun al-Rashid's (763/3-809) famous Bayt al-Hikmah which is reported to have had 50 astronomers. Many contributions were made by Muslims, including the names of at least 165 stars[15] in Arabic (e.g. Betelgeuse, Aldebaran etc.), most of which can be traced back to the star catalogue of Abul Hussain 'Abd al-Rahman ibn Omar al-Sufi (known in medieval Europe as Azophi, 903-986) and others discovered later by Europeans.[16] Whilst they could not precisely determine the exact time and location of the *hilal*, earlier Muslim scholars studied astronomy and understood the science of Moon phases of the time. The great Al-Khwarizmi (780-850), for instance, wrote a book called *Zil al-Sindhind* ("Astronomical Tables of Sind and Hind") that contained tables for movements of the Sun, Moon and the planets known at the time. And many mosques had links with an astronomer (called *muqqawit*) to determine prayer times.

With the development of global telecommunications, optical instruments and astronomical calculations, Islamic jurists from around the world have sought to evolve the *fiqh* to take into account new factual information relating to the possibility of sighting and the best time to look for the new Crescent Moon etc.

Madhab	**Juristic opinion**
Hanafi	- In overcast conditions, a solitary just witness can be sufficient. - In clear conditions, a large group of people must testify and a solitary report will not be accepted (>50 according to Qadi Abu Yusuf, others are known to have increased it to >500 when the false testimonies became common). - The Qadi has the choice of accepting or rejecting solitary witness in order to protect against errors. - In months other than Ramadhan, two male just witnesses are required if the sky is overcast. - The entire world is considered to be one *matla*
Maliki	- Two just male witnesses are required for a Qadi to declare the start of a new month.
Shafi'	- Two just male witnesses are required for a Qadi to declare the start of a new month. - One witness is enough for Ramadhan. - The *matla* is restricted to 48 miles.
Hanbali	- For Ramadhan, a solitary just male witness is sufficient for a Qadi to declare the start of a new month. In other months, two male just witnesses are required. - No distinction is made about clear or overcast conditions.

Table 2. Summary of the most common *fiqh* of declaring Crescent Moon sighting according to the four Sunni *madhahib*. For detailed citations see p22-25 in Mufti Amjad's paper *The Islamic Calendar According to Muslims in the UK* (2015). By no means is this an extensive survey of variant *fiqh* positions. It is worth noting that for a minority in a majority non-Muslim country, the responsibility of declaring the start of a month (particularly the sacred/*'ibadah* months like Muharram, Sha'ban, Ramadhan, Shawwal and Dhul-Hijjah) is on imams, mosque committees and Moon sighting organisations.

4. A brief introduction to the science of Moon phases

The Moon takes exactly 29.53 days (approximate 29 days and 13 hours) to complete one full orbit of the Earth – this represents the "**lunar month**." The lunar year is 354.4 days (6 months are 29 days and 6 months are 30 days) and is 10 days shorter than the solar year. This is why we see Ramadhan come forward by 10 days each year.

As the Moon travels in its 29.5 (or so) day orbit, its position changes daily. The Moon's orbit sometimes takes it between the Earth and the Sun (known as "**New Moon**"), sometimes opposite the Earth and Sun (known as "**Full Moon**"), and sometimes half way in between (known as "First-" and "Third Quarter Moons"). The Moon does not itself produce any light but reflects the light radiated from the Sun. The different amounts of the Moon's surface lit up by the Sun is seen from the Earth as lunar/Moon phases.

These phases of the Moon change throughout the month in a regular, predictable way. In fact, the phase of the Moon is correlated to its angular distance from the Sun, as seen from the Earth (known also as "**angle of elongation**" or "angular separation" – see Figure 1). The Crescent Moon is usually seen after sunset. As the Moon moves west from the point where the Crescent Moon is first visible on Earth, the crescent becomes thicker. Due to the **elliptical orbit** of the Moon, the first visibility starts from different locations on the Earth every month. Sometimes, it may start from the Southern and sometimes from the Northern hemisphere. It may also start from any location from the east to the west.

The location of the first visibility of the Moon is not repeatable every year (like sunrise/sunset times) because the length of the lunar year (354.4 days) is shorter than the solar year (365.25 days). Hence, it takes approximately 33.5 years for the location of the first Crescent Moon visibility to repeat itself!

The Moon can be seen at different positions in the sky, depending on where one observes from – in some locations it will appear higher above the horizon than others. And the path that it takes for moonrise (to go above the horizon) and moonset (to go below the horizon) are different depending on one's location on Earth. In some locations it will seem like a slanting path while in others it will be more vertical.

4.1 Key terms in Moon sighting science

Moon cycle	Description
Full Moon	The full Moon is the instance of time when the Sun, Earth and Moon are in the same vertical plane, in that order. This could happen at any moment of the day or night on the 13th, 14th or 15th of the lunar month. On these days the Moon is the brightest.
New Moon Conjunction (*Iqtiran*/*Mahaq*), also known as "Moon birth"	The new Moon Conjunction is when the Earth, Moon and Sun are in the same vertical plane, in that order. The angle of elongation is 0°. The Moon cannot be seen. Unlike non-Islamic calendars, in the Islamic calendar this is ***not*** when the new month starts, but is either the 28th or the 29th of the lunar month.
Crescent Moon (day 1 Moon)	Rises after sunrise and sets after sunset – the first sighting will be 38-40 mins after sunset (for under 24 hours old moon).
First quarter	Rises at noon and sets around midnight.
Third quarter	A last quarter moon looks half-illuminated. It rises around midnight, appears at its highest in the sky at dawn, and sets around noon.

Table 3. Description of Moon rise times at different points in the lunar month.

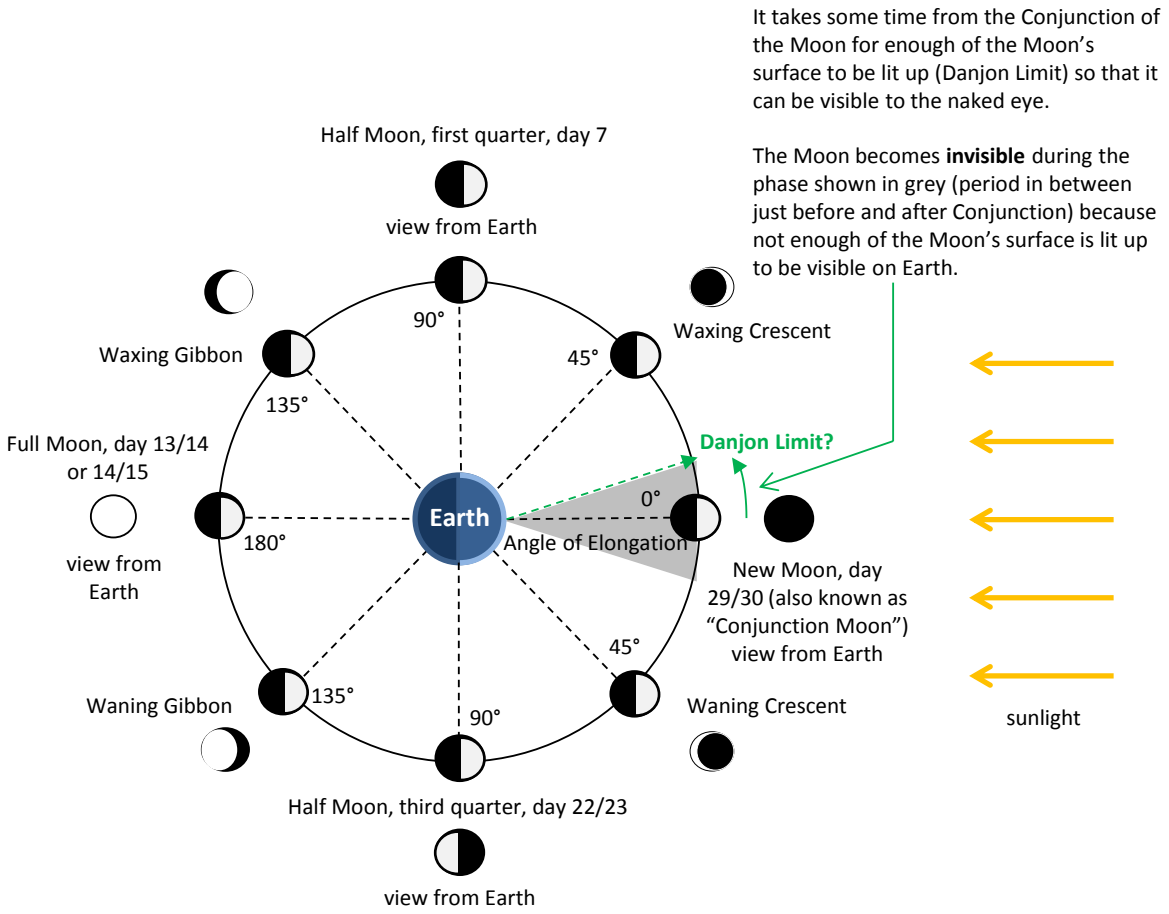


Figure 1. Diagram showing the Moon phases and their names (not to scale). The Sun-Moon angle is the angle defined by Sun>Earth>Moon with Earth as the fixed point. As the Sun-Moon angle increases more of the Moon is visible. Notice only one side of the Moon faces the earth at all times – this is because the Moon is "tidally locked" into the Erath's gravitational pull.

