

# Astro-Tourism as a High Potential Alternative Tourist Attraction in Tanzania

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**Abstract:** Besides Tanzania's world famous traditional tourist attractions, the country has many hidden treasures. Among these are the stars in the night sky. Tanzania's geographic location near the equator offers 95% of the view of stars that can be seen in one night. Tanzania also has vast rural locations that are unaffected by light pollution, and allows viewers to experience the full glory of the night skies. Extreme light pollution in developed countries points towards the potential of Astro-tourism as an alternative tourist attraction for Tanzania. Astro-tourism is a nighttime activity that complements traditional tourist activities. Fixed or mobile observatories can be set up with easily available good quality telescopes. Astro-tour guides can be trained locally and monthly night sky updates can be provided to highlight local delights.

**Keywords:** Astro-tourism, Tanzania, tourist, astronomy, light pollution, telescope.

## INTRODUCTION

Astro-tourism is a new phenomenon that is taking hold across the world. Capturing people's inherent interest in the mysterious provides the drive for tourism through the ages. Astronomy provides numerous opportunities to catch the interest of young and old alike. A chance to combine the thrills of the visiting new parts of the world with viewing the unknown world of space can be exhilarating. This paper highlights the potential of astro-tourism for Tanzania and suggests ways to introduce and develop this opportunity.

## LITERATURE REVIEW

Astro-tourism has traditionally been associated with actual travel to space, for example, by Dennis Tito who was the first 'tourist' who in 2001, visited the International Space Station orbiting 400 km above Earth (Wikipedia, 2014a). In such cases it is also termed "space tourism" (Duval, 2005; Cater, 2010). Astro-tourism is referred to as tourism for watching the night skies from suitable places on earth as discussed in Ingle (2010). Jiwaji (2010a). Jiwaji (2010b). According to Duval (2005). such niche tourism is the fastest growing sector in the tourist industry.

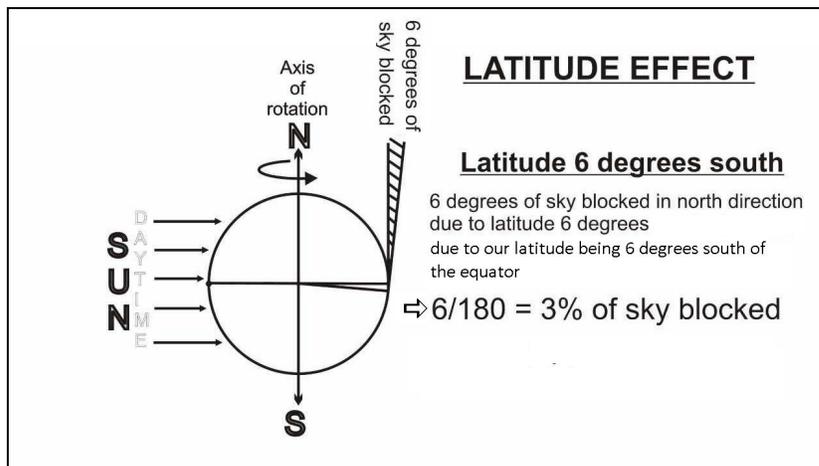
The novelty of astro-tourism can be gauged by the number of page hits returned by Google search. Words such as "astro-tourism", astrotourism, "astro-tourist", astrotourist, when they are googled, they yield an average of about 10,000 hits each one. It is also significant that tens of thousands of pages have been written about this mostly unknown brand of tourism. Online Oxford, Cambridge and Merriam-Webster dictionaries did not contain the word astro-tourism when accessed from the purposes of this review. Wikipedia (2014b) has only one page describing astro-tourism in a stub page where details are still being added.

In the astronomy community, however, astro-tourism is a recognized term, especially in connection with the need to maintain dark skies on earth (Jiwaji, 2010a; Astronomers Without Borders, 2015). Ingle (2010) provides a comprehensive review of recognition of Southern African skies as ideal for observing stars.

