

THE DARK SKY IS A NATURAL RESOURCE, AND TOO MUCH LIGHT IS POLLUTING IT

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A view of stars and the Milky Way in front of a telescope in Hanle, Ladakh, on September 30, 2022. | Photo Credit: R.V. Moorthy/The Hindu

On December 14, 2022, the district administration of Ladakh designated six hamlets within the Changthang Wildlife Sanctuary a [“dark-sky reserve”](#) – an area whose skies were free of light pollution. The designation meant that the reserve had a responsibility to keep the skies dark, particularly for the astronomical observatories located in the area.

When SpaceX’s Starlink constellation of small satellites [began to obscure the view](#) of ground-based telescopes around Earth, the idea of the sky as a natural resource capable of being polluted became popular. These incidents also rendered the absence of a global treaty to reduce light pollution more conspicuous.

But while authorities safeguard telescopes’ access to dark skies by actively lowering light pollution around their sites, the night is actually becoming brighter in almost the rest of the world thanks to ‘skyglow’, with significant ecological, health and cultural consequences.

How bad is light pollution?

In a [new study](#), researchers from Germany and the U.S. analysed a [global database](#) of what the dimmest star visible from a particular location is; the database had more than 51,000 entries submitted by citizen scientists. They found that non-natural light had increased the brightness of the artificial glow of the night sky, or skyglow, by 9.2-10% every year between 2011 and 2022.

Specifically, they reported that skyglow had brightened around 6.5% over Europe, 10.4% over North America, and 7.7% over the rest of the world.

The finding is significant because it disagrees with satellite-based data, which has indicated that the rate of increase has been around 2% per year. According to the new study, the discrepancy is probably the result of the satellites being unable to ‘sense’ blue light emitted by LEDs and to study light that is emitted parallel to the ground.

Visible light emitted by many sources (except e.g. lasers) is divergent, so light emitted insufficiently downward could find its way into the sky. Almost all surfaces in cities also reflect

light, meaning a portion of entirely down-cast light will be reflected upwards, contributing to nighttime light pollution.

The researchers recommend light sources casting light at an angle below the plane of the horizon, capping the emissions of these sources and calibrating their output according to the total brightness at the spot being lit.

What is the situation over India?

The study had few observations from Asia, South America and Africa. Africa had only 452 observations between January 2011 and August 2022 in the database. There were no entries from China or Brazil – both rapidly industrialising nations – in the study. The researchers themselves admit that only data from Europe and North America are representative, which means their conclusions must be taken with a pinch of salt.

India isn't a blind spot, however. In March 2021, Dorje Angchuk, an engineer at the Indian Astronomical Observatory in Hanle famous for his night-sky photographs, [tweeted pictures](#) of the Chemrey Monastery, near Leh, before and after a power cut. The number of stars that become invisible when the monastery is lit is striking.

A [2016 study](#) reported that 19.5% of India's population – the lowest fraction among G20 countries – experiences a level of skyglow that would at least keep the Milky Way galaxy out of sight and at most render "dark adaptation for human eyes" impossible. The effects include stimulating the cone cells in human eyes, which is possible only when an environment is [considered to be well-lit](#).

A [2017 study](#) reported that between 2012 and 2016, India's lit area increased by 1.07-1.09% and the average radiance of "stably lit areas" – e.g. excluding wildfires – increased by 1.05-1.07%.

What are the consequences?

The 2017 paper noted a curious pattern: "Regardless of historical or geographical context, humans tend to use as much artificial light as they can buy for about 0.7 percent of GDP." That is, even though LEDs have become more efficient, their utilisation hasn't decreased, which in turn means the carbon emissions due to their production and use hasn't decreased.

Numerous studies have also found artificial light at night affects both people and wildlife in important ways.

According to a [2003 report](#), lit beaches deter sea turtles from coming ashore to nest. A [2006 review](#) found that skyglow keeps trees from sensing seasonal variations. A [2017 study](#) found that young burrow-nesting seabirds don't take flight unless the nesting site becomes dark. A [2019 study](#) reported that clownfish eggs don't hatch when exposed to artificial light at night, killing the offspring. A [2020 study](#) noted that skyglow interferes with multiple aspects of insect life and allows insect predators to hunt for longer.

Parties to the Convention on Migratory Species [adopted guidelines](#) to address this specific problem at their meeting in Gandhinagar in 2020.

By disrupting the circadian rhythm, artificial light at night [can hamper](#) the production of melatonin, an influential hormone in the human body with effects on sleep, moods and cognition. A small [2009 review](#) concluded that circadian disruption – which [altered melatonin levels can](#)

[cause](#) – increased the risk of breast cancer among night-shift workers by 40%.

Starry skies have also inspired countless works of science and poetry. When Los Angeles had a big power cut in 1994, many people phoned local authorities to report a “[silvery cloud](#)” at night. It became evident later that they were really seeing the Milky Way.

In 2020, Australian researchers [wrote in a paper](#), “The erasure of the night sky acts to erase Indigenous connection to the stars, acting as a form of ongoing cultural and ecological genocide.”

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