

**LIGHT POLLUTION AND THE LAW: TOWARDS A DARK SKY
FRAMEWORK FOR INDIA THROUGH COMPARATIVE
INSIGHTS FROM GLOBAL LEGISLATION**

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INTRODUCTION

Nature is plagued by various natural and man-made factors that have polluted the air, water and soil around us and now, as it turns out, light factors are entering into all of them as well. Electrical and artificial lighting were associated with economic growth and development. Unfortunately, the overuse of natural lighting has proven to have negative consequences. Rapid urbanization across the globe has resulted to exponential population boomed inhabiting the big cities and urban areas and this also means more people are now experiencing light pollution without even realizing it. Vigorous development and economic growth contributed to a sweeping increase in artificial light usage, which further deteriorate the natural dark sky. The night sky is getting brighter every year, as the light pollution becomes more prevalent. Nights are becoming around 10% lighter each year, which has implications for the health of both humans and wildlife. The stars are vanishing before our very eyes, as increasing levels of light pollution mean that increasingly fewer stars are visible in the night sky above us. The issue of light pollution is not only becoming more widespread, but it is also accelerating. This issue was first recognized in 1970s, when the astronomers began to see the impact of rapid increase in artificial light on their work. This paper attempts to analyse the measures for mitigating light pollution across the world by looking into the laws and regulations in this regard.

1. Emergence of Light Pollution:

1.1 Definition:

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Light Pollution, known also as photo pollution, is the excessive, misdirected or obtrusive artificial (usually outdoor) light. It is a generic term meaning artificial light which shines where it is neither wanted nor needed. This is one of the least known types of pollution and the easiest anthropogenic pollution to address and reduce. The light pollution is observed mainly in large cities and is mainly identified by the absence of starry skies.

1.2 Types of Light Pollution:

According to the classification introduced in 1988 by the International Dark-Sky Association¹, the light pollution may occur in the following forms:

- 1.2.1 The **glare** when the light source is directly visible and the contrast between it and the surroundings causes disturbance to the nocturnal vision² of living organisms is one such form of light pollutions. Examples are brightly lit ski slopes in winter, street lighting, and especially various typed of illuminated advertising installations, mainly LED billboards rapidly changing their brightness;
- 1.2.2 The **lighttrespass**, treated as a violation of property boundaries, constitutes another form of light pollution. It occurs when the light source illuminates not only the dedicated area, but also the surrounding area. A typical example is the light of exterior street lamps illuminating the interiors of flats through the unprotected windows. Another example may be the lamps intended to illuminate roads leading through the National Parks and other protected areas illuminating the surroundings and, in doing so, disturbing the local nocturnal ecosystems;
- 1.2.3 **Grouping of light** refers to a type of light pollution that arises when the density of artificial light sources in a particular area surpasses practical requirements. This is often observed in tourist destinations, where clusters of bright lamps are installed for decorative purposes, leading to overlapping illumination. In this way, grouped lighting also adds to other recognized forms of light pollution. Within cities, this issue may be seen in spaces such as parks or university campuses. It is also present around leisure facilities situated near, or even within, national parks, nature reserves, and

¹DarkSky International, formerly the International Dark-Sky Association (IDA), is a United States- based nonprofit organization incorporated in 1988. The mission of the association is “to preserve and protect the night time environment and our heritage of dark skies through quality outdoor lighting”.

²Nocturnal vision, known also as scotopic vision, is the ability to see in very low light conditions, primarily using the rod cells in the retina rather than cones. This can be commonly seen in animals, which are referred as nocturnal animals like cats and owls.

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other protected zones. The problem is particularly noticeable in the illumination of sports venues, including stadiums, ski slopes, and similar facilities.