4.2 Factors that affect the visibility of the Crescent Moon

The main factor is the angle of elongation, which needs to be sufficient for the new Crescent Moon to be first visible (known as the Danjon Limit[17]), below which no visible light wavelength is reflected from the Moon (and is not visible to the naked-eye from Earth). Observation data for the Danjon Limit ranging from 12° through to 5° have been reported by different research groups,[18] probably due to differences in methodology and atmospheric conditions in the viewing location. The Danjon Limit was originally considered to be 7°, though most predictive astronomical calculations like that used by Dr Bernard Yallop (see later) use at least 8°.

In addition, other factors are also known to impact the timing of the first visibility of the Crescent Moon, these are:

- As the Earth is spherical, locations nearer the equator are closer to the Moon which makes them more favourable for sighting with the naked eye.
- Elevation angle of the moon (i.e. how high it is above the horizon) – the higher the elevation angle the easier it is to sight.
- The local times of sunset and moonset.
- Absorption and scattering of moonlight by the atmosphere.

Usually it takes between 18 to 24 hours from the New Moon Conjunction time for the Crescent Moon to be first visible. But this time varies depending on one's position on Earth. And, just as the Earth revolves around the Sun in an elliptical orbit, with the Sun off-centre, the Moon also revolves around the Earth in a similar way, and, therefore, sometimes it is closer to the Earth and sometimes it is further from the Earth.[19] When the Moon is closer to the Earth it looks bigger than when it is further (technically known as "lunar liberation").

All of these factors can be mathematically calculated to predict with exact dates and times for Crescent Moon visibility with the provision that it will always have a small amount of uncertainty due to unknown factors such as weather condition, eye sight and the experience of the observer etc.

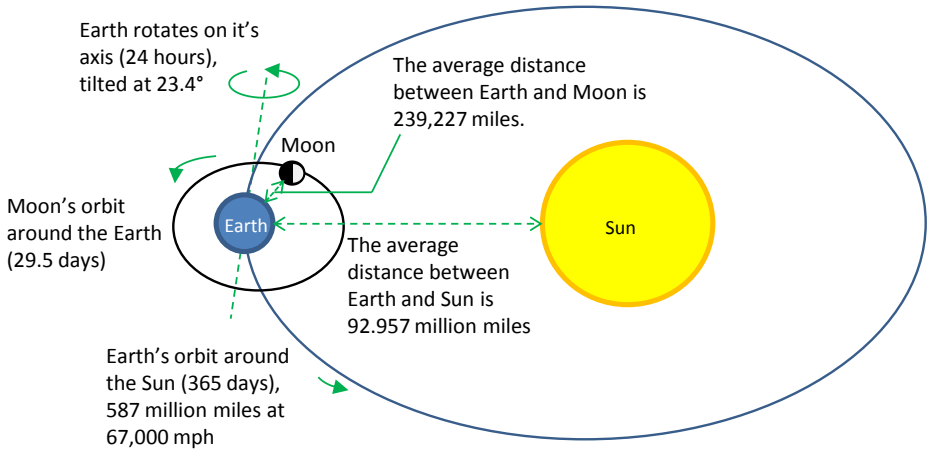


Figure 2. Diagram showing the elliptical orbits of the Moon around the Earth and the Earth around the Sun (not to scale). The Moon also has a tilt of 5.1° on its axis towards the Earth which is not shown. Distances shown here correspond to the distances between the centre of Earth, Moon and Sun.

5. A brief overview of the development of methods for predicting the first sighting of the Crescent Moon

Early astronomical calculations for predicting the first visibility of the Crescent Moon used factors like the age of the Moon (age) and the time difference between moonset and sunset (lag). This was pioneered by Prof. Muhammad Ilyas of Malaysia.[20]

More modern mathematical methods, such as that developed in 1997 by Dr Bernard Yallop of the Royal Observatory use a wider range of factors, namely: 1) the angular separation of the Sun and Moon; 2) the width of the crescent and 3) "best time" of observation.[21]

Using empirical measurements Dr Bernard Yallop produced:

1. **A predictive astronomical calculation and categorisation system of visibility types/codes** (A to F) for the Crescent Moon that can be applied to anywhere in the world (see Visibility Diagram produced by HMNAO in Figure 3):

Visibility category	Description
A	easily visible to the unaided eye
B	visible under perfect atmospheric conditions
C	may need optical aid to find the thin crescent moon before it can be seen with the unaided eye
D	can only be seen with binoculars or a telescope
E	below the normal limit for detection with a telescope
F	not visible - below the Danjon limit

Table 4. Description of visibility categories proposed by Dr Bernard Yallop.

2. **A predictive astronomical calculation of "best time" to view the Crescent Moon** that can be applied to anywhere in the world. Being able to announce Ramadhan and Eid as early as possible is crucial for obvious reasons – preparation and planning *tarawih*, *suhur* etc. Hence, it is also important to know the "best time" to look for the Crescent Moon given that:

    - If it is made too late after sunset then the twilight sky may be too bright to pick out the faint crescent of the Moon (due to stars).
    - The observer will need to wait until the contrast between the Crescent Moon and the twilight sky has increased sufficiently for the Moon to be seen.

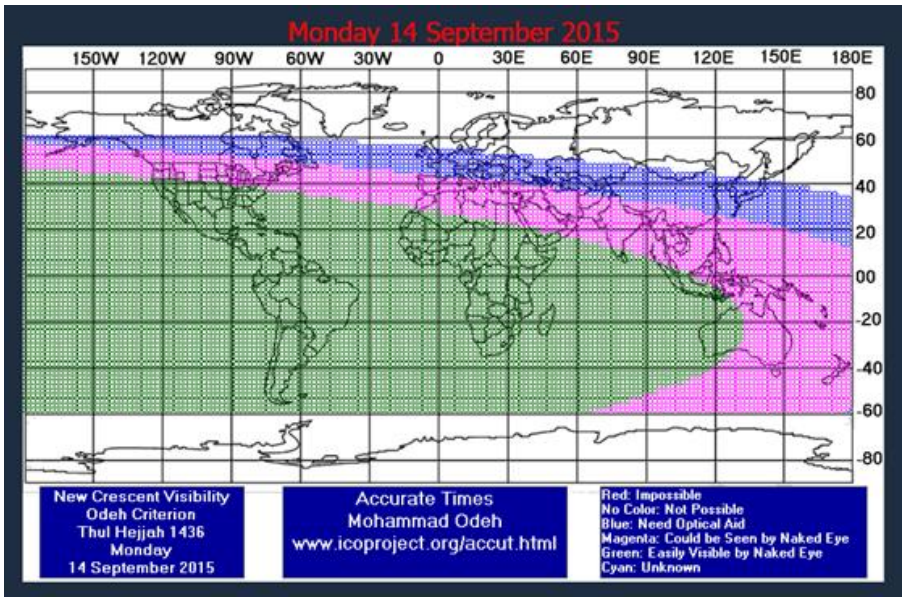
Since Dr Bernard Yallop produced mathematical algorithms, further technical advances have been made, most significant amongst these were:

1. To give non-specialists access to astronomical calculations in a form that could be easily interpreted, around 1999, Dr Monzur Ahmed developed a way of translating astronomical calculations into graphical "**visibility diagrams**," which were later reproduced by other authors. He also developed a computer software programme called MoonCalc which provides information relating to the position, age, appearance, visibility etc. for any given time or location on the Earth (http://www.mooncalc.moonsighting.org.uk). Visibility diagrams are now in common use, and can be accessed from, for example, the website of the UK Hydrographic Office/Her Majesty's Nautical Almanac Office (HMNAO): http://astro.ukho.gov.uk/moonwatch/.

2. Each month, **actual sighting data from across the world are collected and used to refine the predictive power of astronomical calculations** (this is the current practice of ICOP - Islamic

Crescents' Observation Project (http://icoproject.org), which is yet to be adopted by HMNAO). This activity of collecting actual sighting data from around the world by Muslim astronomers is led by the international effort of the ICOP and is also published by one of the UK pioneers in this area, Engineer Qamar Uddin[22] (founder of ICOUK: http://www.moonsighting.org.uk).