There is no formal astro-tourism industry in Tanzania, hence this type of tourism has a great potential of increasing tourist revenue for Tanzania. This paper analyses Tanzania’s geographical position as advantage in astro-tourism and for astronomy in general. The availability of substantial sites with dark sky, especially within the already protected national parks and reserves is also discussed. This paper is written with the intention of highlighting astro-tourism as a new avenue for economic activity for public and private enterprises, as well as development of science and technology in Tanzania.

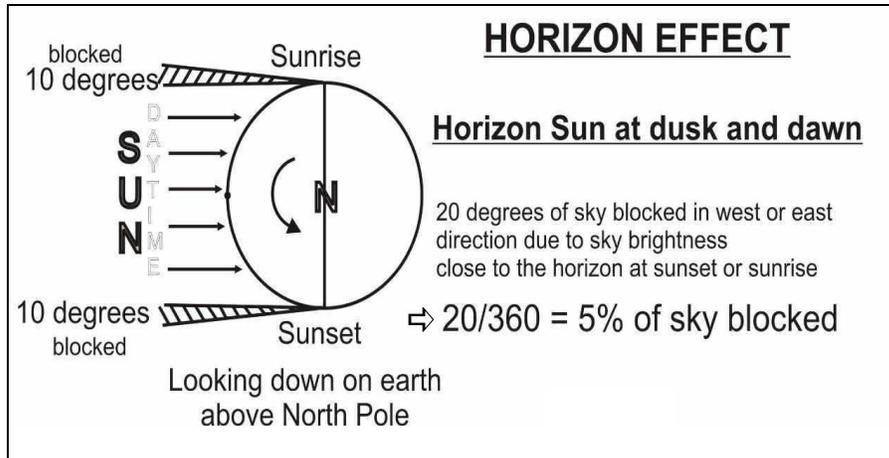
### POTENTIAL FOR TANZANIA

Tanzania has several advantages in exploiting this potential to attract more tourists. Firstly, its geographical position close to the equator, between the latitudes of 1 and 10 degrees south and longitude 30 to 40 degrees east (Maps of World, 2015). This proximity to the equator gives Tanzania an astronomical advantage of encompassing practically 97% of the north south horizon as proved by the following calculation:  $(180 - 6)/180 \times 100\% = 97\%$  visible where 6 degrees is cutoff from the north pole view due to our average latitude of 6 degrees south of the equator. This calculation is illustrated in Figure 1 which shows the amount of sky blocked due to our south latitude position.



**Figure 1: Illustration of amount of sky blocked due to Tanzania’s latitude position**

In Tanzania, the 97% north-south view of the sky is combined with a practically 95% of the east west skies visible between sunset and the sunrise of the following day as shown in the following calculation:  $(360 - 20)/360 \times 100\% = 94.4\%$  of the sky is visible in sufficiently dark skies when the sun has dipped 10 degrees below the horizon after sunset or is still 10 degrees below the east horizon before sunrise. This situation is as illustrated in Figure 2 which shows the amount of sky blocked from view due to horizon brightness soon after sunset or just before sunrise.



**Figure 2: Illustration of Amount of Sky Blocked due to Horizon Brightness at Sunrise and Sunset**

Tourists from high northern latitudes would hence find Tanzania ideal to come for night sky observations. Tanzania's equatorial position also provides conducive climate for outdoor observations during the night. Tourists from cold climates, who are also concurrently from high northern latitudes, would find Tanzania extremely attractive.

Tanzania is also home to some of the darkest skies in the world as gauged from the night time view of the world shown in Figure 3. Tanzania is seen only through a few city lights, while lights in comparative places in the northern world completely carpet those countries.

Light pollution is an extreme evil for astronomy observations from the ground. It blinds the eyes from seeing fainter objects, and, more seriously, brightens the sky through the sky glow producing light pollution (Jiwaji, 2014a; Jiwaji, 2014b; Walker *et al.*, 2013). The northern and more developed countries can be clearly seen in the Earth at Night picture (Figure 3, Astronomy Picture of the Day, 2015). with their borders clearly outlined by the carpet of numerous lights, unnecessarily pointing upwards, wasting energy and blocking the views of stars. Tanzania can offer them dark sky sanctuaries in its renowned and vast game parks, legally protected from human encroachment.