- 1.2.4 **Sky glow** is a form of light pollution resulting from the dispersion of artificial light on atmospheric aerosols. This is the most widespread category of light pollution as such dispersed light even reaches areas where none of the previously mentioned categories of light pollution are present. The sources of sky glow are improperly shielded lamp filaments or wrongly inclined lamp holders. Every single such light induces a local sky glow effect, which is important particularly in National Parks, reserves and other protected areas. However, it should be emphasised that exceptionally strong sources of this kind of light pollution are city glows, which have an impact upon and disturb even distant nocturnal ecosystems.
- 1.2.5 **Over illumination**, is the excessive use of light well beyond that requires from a specific activity. Many indoor and outdoor locations have lights on when no one is around. This frequently extends beyond the requirement for security illumination. Examples include office buildings that have lights on all night even though the buildings are virtually empty or even landmarks, historic buildings, and attention-seeking skyscrapers.
- 1.2.6 **Light clutter**, is the term used to describe excessively bright and confused group of lights. This is frequently observed in densely populated areas and overlit cities. The other forms of light pollution in metropolises are likewise brought on by the fast growth of light clutter. These kinds of light clutters can be confusing and result in numerous mishaps. In areas with inadequate illumination, particularly on roads and streets, and in areas with excessively bright advertising screens, clutter can be seen.³

1.3 Causes of Light Pollution:

Natural light consists of the light from natural objects such as the sun and other celestial objects whereas, light pollution is caused due to the lightning through different sources and mediums. Various sources of light pollution include skyglow, lightning on the roadways, streets, automobiles, illuminated tall buildings, offshore and undersea vessels.

³ Komal Kaushik, Soumya Nair, Arif Ahamad, *Studying Light Pollution as an emerging environmental concern in India*, Volume 11, Journal of Urban Management ,394, (2022), accessed 01 Oct 2025

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Outdoor lights used for residential, commercial, and industrial purposes are all poorly designed and greatly increase light pollution. Light pours into the sky since the majority of these lighting sources are operated at night. They significantly reduce natural light instead of being used in places that need illumination. As was already established, we are always surrounded by light trespass, which includes things like too much artificial light from the outside entering our rooms without our conscious awareness.

Poor planning and placement of streetlights has resulted from a lack of awareness of the problems that clutter, spillage, and excessive light illumination may cause to our surroundings. These strong light sources are frequently switched on all night long. These street lights illuminate many areas where they shouldn't be, in addition to the cars that use the route. Roadway lights have been found to be responsible for between 35 and 50 percent of light pollution.

1.3.1 Excessive use of light:

Another source of light pollution is careless light use, such as leaving lights on for extended periods of time and failing to reduce energy waste. Observing the sky has become extremely challenging due to the continually rising amount of light from towns and cities. A visible glow known as "skyglow" is created in towns and cities when light from different lighting sources is directed into the sky and dispersed throughout the atmosphere. Since it is challenging to see different celestial objects in the night sky, this also obstructs many astronomical observations. Light trespass is caused by tall buildings and structures such as lighthouses, towers, and wind energy turbines.

Cheaper substitutes, such as LEDs, have a number of unintended and deadly consequences, such as over use without the right protection or safeguards against excessive illumination. Excessive light is projected into the environment by extremely bright light sources such tube lights and bulbs, which has a detrimental effect. Among the streetlights are those white LEDs that produce shorter blue light waves, which cause skyglow and have a negative effect on the animals as well. Concerning outcomes also result from production facilities that handle oil or gas. The night skies are additionally contaminated by gas flares and industry in addition to night lights. Up to 2500 stars were visible to the unaided eye at night. This number has decreased over time to 200 to 300 stars, or even less than a dozen in urban areas due to increased light pollution.

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Light pollution is man-made, much like all other forms of pollution, and it has gotten worse over the last few decades due to its exponential growth rate. Alongside the previously listed causes, other factors that contribute equally to the development of this hazard include smog, excessive lighting at night, bad planning, overcrowding, vehicle lights, etc.⁴

2. Effects of Light Pollution:

Frequent exposure to high levels of light from both indoor and outdoor sources has been shown to have detrimental effects on the circadian rhythm, which affects not just humans but also other animals, insects, and plant species. Due of artificial light used at night, it is challenging to examine the night sky in many towns and suburban areas. Many night sky observatories throughout the world have also seen variations in the visibility of different celestial bodies in the sky, and the artificial light used at night makes it difficult to observe the night sky in many cities and suburban areas. Some of the very known impacts are discussed below:

2.1 Human beings:

Night time artificial light is a necessity due to urbanisation and population growth. However, it has been noted over the years that artificial light at night can negatively impact human physiological functions by altering the circadian rhythm, which is the brain's biological clock that controls sleep-wake cycles in all mammals, including humans. Unwanted light exposure is one of the main causes of circadian disruptions and other physiological abnormalities, such as metabolic changes that result in renal, cardiovascular, and type II diabetes. Reduced sleep and the onset of depressive symptoms can result from increased exposure to artificial lights at night, which can raise cortisol levels and lower melatonin levels. LED lights can also alter visual perception because the human eye is sensitive to them. Constant exposure to artificial illumination can induce a variety of retinal illnesses, including age-related macular degeneration⁵ (AMD) and Retinitis pigmentosa⁶ (RP), by changing the wavelengths and intensities of light.

2.2 Plants:

⁴*Id.* At 395.

⁵Age-related macular degeneration (AMD) is an acquired degeneration of the retina that causes significant central visual impairment through a combination of non-neovascular (drusen and retinal pigment epithelium abnormalities) and neovascular derangement (choroidal neovascular membrane formation).

⁶Retinitis Pigmentosa (RP) is defined as a group of hereditary, progressive degenerative diseases characterized by the loss of photoreceptor cells and pigment epithelium in the retina.

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The dark hour, which is essential for plants to carry out photosynthesis effectively, and the natural cycles of plant species are both impacted by light pollution. The nocturnal pollination networks⁷, which pose a serious risk to terrestrial ecosystems, are also harmed by artificial light sources. This affects the plants' ability to reproduce.

2.3 Animals:

Artificial light interference affects all wildlife species, including fish, amphibians, coral reefs, reptiles, birds, and mammals. Because nocturnal birds are frequently trapped by lighted sources in urban areas and have their sleep cycles disrupted, light pollution hinders the movement of migratory bird species. Because of the reflected light surfaces, birds also crash with the buildings. This kind of pollution puts Petrels⁸, one of many endangered bird species, at high risk of dying. Birds that did not come in contact with excess lighting were found to have better health conditions than others.

LED lights turned out to have a greater influence, changing the amphibian's distribution and behaviour, which affects their entire ecology. Since mature female turtles prefer much darker areas to deposit their eggs, artificial light sources close to beaches have gradually decreased the number of turtle hatchlings. Different species react differently to different light sources, although most fish steer clear of the white light sources utilised by industrial fisheries. Fish species' behaviour can be severely impacted by bright light sources, such as harming their eyes, which are mostly evolved to a darker habitat. Because so much of their behaviour is affected by natural light, coral reefs in shallow water are sensitive to cycles of light and dark. Therefore, artificial illumination has a harmful effect on them as well.

2.4 Astronomy:

Because of the increasing Artificial Light at Night (ALAN)⁹, over 80% of people worldwide are unable to view the clear night sky or even recognise the stars. It affects astronomical

⁷A nocturnal pollination network is a system where night-active animals, primarily moths, but also bats, nocturnal bees, beetles, flies, thrips and other insects, pollinates plants that bloom at night, like evening primrose. These networks are crucial for plant reproduction and biodiversity, but are often overlooked and vulnerable to disruptions from artificial light at night and habitat loss, which can negatively impact pollinator populations and their interactions with plants.

⁸Petrels belong to Procellariiformes, which is an order of seabirds comprising 127 species, refer to a small long-winged tube-nosed bird that flies far from land.

⁹Artificial Light at Night (ALAN) refers to human-made light during nighttime hours and is a form of light pollution that significantly disrupts natural behaviours, physiology, and ecosystems. It impacts human health, potentially increasing the risk of obesity and certain cancers by suppressing melatonin and disrupting circadian

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observatories worldwide that struggle to see celestial objects because of ground reflections, light scattering, or sky glow. These celestial objects, which already appear fainter in the sky, are harder to see because of the sky glow. Compared to stars, galaxies and nebulae have a far greater impact on visibility.¹⁰

2.5 Unbalanced Ecosystems:

Light pollution can lead to many imbalances at the ecosystem level. It can specifically alter the structure of species communities, prey/predator balances, and competitions between and within species. In fact, light pollution generates a new ecological niche by altering the illumination environment. Nonetheless, some nocturnal species are drawn to this niche's intense illumination while others are repelled by it. The combination of spotlights and nocturnal insects can therefore be exploited by swift-flying bats. Specifically, the caloric consumption for Nilsson's Serotin (*Eptesicus nilssonii*) is 0.2 kJ/min in woodland areas and 0.5 kJ/min in peri-urban areas and close to streetlights. However, slow-flying bats cannot exploit insect aggregations near streetlights because they are not adapted to evade nocturnal raptors. The result is interspecific competition for food, which is at the expense of slow-flying bats.