Example of a **first visibility diagram produced by ICOP** published at http://icoproject.org – these are based on data up to 2005:



Below is the **first visibility diagram produced by HMNAO**, published at http://astro.ukho.gov.uk/moonwatch/ – these are based on pre-1997 data, and a similar one is produced by the American group at www.moonsighting.com, and by ICOUK at www.moonsighting.org.uk with a different colour coding.

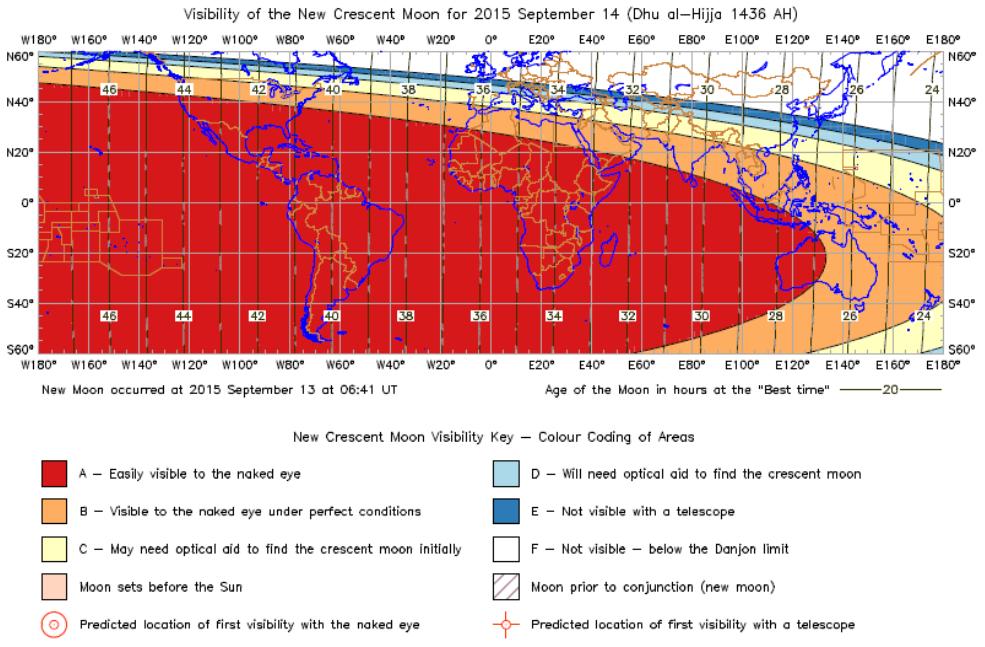


Figure 3. Examples of a visibility diagrams of the Crescent Moon on 14 September 2015 (Dhul Hijjah 1436) produced by ICOP (top) and HMNAO (bottom).

6. Evaluation of different Moon sighting methods

A fuller discussion of the main arguments for and against each of the methods/options can be found in the bibliography at the end of this paper. Here, the aim is to present a summarised view of the main arguments to help the reader cut through the detail and to bring into one place the salient arguments for and against each method.

6.1 Option 1: Do nothing – maintain pluralism

Description of method	Organisations that advocate this method
Going with one's local masjid in general, where each mosque goes with what it thinks is correct according to their understanding and contexts, whilst maintaining inter-community harmony.	Not advocated by any one group, but is often the path of least resistance.

6.1.1 Arguments in support of Option 1

1. It could be argued that it is possible to start fasting or celebrating Eid on different days as it has become a matter of *ijtihad* and that the Islamic *Shari'ah* has room for different opinions to harmoniously co-exist .

2. The Companions of the Prophet ﷺ would travel from places where the Crescent Moon had been sighted to places where the Crescent Moon had not been sighted and would act according to the place where they came from. Whilst those residing in the locality would act according to the sighting in their place of residence.[23] Companions like Kuraib (*radiAllahu 'anhu*), in his travel to Syria encountered the start of Ramadan there on a Friday, upon returning to Medina, he informed Ibn Abbas (*radiAllahu 'anhu*) that he had seen the Crescent Moon on the night of Friday, and that the people in Syria, including Muawiyah the governor (*radiAllahu 'anhu*), had fasted on Friday. Ibn Abbas replied that they (in Medina) had seen the Crescent Moon on Saturday, and that they would not stop fasting until they either saw it again, or had completed thirty days. Kuraib asked, "Will you not suffice with the sighting of Muawiyah?" Ibn Abbas replied, "No, that is how the Messenger of Allah (ﷺ) commanded us" (Muslim, *hadith* no. 2391). Thus, it could be argued that simply because news of Crescent Moon sighting reached a place where the crescent is not visible on a clear sky, or it is cloudy on the 29th day does not in itself make it permissible to start Ramadan or Eid.

3. It could be argued that it is in the best interest of ordinary Muslims to conform to the decision of whichever mosque they frequent or the community they identify with. Most ordinary Muslims are not in any position of authority or influence nor have the time to do so, and hence attempting to bring others to a different viewpoint may in practice invite feelings of animosity and looking down on one another.

6.1.2 Arguments against Option 1

1. It could be argued that pluralism on the matter of Moon sighting, even for pragmatic reasons, for a small country with 2.5m Muslims brings about a needless chaos that is not worth the damaging impacts outlined in Section 2.2.

2. It could be argued that the source texts regarding Moon sighting are unequivocal, and hence accepting a plurality of views as equal in authenticity for people living next to each other would call into question the wider authority of Islamic legal methodology (*usul*) with respect to its

application to public well-being (*maslaha mursalah*) in minority Muslim societies, and, as some scholars have also argued, the rules of Arabic linguistics.[24]

6.2 Option 2: Confirm the start of the Islamic month using astronomical calculations

Description of method	Organisations that advocate this method
Islamic lunar months are confirmed in advance using astronomical calculations without any need for naked-eye sighting on the 29th of the lunar month. There are two variants of this option: 1) calculations based on Conjunction Moon; 2) calculations based on visibility of the Crescent Moon.	• Fiqh Council of North America (USA) – uses conjunction Moon calculations. • http://www.moonsighting.com (USA) – uses Crescent Moon visibility calculations. • No known groups in the UK.

6.2.1 Arguments in support of Option 2

1. It could be argued that astronomical calculations are highly accurate and precise empirically-verifiable measurements for determining the start and end of the Islamic month. And as such they remove uncertainties, mistakes and practical hindrance/hardship (*mashaqqah*) connected with naked-eye sighting (e.g. late start to *tarawih*, confusion in schools and work places etc.).[25] It also removes the burden (*takleef*) for Muslims having to look for the Crescent Moon in places where it is typically or nearly always cloudy.

2. It could be argued that the Prophet ﷺ stressed naked-eye sighting because it was the only available means at the time to achieve the required certainty, not because the act of actual sighting was the objective, and as such does not preclude other ways of attaining certainty.[26]

3. *Ahadith* cited as proof for naked-eye sighting do not specify sighting the Crescent Moon on the 30th of the Islamic month. It could therefore be argued that since sighting on the 30th of the month is not required, the actual *Shari'ah* cause (*sabab*) of starting Ramadhan is not the sighting of the Crescent Moon *per se* but the certainty of the arrival of the month of Ramadan.[27] This certainty can equally be achieved using astronomical calculations and thus satisfies the actual underlying *Shari'ah* cause.[28]

4. It could be argued that the reasons why classical scholars took a staunch disliking to the use of astronomical calculations in confirming Ramadhan were due to historical realities (*illah*) of the time which are no longer relevant today (see Table 5 below).

Historical reason	Why the reason (*illah*) is no longer relevant
Inaccuracy of astronomical calculations.	Moon phasing calculations are now extremely accurate as the science has advanced particularly with computational modelling.
Claims by dubious astrologers to have special access to the unseen	Astrologers have little or no influence on Muslims of the West.
Risk of leading Muslim masses astray by monopolising the knowledge of calculating Moon phasing to a select few individuals.	It is possible for ordinary Muslims to learn the science of Moon sighting and to independently determine astronomical calculations.
The risk of binding matters of faith (*imaan*) and *'ibadah* to something that may not be intrinsic to the religion.	There are a number of reputable organisations that specialise in this field which removes the burden from ordinary Muslims.

Table 5. Description of the main historical reasons and why they are no longer relevant.

5. It could be argued that the Quran mentions "witnessing (*shahida*) the month" as the cause of fasting (Quran, 2:185) not "sighting the month" *per se*, underpinning sighting as just a means (*wasilah*) not a condition (*shart*) for each and every Muslim.