**Figure 3: Earth at Night (Courtesy NASA, NOAA NGDC, Suomi-NPP, Earth Observatory)**

Astronomy related artifacts found in Tanzania would provide additional attractions. Tanzania hosts one of the biggest meteorites in the world the 16 tonne Mbozi meteorite at Mbozi near Mbeya in southern Tanzania (Jiwaji, 2014c). The primordial Ivuna meteorite found in Tanzania in 1938 brought attention to the potential of such astronomy attractions (Lukumbo, 2008). An astro-tourist interest can in turn spur exposure of further historical artifacts and knowledge about indigenous astronomy in Tanzania.

**VIABILITY OF IMPLEMENTATION IN TANZANIA**

Astro-tourism often starts as an opportunistic endeavour arising from international astronomy events, such as eclipses, that are publicized internationally. The recent total solar eclipse in Kenya gave that country a lot of publicity though neighboring Uganda would have offered more promising viewing sites (Premier Safaris, 2015). Numerous scientists and astro-enthusiasts set up experiments at eclipse sites because such events provide rare and unique possibility of measuring phenomena that otherwise would need expensive spacecrafts. Major astronomy publications such as Sky and Telescope also organize tourist events to take tourists to the center of the astronomical event (Sky and Telescope, 2015).

We contend that Tanzania can be proactive in taking preparatory steps for an upcoming astronomical event in September 2016, an annular solar eclipse that will pass across southern Tanzania, peaking over the Selous Game reserve (NASA Eclipse Website, 2015). Prominent scientists have already shown interest to participate in scientific expeditions to the central path of the eclipse (personal communication 2015, with solar eclipse scientist, Prof. Jay Pasachoff). Such international attention will kick start the drive to attract more tourists to visit Tanzania for astro-tourism.

Astro-tourism can meantime also be introduced by publicizing it as a novelty for tourists who usually visit Tanzania's game and nature reserves. Tourists can be invited to savour the dark skies in national parks and enjoy the mysteries of the night skies in a relaxed atmosphere after an arduous daytime nature excursion. Hence astro-tourism provides an option that complements traditional tourism hence attract even more tourists.

High quality optical observatories can be set up on available roof/terrace space equipped with readily available optical telescopes, binoculars and peripherals technology at extremely economical prices (Celestron, 2015; Meade, 2015). Permanent observatories can be set up at hotels in game parks, while portable equipment can be used at camp sites or for night safaris. Costs would be extremely economical (Orion Telescopes and Binoculars, 2015). of the order of about 10,000 USD, including training by local experts of a couple of astro-tour guides for each hotel or camping site. The comparatively extremely low investment cost makes the introduction of astro-tourism an attractive proposition for established tourist hotels and resorts.

The major challenges that can face the astro-tourism industry in Tanzania would be the weather and climate. Interruptions in sky visibility due to clouds or overcast skies and overall climate over game parks and dark sky reserves would have to be taken into account when determining suitable dates. Variability due to climate change would add a further challenge that would have to be taken into account. However, well trained astro-tour guides can accommodate successful viewing by timing their viewing within interruptions in cloud cover or in bad weather. Viewing of suitable cosmic objects at convenient times can be accommodated by arranging viewing during evenings or dawn as appropriate. Equipment malfunctions can be accommodated by having backup telescopes and accessories.

## **CONCLUSION**

Tanzania's geographical location and light-pollution free skies allows us to offer astro-tourist attractions within the existing tourism setup. With pristine parks and established infrastructure, astro-tourism would be a natural extension of daytime nature tourism into the night time stargazing. With readily available optical telescopes, binoculars and peripherals at extremely economical prices, combined with training of astro-tour guides supported by available expertise, Tanzania can quickly and sustainably exploit the benefits of this novel, rapidly growing brand of tourism without undue waste of time and resources. The upcoming annular solar eclipse on September 1, 2016 provides a push, with sufficient time, to prepare and establish the resources and personnel needed for astro-tourists.

Further research is recommended to identify specific, accessible sites with dark skies for astro-tourism activities, to determine the magnitude and impact of economic benefits for

public and private sectors, to specification of locally suitable technological and equipment needs, and assess the benefits to science development in Tanzania.

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