6. It could be argued that deciphering the start of a month using astronomical calculations is no different to using astronomical calculations to fix prayer times, and times for *suhur* and *imsak* (cut off time for eating) throughout the year. In both cases, calculations are only a means of establishing the correct time for an act of *'ibadah* and can be achieved in more than one way.

   It could be argued that whilst Muslims "eat and drink until the white thread appears … distinct from its black tread" (Quran, 2:187), in practice they are implement only in the spirit, not in the letter because, as one scholar noted, "following these specific commands literally [seeing the actual Sun] has never been the real objective."[29]

7. There are examples of classical scholars who despite concerns, allowed the use of astronomical calculations in confirming the month of Ramadhan. They deemed obscurities a *Shari'ah* cause to use astronomical calculations. These scholars included notables like Ibn Surayj (d. 306 AH), Ibn Qutaybah (825-885), al-Subki (1285-1355).[30]

6.2.2 Arguments against Option 2

1. It could be argued that the Quranic *ayaat* and *ahadith* exhorting naked-eye sighting of the Crescent Moon on the 29th of the lunar month stand on their own clear linguistic merits. And as such, they explicitly connect the cause (*illah*) of the beginning of the month of Ramadhan to the sighting of the Moon and the sighting of the Moon only, which cannot be violated or rationalised in any way. Moreover, the crescent being obscured from view is a conditional clause (*shart*) and not an unrestrictive clause, and therefore cannot be used to allow astronomical calculations for confirming the Crescent Moon.[31]

2. It could be argued that the act of sighting the Crescent Moon is in itself an act of worship (*'ibadah*) on its own terms, and even if this day can be known with certainty by astronomical calculations, it is only the naked-eye sighting which has been prescribed in the *Sunnah*. Moreover, some scholars argue that there is an esoteric intent of the Law Giver to bring about an inspirational and reflective state of awareness of one's own insignificance, neediness and Allah's Power by making attempts to physically sight the Crescent Moon.

3. It could be argued that the use of astronomical calculations should be restricted to negating reports of improbable sightings and not in cases of actual obscurity, in the same way jurists have in the past specified ways of reducing errors (e.g. stipulating mass sighting in clear sky conditions).

4. It could be argued that whilst there is no absolute consensus (*ijma'*) between past and present *'ulama* on whether or not using astronomical calculations in confirming or negating the month of Ramadhan is absolutely illegal (*haram*), the overwhelming majority prohibit it, and, at best only allow the use of astronomical calculations to negate reports of improbably sightings.[32] An important point to note here is that the overwhelming majority of UK-based scholars do not support the use of astronomical calculations to confirm Ramadhan, even though they have studied under scholars elsewhere who do support it.

5. It could be argued that far from eliminating the subjectivity and mistakes of naked-eye sightings, relying on astronomical calculations alone in practice brings into consideration non-linear and

unpredictable variables (e.g. absorption and scattering of Moonlight by the atmosphere) that as yet remain poorly characterised. As such, despite the certainty of astronomical calculations, there is a small possibility that someone with a particularly sharp eye-sight could actually see the Crescent Moon under favourable visibility conditions. This can be a source of confusion.

6. It could be argued that if astronomical calculations can be used to confirm the Crescent Moon with certainty, then by the very same argument the capability of telescopes and photo-imaging techniques (e.g. using an infrared camera) should also be embraced for an even greater level of certainty. However, in doing so, the risk is that technical method no longer mimics naked-eye capability – infrared light for example is not visible to the naked-eye. Moreover, the Danjon Limit would reduce to angles near 5° at which point naked-eye sighting would be impossible. With the increasing availability of telescopes and optical imaging techniques, the tendency would be to look for the Crescent Moon in regions where it is impossible to sight with the naked-eye (codes C, D and E).

6.3 Option 3: Government set dates

Summary of method	Organisations that advocate this method
Government appoints a body that uses a method which may or may not be based on a predicted crescent visibility calendar and fixes the dates of Ramadhan and Eid.	None

6.3.1 Arguments in support of Option 3

1. It could be argued that on the basis that "the Government removes disagreement which has worked well in the Muslim world,"[33] a Government appointed body should fix dates to, for instance, engender a more homogeneous sense of indigenous British Muslim culture, enable Eid to be become a national holiday, or to minimise disruption in schools and work places.

6.3.2 Arguments against Option 3

1. It could be argued that the Government does not have any appetite to fix religious dates for Muslims. The petition to the Government to make Eid (and Diwali) a public holiday, for example, has been rejected citing adverse economic impact of additional public holidays and lack of full public consultation.[34] Moreover it is very likely that Muslims would reject Government involvement.

6.4 Option 4: Confirm the Islamic month by local naked-eye sighting using astronomical calculations to reduce errors

Summary of method	Organisations that advocate this method
Attempt is made to sight the new Crescent Moon locally in the UK on the 29th of the Islamic month, and if it is not possible (due to cloudy sky or because there is no possibility of sighting), Moon sighting organisations refer to the closest easterly country (typically Morocco or South Africa) where: a) Muslims reside, b) there is a proven method for confirmed, verifiable sighting, (e.g. use of astronomical calculations to negate false or improbable sightings), and c) where proper channels of communication with UK Moon sighting committees exist for the declaration of all Islamic months.	• Wifaqul 'Ulama UK (www. wifaqululama.co.uk) and Rabetah Al-Ulama (Batley, UK) • Zaytuna College (USA) • www.crescentwatch.org

6.4.1 Arguments in support of Option 4

1. The reports of Companions of the Prophet ﷺ who kept fast whilst others did not suggests that the Companions (*radiaAllahu 'anhum*) went by their own local sighting. A global sighting does not preclude the fact that the Moon cannot be seen in certain places, hence it could be argued that it was always meant that some Muslims fast for 30 days whilst others in a different location fast for only 29 days. Simply because global telecommunications make it possible to globally synchronise fasting from the same Gregorian calendar day does not remove the cause (*illah*) of sighting the new Crescent Moon. In the same way prayer times are only determined by the Sun's positon where one is located.

2. Local sighting has always been the implemented *Shari'ah* method of declaring the start of Ramadhan and Eid, and this is the overwhelming consensus of Hanafi jurists today.[35]

3. This method follows the agreed resolutions at an International Conference held in Makkah on 11-13th February 2012 in which *'ulama* from different countries met to discuss the Moon sighting declaration from Saudi Arabia. The relevant ones that were adopted are mentioned below (for Arabic and Urdu transcripts, see Mufti Amjad's paper The Islamic Calendar according to Muslims in the UK, 2015).[36]

   > "Motion Six – With respect to those countries with a Muslim minority who cannot sight the Moon due to some reason then it is necessary upon them to follow the nearest Muslim-majority country or the nearest country with a Muslim community in which the sighting of the Moon is established similar to those Islamic centres and the like."
   >
   > "Motion Seven – The confirming of the beginning of the lunar months which are associated with acts of worship is an issue of the *Shari'ah*; as a result it is under the remit of the authorised scholars of the *Shari'ah* from the reliable institutes or those of a similar legal capacity. The remit of the astronomers and the institutes of astronomy is to submit the precise astronomical calculations [to the *Shari'ah* institutes], like details about the birth of the Moon, place of the *hilal*, prediction of the circumstances of the *hilal*, for instance where upon the globe it will be seen, also other such matters which will assist the *Shari'ah* institutes in issuing a correct precise decision."
   >
   > "Motion Eight – The *Shari'ah* does not forbid the use of technological developments like the recent astronomical calculations' developments or the historical methods of observation in the interests of the people and in their affairs because Islam does not oppose science and scientific facts."

6.4.2 Arguments against Option 4

1. It could be argued that the declaration from Morocco reaches the UK too late in the night (especially when Ramadhan is in summer months). And, as such, it causes hardship for ordinary Muslims eager to receive news of sighting as early as possible, particularly given that news from Makkah consistently reaches the UK 2-3 hours ahead of Maghrib (through live broadcast of *tarawih* prayers).

2. It could be argued that the lack of a clear process and support for mosques (particularly new and small ones) to coordinate and collect news from different sighting sites/groups on their own is too cumbersome and unworkable. Whereas, keeping to Saudi declaration through the broadcast media is quite straightforward.

3. It could be argued that having to rely on Moon sighting organisations introduces a new power relation in the inter-politics of Islamic organisations, which mosques may wish to remain neutral to.

4. There has been at least one example, in 1985, of an extreme delay in receiving news of Moon sighting from Morocco (received at 10am the next morning) due to a breakdown in telex service which caused some confusion. It could be argued that whilst communication and resilience have since improved, when there is no possibility of sighting, news can take up to 1.5 hours after Maghrib to reach the UK which may be too late in the night for some communities. Delay is due to additional time needed to collect news from all sighting zones before the Moroccan Ministry of Religion can take a definitive decision (rather than up to 30-40 minutes when there is a possibility of sighting).

6.5 Option 5: Follow Saudi declaration

Summary of method	Organisations that advocate this method
Follow Saudi declaration that, at least for Ramadhan and Eid, reaches the UK via television channels and individual contacts, without any negating conditions like the possibility of sighting (*imkan al-ru'ya*) based on astronomical calculations and/or a large group of witnesses in clear sky etc.	• Jamiat al-'Ulama (UK) • Hizbul ulama (UK) (www.hizbululama.org.uk) • Major Islamic centres of London • Some satellite channels

6.5.1 Arguments in support of Option 5

1. It could be argued that, in the past, news of Morocco's declaration tended to reach the UK too late in the night for mosques to act upon, and mosque-goers were right to insist on following Saudi declaration to satisfy the need for an earlier time. The problem was particularly acute in the late 1980s when Ramadhan was in the summer months. Additional pressure for an earlier declaration came from:

    - Increasing mosque-goers (as a result of inward emigration of Muslims) simply eager to get on planning for *tarawih* and *suhur* etc.
    - The growing numbers of new mosques lacked a proper communication channel for the news of sighting to be received from Morocco, and there were none or ineffective platforms (e.g. local mosque councils) to share the news.
    - The diverse Muslim communities had other priorities to deal with (e.g. earning income, maintaining family, bringing family to the UK etc.). Under these conditions, legal dispensation (*ruksa*) aside, for practical reasons it was prudent to adopt Saudi declaration.

2. It could be argued that in the absence of experts of Moon sighting among Muslim communities and visibility diagrams, following Saudi declaration was particularly convenient as news could be easily relayed to the UK by family members residing in Saudi Arabia or through satellite channels. It could be argued that for some communities these conditions are still relevant today.

3. It could be argued that the basis of following Saudi declaration was one of "unity." Unlike any other country, Makkah being the direction of *qibla* and the place of pilgrimage (Hajj) means that there is already a spiritual and instinctive reason to follow Saudi declaration. And, in the event of a lack of a workable solution, it could be argued that the basis of the dispensation (*ruksa*) to follow Saudi declaration is still applicable.

4. It could be argued that for much of the 1980s, 1990s and 2000s there was little or no awareness or evidence suggesting that Saudi Moon sighting had any methodological defects (e.g. reliance on the Um al-Qura calendar, risk of errors from solitary witness reports etc.). Hence, Saudi declarations were arguably as reliable as any other at the time.

5. It could be argued that relying on Saudi declaration has served some communities very well. The British-Bengali, -Somali and -Arab communities in particular across Britain, or very large parts of it, have by enlarge always completed Ramadhan and Eid together. Thus, the thought of moving away from this and risk splitting these communities in different towns may be quite devastating.

6.5.2 Arguments against Option 5

1. It could be argued that the sentiment for "unity" as a legitimate basis for fixing distant sighting to Saudi Arabia is intrinsically weak. As many scholars have pointed out, unity does not mean that the whole Ummah should perform Eid at one and the same time. Not least because for the Moon to be the same phase on the same Gregorian calendar day across the world is physically impossible. Moreover, as one leading jurist has articulated, there is no suggestion that "the Quran and Sunnah would order Muslims to celebrate Eid al-Adha according to their local dates up to a particular time [until the late 1980s] and to link it to dates with Makkah thereafter."[37]

2. It could be argued that fixing the location of sighting/declaration to one specific country is arbitrary, and lacks a basic understanding of Moon sighting science and *fiqh*, particularly given that:

    - The first visibility of the Crescent Moon does not occur over Saudi Arabia every month, which means that Saudi declarations necessarily rely on other sources of information or methods.
    - There have been many cases[38] of sightings that have been accepted by the Saudi judiciary despite being scientifically impossible. Thus, it could be argued that in these cases perceptual psychology may have confounded the witness' observation, or telescopes/photo-imaging has been used.
    - It could be argued that fixing the location of sighting to a closer Muslim country like Morocco which is closer to the UK, is more consistent with the spirit of the *Shari'ah* than Saudi Arabia which further away. Moreover, Morocco has an extensive Moon sighting coverage with 218 sighting points across 14 sighting zones and is overseen by Morocco's Ministry of Religion.[39]

3. The Um al-Qura calendar (the official civil calendar of Saudi Arabia, used for state and commercial administration – not a religious calendar) uses what experts have said is a basic criteria that generally makes Hijri months one day ahead compared to the months based on actual *hilal* sighting. The Um al-Qura criteria for starting a new Islamic month is that on the evening of the 29th of a month (a) the conjunction of Moon should have occurred before sunset and (b) the moonset should be after sunset. If these two conditions are fulfilled, the next day is considered to be the 1st of the next Islamic month. However, these conditions are not always sufficient for the *hilal* to be seen. Conjunction can occur at any time, and moonset can be before sunset.

4. It could be argued that Saudi sightings have a long history of errors and unreliability due to:

    - Changes to the Um al-Qura criteria in recent years: old criteria up to 1419 AH; second criteria 1420-22 AH; and present criteria since 1423 AH.[40]

- Inconsistency between the lack of sighting by established *hilal* Committees in Saudi Arabia versus the Judiciary's acceptance of a solitary report of sighting when it is in fact scientifically impossible to (e.g. before the Conjunction Moon).[41]
- A number of investigations have exposed many reporting errors, including on one occasion during a partial solar eclipse on 3rd November 2013, which was subsequently overturned by the Riyadh Supreme Court.[42]
- Studies have shown that an observers' prior knowledge can affect their perceptual psychology, i.e. observers are more likely to report sighting if they know that there is an expectation that it should be a new lunar month according to a pre-determined calendar.[43]
- A number of studies have shown that naked-eye sighting by the untrained has a natural error rate of 15% to 17%.[44]

5. Evidence from a number of different sources have come to light showing that for 8-9 months of the year the Um al-Qura calendar relies on astronomical calculations, and uses observatory telescopes to confirm the Crescent Moon. Moreover, news of monthly declarations do not reach the UK outside of the non-*'ibadah* months.[45]

6. It could be argued that despite nine Crescent Moon sighting committees in Saudi Arabia (since 1430 AH), they still "do not have exclusive jurisdiction, [and] therefore if any Muslim makes a claim of sighting the *hilal* then the Justice Department can accept it."[46] Moreover, the *fiqh* followed in Saudi Arabia allows for solitary witness statements in clear sky to be accepted even though it might be scientifically impossible for anyone to have sighted the new Crescent Moon.

7. The most prominent Saudi scholars have given *fatwa* to the effect that "…each country has its own sighting and that they have to resort to their scholars in this regard."[47] Similarly, *fataawa* of eminent Hanafi jurists today is to follow local sighting.[48] Apart from a segment of Muslims of the West, elsewhere rarely do people follow Saudi declaration and rely on their own local sightings.

8. Differences in the *fiqh* of Moon sighting between Saudi Arabia (which follows Hanbali *fiqh*, or a derivation of it) and the majority UK *fiqh* based on the Hanafi *madhab*, means that there could be a situation when a report of a solitary witness in clear sky is accepted by Saudi Judiciary while this would be rejected in the UK under Hanafi *fiqh*.

6.6 Option 6: Follow majority view

Description of method	Organisations that advocate this method
Based on the "principle of the majority" ordinary Muslims adopt whatever the majority decides which is taken as the bona fide opinion of the Ummah when there is no leader of the community.	No one organisation follows this, but is the opinion of a few scholars.

6.6.1 Arguments for Option 6

1. It could be argued that following the Muslim community (*jama'ah*) constitutes the Sunnah of the Prophet ﷺ based on the *hadith*: "The fast is the day you all fast; the breaking of fast is on the day that you all break fast; and the day of sacrifice is on the day that you all sacrifice" (Al-Tirmidhi, book 8, hadith no. 16).[49] Imam al-Tirmidhi's commentary of this *hadith* is that: "one fasts and celebrates the Eid with the group of Muslims and their majority."[50] As such, what is most important is not to break away from the majority.

2. It could be argued that since Muslims as individuals do not have room to exercise personal choice on a matter that to all intents and purposes is communal, following the majority is necessary and anything else would be inappropriate and lead to confusion.

3. Since there is no practical workable national co-ordination, it could be argued that following the majority of the town/city one resides in is the most pragmatic and common sense approach to uniting Muslims locally.

4. It could be argued that the idea of following the majority view has, despite people's differences, worked to keep some sections of the Muslim community relatively united (e.g. Bangladeshi, Arab, Somalian to name a few).

6.6.2 Arguments against Option 6

1. It could be argued that there is no consistently applied statistical definition of "majority," and differences in one's personal subjective take on what is meant by "majority" will likely produce different choices between people.

2. It could be argued that the simplest and most popular method of defining a "majority" is by a count of the number of mosques. However, in many towns like Luton a small number of mosques may have the largest base of mosque-goers, and as such a simple count of mosques may not necessarily approximate to a "majority." Many Muslims, particular women, are not aware of all the mosques in their town too. Moreover, at the national level, it becomes even more difficult to discern majority.

3. In many towns there is no clear cut majority whatever method of counting is used. Splits tend to be 60%-40% and can be difficult to notice. The situation in London may be different however due to large mosque communities.

7. Recommendation, practical advice and next steps

7.1 Some broad conclusions about each option

In view of discussions in the paper, it seems that some degree of favour remains for doing nothing and keeping to a plurality of methods (Option 1). However, to all intents and purposes this is not seen as a compelling position but a compromise path of least resistance in the hope that the status quo does not deteriorate whilst there is no workable unifying alternative. No one denies, for instance, that resident neighbours celebrating Eid together is a more preferred outcome.

In the UK the *'ulama* overwhelmingly oppose the sole use of astronomical calculations to confirm the start of Ramadhan or Eid (Option 2). Given the traditional background of the *'ulama* of the UK, who maintain the principle of physical naked-eye sighting, Option 2, despite scoring well in comparison to other methods, is unlikely to be a workable solution. Similarly, the Government is highly unlikely to intervene on what is a religious matter (Option 3), not least since a full public consultation would be required which Muslims would likely reject. The follow majority option (Option 6), too, seems an intrinsically passive position as it only becomes relevant once a more binding decision comes into play.

This leaves us with two prevalent options - Options 4 and 5, both of which accept the physical sighting the new Crescent Moon as the *Shari'ah* method. However, there remain considerable disagreements regarding a) whether the sighting should be local (or in a nearby Muslim country/community) or follow Saudi declaration, and b) what standard of safeguard should be in place to reduce errors.

In order to evaluate this, we have proposed a scoring system using factors discussed in this paper (see Table 6). What is clear is that Option 4 overwhelmingly ranks 1st whilst Option 5 ranks only 3rd, 4 point below Option 2.

				Recommendation		
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Criteria	Do nothing – maintain pluralism	Confirm the start of the Islamic month using astronomical calculations	Government set dates	Confirm the start of the Islamic month by local naked-eye sighting using astronomical calculations to reduce errors	Follow Saudi declaration	Follow majority view
Conformity to the *Shari'ah*	1	0	0	3	2	2
Reliability and accuracy	1	3	1	3	1	1
Confidence in negating false sightings and errors	1	3	1	3	1	2
Potential to unify at least 80% of Muslims of theUK	0	0	0	3	1	1
Simplicity	0	3	3	1	3	2
Time lag of declaration	1	3	3	1	3	1
Consistency of use to confirm non-*'ibada* months	1	3	1	3	2	0
Potential to allow Muslims of the UK to take ownership for their own space and context	0	3	3	3	1	1
Total score	5	18	12	20	14	10

Table 6. Proposed scoring of each option, where 0 is lowest and 3 is highest.

7.2 Recommendations

Recommendation 1| Muslims of the UK should adopt local naked-eye sighting keeping to the Sunnah and the *fataawa* of expert scholars in the field.

Recommendation 2| Moon sighting organisations and expert scholars should form an inclusive national Crescent Moon sighting authority with the highest professional standards to co-ordinate and announce the *hilal* in the UK across all communities.

Recommendation 3| In cases of cloudy conditions or there is no possibility of sighting in the UK, the national authority should refer to the nearest easterly (or in the same sighting-zone), most reliable Muslim country/community. However, for an earlier declaration other easterly countries in a different sighting zone may be followed (as set out in Position Two and Three in Mufti Amjad's paper[51]), provided that conditions outlined in recommendation 4 are satisfied. This recommendation is for the national authority to consider.

Recommendation 4| The reference Muslim country should fulfil 3 conditions:

1. It is the nearest Muslim country in the same sighting zone or to the east of the UK that fulfils conditions 2 and 3.
2. The country has a well-established and independently verified, competent and reliable *hilal* sighting committee and judiciary (if state sanctioned).
3. There are well-established, contractually binding communication channels between the country's *hilal* committee/judiciary and the UK's national organisation.

Recommendation 5| The national authority should adopt the most accurate and reliable method by using the latest astronomical data to negate false sightings whether in the UK or elsewhere, and must initiate good practices and governance to reduce errors in communication.

Recommendation 6| The national organisation should take steps to:

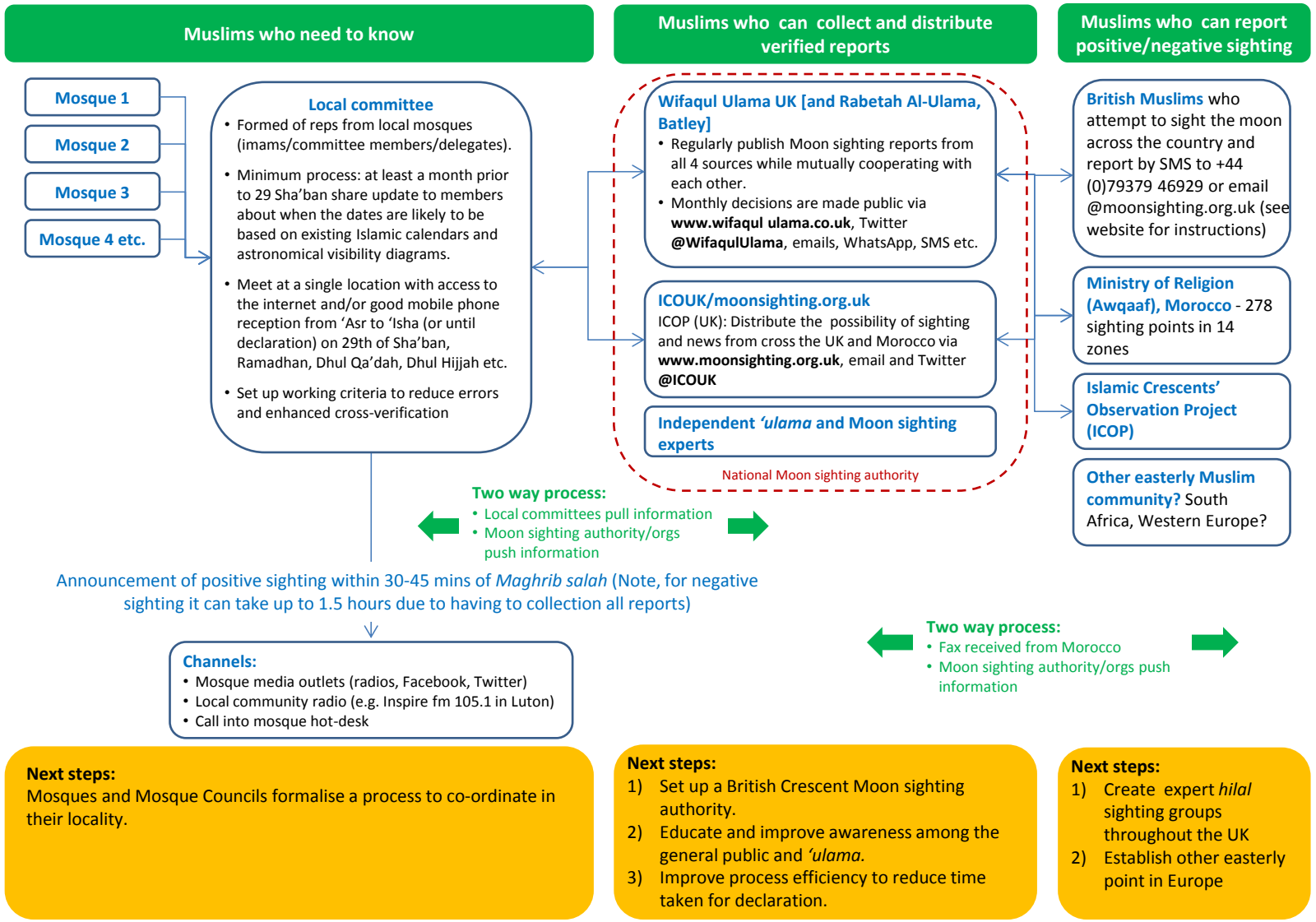
1. Maintain the highest professional standards and best practices in instituting an efficient, easily accessible process for disseminating news of *hilal* sighting.
2. Minimise the time it takes for the declaration in the reference country to reach the UK.
3. Set up a clear process for all mosques to receive information of *hilal* sighting each month.

Recommendation 7| Scholars and learned Muslims should make concerted effort to teach the science and *fiqh* of Moon sighting.

Recommendation 8| Local mosques and mosque councils should establish working groups responsible for putting in place a rigorous process for *hilal* declarations that locks into the national process. In the meantime, the work to bring about change at the local level should adopt best practices in stakeholder engagement and diplomacy.

Some of these recommendations have been illustrated in Figure 4.

Figure 4. Diagram showing the flow of news of Moon sighting across Muslims who need to know, Muslims who can collect and disseminate verified reports and those who can attempt to sight first hand. Some of the recommendations of this paper have been outlined in the next steps.



7.3 Reflections on unity

Unity is of course not uniformity in the sense that unity is not about doing everything the same way or removing one's freedom to differ in matters that are not decisive (*qat'i*) or due to differences in understanding or one's particular circumstances. Rather, unity may be better conceived as a state of being in actively discharging one's duty (legal, spiritual, and humanitarian) towards others and loving for others what one loves for oneself.

Moreover, the tendency to demand that others unite on one's own terms overlooks the fact that the very nature of unity, particularly on a communal matter, requires a **willingness to put aside one's own views for the greater public interest and well-being** (*maslaha mursalah*).

And finally there is **no reason to fear reputational damage** in choosing to change. Change does not imply that previous decisions were wrong. As this paper has found, following Saudi declaration was a reasonable response to the circumstances in the late eighties and nineties, and depending on circumstances, arguably, is still relevant for many. However, what is dangerous is escalating commitment,[52] for want of a better description, for something that has since proved unreliable and there may be workable alternative that exist.

7.4 Adopting best practice in stakeholder engagement and diplomacy

Below is a list of suggested best practices to adopt for local stakeholder engagement.

1. Identify key stakeholders and involve them in a process of consultation (*shura*) as partners responsible for overcoming challenges of the local community.
2. Carryout the necessary background work to identify those stakeholders more likely to be sympathetic and build a baseline consensus first before embarking on a wider consultation process.
3. Focus on: a) clarifying the benefits of a unified approach to Moon sighting; b) bringing about a more academic understanding of the relative merits of the options; and c) building awareness of the damaging consequences of division or inaction.
4. Maintain an ongoing, transparent, engaging dialogue between stakeholders. Use encouragement and honest appreciation.
5. Understand and empathise with the sensitives of stakeholders.
6. Maintain professionalism at all times – present facts on the science of Moon sighting, avoid stigmatising or maligning any individual, group or mosque.
7. Maintain Prophetic *adab* at all times, showing due warmth and respect to stakeholders, e.g. refrain from making derogatory/demeaning comments on matters related to Moon sighting or otherwise. Ask questions instead of giving direct orders.

7.5 Overcoming structural barriers requires a national Crescent Moon sighting authority

This report finds that a national Moon sighting authority should be formed to enable Muslim communities overcome structural barriers that currently act as "sticky" factors that maintain the status quo. There are two main structural barriers:

1) Loyalties impeding effective organisation at local and nationally levels.

Islam has always shown itself to be culturally friendly. "The religion became," says Sheikh Umar Abd-Allah, "not only functionally and familiar at the local level, but dynamically engaging, fostering stable

indigenous Muslim identities and allowing Muslims to put down deep roots and lake lasting contribution wherever they went." [53] This is of course an ongoing process in the British Muslim experience.

However, in context to Moon sighting, the ethnic-cultural identities in the examples of the British-Bengali, -Arab, and -Somali communities across Britain, has meant that irrespective of internal or external theological differences, they have for some time, and by enlarge, followed Saudi declaration, which has meant that they have not been divided on Moon sighting. Shared ancestral history and cultural factors appear to drive uniformity. And for good reasons – people visit relatives at Eid who tend to be from the same ethnic background. Thus, a national approach is required to avoid creating new divisions in these communities across different towns.

2) A lack of education on Moon sighting *fiqh* and science.

Moreover, there is a substantial need to educate the public on *fiqh* and other religious sciences in a more academically rigorous way. The poor understanding of Moon sighting *fiqh* is a symptom of a wider lack of learning. To effectively address these aspects requires better organisation and standards locally and nationally.

For these reasons, unless there is a national approach to Crescent Moon sighting in the UK, it is very likely that the status quo will remain for the foreseeable future. As such, this paper calls upon Moon sighting organisations, representatives of mosques and *'ulama* bodies from all backgrounds to organise a symposium to formally adopt the proposal for a national Crescent Moon sighting authority for the UK.

End of report.

We pray that Allah gives Muslims of the UK the ability (*tawfique*) to achieve this, that He makes it possible for us to restore the Crescent Moon as our historical symbol of unity.

All praises are for Allah, the Lord of all that exists, and we send our *salawaat* to the Prophet ﷺ and the *ambiya* (*'alaihissalam*), and to all those that followed them.

8. Bibliography

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Sheikh Hamza Yusuf, *Caesarean Moon Births*, Part I & II, 2006-2007, http://www.masud.co.uk/ISLAM/misc/moonsighting/Cesarean_Moon_Births_Pt_1.pdf and http://www.masud.co.uk/ISLAM/misc/moonsighting/Cesarean_Moon_Births_Pt_2.pdf.

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Sheikh Dr Muhammad Afifi al-Akiti's *Definitive Reply to the Moonsighting Controversy*, http://www.masud.co.uk/ISLAM/misc/moonsighting.htm.

Naveed Sheikh, *The Fiqh and Science of the Islamic New Moon*, 2010, http://www.zawiyah.org/The_Fiqh_and_Science_of_the_Islamic_New_Moon.pdf.

9. End notes

[1] Mamnun Khan studied Biochemistry at Imperial College London before completing a PhD in Molecular Immunology at Cambridge University. He has a keen interest in tradition-modernity dialectics and takes an active part in community work. Currently he is studying various aspects of his faith with Sheikh Mohammad Akram Nadwi, and has attended classes with Sheikh Muhammad al-Ya'qubi, and Luton-based scholars, Mufti Abdul Hannan, and others.

[2] Sheikh Surkheel Sharif, *Moonsighting – Unity or Lunacy?* 18/07/2015, http://www.islamicate.co.uk/. Retrieved 28/8/2015.

[3] In some cases, the advice given is not well thought out for different spaces and contexts which, in turn, can lead to further confusion. For example, the nuances of the situation in the UK are quite different to the USA in a number of ways, e.g. the US is split across different time zones and sighting zones, and the argument of using astronomical calculations for confirming Ramadhan is much more prominent.

[4] Sheikh Shams Ad-Duha Muhammad, *Let's agree to disagree* (Part 1 and 2), Islamique Magazine, issue 4, February 2012, http://islamiquemagazine.com/lets-agree-to-disagree/

[5] Whilst there have been disagreements in the past it is clear is that the kind of divisions that have become a matter of routine for neighbouring mosques goers within minutes of walking distance, is not a phenomenon that can be found in historical literature. One proof of this is that in Muslim countries today, >95% of Muslims start and end Ramadhan and Eid al-Adha together. Differences are usually removed by people in authority, which, according to Sheikh Hamza Yusuf, "has worked well in the Muslim world."

[6] For description see Sheikh Hamza Yusuf's *Purification of the Heart*, Starlatch, 2004, p94-96.

[7] Tafsir Jalalayn, translated by Aisha Bewly, Dar Al Taqwa Ltd., 2007, p945-947.

[8] See Hamza Yusuf, *Caesarean Moon Births*, Part I & II, 2006.

[9] Sourced from http://www.sunnah.com.

[10] Ibid.

[11] See also other definitions of *hilal*, particular those that discussed by Dr Zulfiqar Ali Shah connected with the idea of people announcing its sightings.

[12] Dr Salman Zafar Shaikh, *Hilal Sighting & Islamic Dates: Issues and Solution Insha'Allaah*, 2001, p21, http://www.hilalsighting.org/papers/salman.pdf.

[13] Sourced from Sheikh Muhammad Afifi al-Akiti's *Definitive Reply to the Moonsighting Controversy*, http://www.masud.co.uk/ISLAM/misc/moonsighting.htm.

[14] Naveed Sheikh, *The Fiqh and Science of the Islamic New Moon*, 2010, p20, http://www.zawiyah.org/The_Fiqh_and_Science_of_the_Islamic_New_Moon.pdf. Retrieved 10/9/2015.

[15] International Astronomical Centre, http://www.astronomycenter.net/star.html. Retrieved 11/9/2015.

[16] *Arabic in the Sky*, http://www.aramcoworld.com/issue/201005/arabic.in.the.sky.htm. Retrieved 11/9/2015.

[17] For more details on the Danjon Limit see: http://the-moon.wikispaces.com/Danjon+Limit.

[18] A.H. Sultan, *First Visibility of the lunar Crescent: Beyond Danjon's Limit*, The Observatory, 127, No 1, 53-59, February 2007.

[19] Syed Khalid Shaukat, Edited by Qamar Uddin (May 2000), *The Science of Moon Sighting*, http://www.moonsighting.org.uk. Retrieved 26/8/2015.

[20] Dr. Mohammad Ilyas of Malaysia, is the founder of modern day Hilal visibility models, and author of *A Modern Guide to Astronomical Calculations of Islamic Calendar, Times and Qibla*. He is also the founder of the idea of Tri-zonal Hiiri calendar.

[21] NAO Technical Note, No. 69, *A Method for Predicting the First Sighting of the Crescent Moon*, B. D. Yallop, 1997. Source: http://astro.ukho.gov.uk/moonwatch/background.html.

[22] Engineer Qamar Uddin has been a long standing advocate of a national Crescent Moon sighting authority, see *Seminar on moon sighting held in Croydon*, 25 July 2008, http://archive.muslimnews.co.uk/paper/index.php?article=3616

[23] Dr Salman Zafar Shaikh, *Hilal Sighting & Islamic Dates: Issues and Solution Insha'Allaah*, http://www.hilalsighting.org/papers/salman.pdf.

[24] Sheikh Mokhtar Maghraoui, *An Islamic Legal Analysis of the Astronomical Determination of the Beginning of Ramadan*, 24 June 2014, http://almadinainstitute.org/blog/an-islamic-legal-analysis-of-the-astronomical-determination-of-the-beginnin/

[25] Zulfiqar Ali Shah, *The Astronomical Calculations and Ramadan: a Fiqhi Discourse*, IIIT, 2009, p131.

[26] Ibid, p71.

[27] See *An Analysis of Moon Sighting Arguments* by Dr. Zulfiqar Ali Shah of Fiqh Council of North America, http://www.fiqhcouncil.org/node/21. Retrieved 15:45 1st August 2015.

[28] Zulfiqar Ali Shah, *The Astronomical Calculations and Ramadan: a Fiqhi Discourse*, IIIT, 2009, p66.

[29] Ibid, p73.

[30] According to some scholars Imam al-Subki was alone in his position – see Mufti Taqi Usmani's *In'am al-Bari Durus Bukhari Sharif*, Maktaba al-Hira, Vo. 5, pp492-4, Pakistan, Karachi. Taken from Mufti Syed Amjad Mohammad's paper.

[31] For a good review of linguistic terms and how they are to be understood in light of traditional scholarship see: Sheikh Mokhtar Maghraoui, *An Islamic Legal Analysis of the Astronomical Determination of the Beginning of Ramadan*, 24 June 2014, http://almadinainstitute.org/blog/an-islamic-legal-analysis-of-the-astronomical-determination-of-the-beginnin/

[32] Zulfiqar Ali Shah, *The Astronomical Calculations and Ramadan: a Fiqhi Discourse*, IIIT, 2009, p143.

[33] Hamza Yusuf, *The Lunacy of Lunar Sightings*, July 2015, https://www.sandala.org/blog/the-lunacy-of-lunar-sightings.

[34] *Make Eid & Diwali Public Holidays* petition reached 123,881 at closure 12 August 2014, https://petition.parliament.uk/archived/petitions/53523.

[35] See *The Issue of Moon Sighting in Britain* by Moulana Muhammad Iqbal Rangooni, http://www.wifaqululama.co.uk/articlespdf/MoonSighting_Maulana_Iqbal.pdf. Retrieved 28/8/2015.

[36] Translation taken from Mufti Syed Amjad Mohammad, *The Islamic Calendar According to Muslims in the UK*, Institute for the Revival of Traditional Islamic Sciences, 2015, p36-37. For full text of the Urdu see: http://www.deeneislam.com/ur/horiz/halate_hazra/2055/article.pho?CID=2055. The Arabic notes of the Islamic Conference can be found therein.

[37] Mufti Taqi Usmani argues these points under the question relating to *Celebrating Eid al-Adha according to dates in Saudi Arabia*, in *Contemporary Fataawa*, Azhar Academy, 2000, p183-186. The arguments have been made elsewhere too.

[38] See both Mufti Amjad's and Dr Salman Shaikh's papers.

[39] Source: Engineer Qamar Uddin of ICOUK, personal communication

[40] See http://www.moonsighting.org.uk/en/saudi-dating-system.html?start=2. See also Um Al-Qura website http://www.ummulqura.org.sa/president_address.aspx.

[41] See Table 1 in *Two Eids: The root of the problem*, by Dr. Waheed Younis, http://www.moonsighting.com/articles/twoeids.pdf. The author lists 17 cases when the *hilal* was claimed to have been seen in Saudi Arabia even before the Conjunction Moon which is scientifically impossible between Ramadhan 1997 and Dhul Hijjah 2003. Retrieved 28/8/2015.

[42] See http://www.moonsighting.org.uk/docs/1435AH/SolarEclipseAndUmmulQuraCalendar.pdf.

[43] Ayman Kordi, *Sightings of the new Moon – The Psychological Effects on Sightings of the New Moon*, 2003, The Observatory, Vol. 123, pp. 219-22. Kordi finds that 35 out of 42 reports (83%) of *hilal* sightings of Ramadhan between 1962-2001 agreed with the Um Al-Qura calendar despite being "difficult observations." http://articles.adsabs.harvard.edu/full/2003Obs...123..219K

[44] Quoted from Naveed Sheikh, *The Fiqh and Science of the Islamic New Moon*, 2010, p21, http://www.zawiyah.org/The_Fiqh_and_Science_of_the_Islamic_New_Moon.pdf. Retrieved 10/9/2015.

[45] Syed Amjad Mohammad, *The Islamic Calendar According to Muslims in the UK*, Institute for the Revival of Traditional Islamic Sciences, 2015.

[46] Ibid, p21.

[47] Fatwa of Sheikh Abdullah Ibn Baaz, *Ruling on depending on astronomical calculations*, Part No. 15; Page No. 109, http://alifta.com/. Retrieved 13/8/2015. See also the fatwa of Sheikh Al-Uthaymeen in p11 of *Hilal Sighting & Islamic Dates: Issues and Solution Insha'Allaah* by Dr Salman Zafar Shaikh, http://www.hilalsighting.org/papers/salman.pdf.

[48] See *The Issue of Moon Sighting in Britain* by Moulana Muhammad Iqbal Rangooni, http://www.wifaqululama.co.uk/articlespdf/MoonSighting_Maulana_Iqbal.pdf. Retrieved 28/8/2015.

[49] Discussion on *hadith* (see http://sunnah.com/tirmidhi/8/16) can be found in Sheikh Haytham Al-Haddad's article: *An insight into moon-sighting*, 16/6/2015, http://www.islam21c.com/islamic-law/964-an-insight-into-moon-sighting/. Retrieved 11/9/2015. This *hadith* has also been used as evidence for sightings by a large group by the Hanafi authority 'Allaama Zafar Ahmad 'Uthmani (1892- 1974) in his book *'ila' al-Sunan* (p128/9): https://ia600409.us.archive.org/22/items/waq55508/09_55514_b.pdf (confirmed by Tariq Pandor and Mufti Sajid Patel – personal communication).

[50] Sourced from Sheikh Yasir Qadhi's article: *Yasir Qadhi on Understanding the Controversies Regarding Moonsighting*, 10/8/2010, http://muslimmatters.org/2010/08/10/retread-yasir-qadhi-on-understanding-the-controversies-regarding-moonsighting/. Retrieved 11/9/2015.

[51] Mufti Syed Amjad Mohammad, *The Islamic Calendar According to Muslims in the UK*, Institute for the Revival of Traditional Islamic Sciences, 2015, http://www.irtis.org.uk.

[52] "Escalation commitment" in the context of Moon sighting can be taken as a term that describes the situation when people continue their commitment to a particular course of action because they fear that giving it up would imply that past decisions may have been wrong. In response, they continue to commit to down the same course of action in an attempt to avoid this question, but in doing so making it that much harder for themselves to change in the future.

[53] Dr Umar Faruq Abd-Allah, *Islam and the Cultural Imperative*, Nawawi Foundation, 2013, http://www.nawawi.org/wp-content/uploads/2013/01/Article3.pdf. Retrieved 12/9/2015.