Additionally, this ecological niche supports the vision of diurnal species¹¹, allowing them to move, orient, and hunt for food. These species compete with nocturnal predators, alter the prey/predator balance, and, in a sense, "colonise" nocturnal ecosystems exposed to artificial light. These actions have been seen in spiders, day reptiles, and day birds that exploit the gathering of nocturnal insects near lamps for hunting purposes and the desertion of certain nocturnal species to occupy an empty space. Some authors believe that this abandonment of enlightened habitats may promote the spread of alien species. Terrestrial invertebrates found in close proximity to artificial lighting are far more numerous than those found farther away, and the make-up of terrestrial invertebrate groups varies greatly between the two settings.

rythms, and harms wildlife, including marine turtles, bats, and corals, by altering their navigation, foraging, and reproductive patterns.

¹⁰*Supra* note 4, at 397.

¹¹ A diurnal species is an organism, like humans, birds, and many insects, that is predominantly active during the day and rests at night. Their activity patterns are aligned with the light portion of the light-dark cycle, and their physiological and behavioural processes are regulated by the body's circadian clock. Examples of diurnal species include horses, sparrows, and corn snakes.

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Predatory and scavenging invertebrates, spiders, carabids, woodlice, ants, and amphipods make up the majority of the communities under the illumination conditions.¹²

2.6 Climate Change:

Light pollution is problematic for climate change because light sources are frequently fuelled by energy sources like oil that emit large amounts of CO₂. Consequently, too much CO₂ may be emitted into the atmosphere as a result of excessive, inefficient, or wasted light. Without the involvement of lighting designers, state and local authorities have used light to draw attention to landmarks and showcase the identity and economic might of cities. This has had a detrimental effect on the economy and the environment because of the wasteful use of energy at a time when the global crisis is pushing entire populations into substandard living conditions. External lighting uses a lot of energy, which has an impact on the environment. According to the US Department of Energy, just 1% of the light that luminaires emit reaches the occupant's eye. Accordingly, the human eye does not use at least 99% of the artificial light we produce at any given moment in order to understand its environment. The microclimate and climate of cities are impacted by the phenomenon of people migration to metropolitan regions. Living conditions and human activity are interlinked on multiple levels when included in human activity, air pollution, and the growing need from land resources. Many factors related to climate, morphology, orientation, human activity, natural materials, vegetation, and water elements; all have an impact on an area's microclimate. One of the most well-considered urban heat mitigation strategies is the use of tall trees, shrubs, and particularly well-organised green infrastructures (GI) to lower temperatures and improve the environmental quality of cities.¹³

3. Legislative backing on Light Pollution:

3.1 International Conventions and provisions relating to Light Pollution:

3.1.1 Convention on Biological Diversity (CBD, 1992):

- **Article 8** of the 1992 Convention deals with the in-situ conservation. Clause (c) of this article mandates the States to regulate and manage the biological resources those that are important

¹²Light Pollution and the Ecosystem, <https://ec.europa.eu/programmes/erasmus-plus/project-result-content/1341c06d->(last visited 01 Oct 2025).

¹³ Christina Skandali, *Light Pollution: Definition, Consequences, Human knowledge and Disclosure Strategies*, EDP Sciences, 2, (2024), <https://doi.org/10.1051/e3sconf/202458509008>, (last visited 01 Oct 2025).

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for conservation of biological diversity to ensure their conservation and sustainable use. This provision indirectly provides for the protection of human beings, animals and ecosystem from the effects of various forms of light pollution.

- **Clause (b) of Article 10** of the 1992 Convention requires the States to adopt the necessary measures to avoid or minimize the negative impacts on biological diversity. By means of this provision, it is the duty of the State to take necessary steps on the adverse impacts of light pollution on human beings and biodiversity as well.
- **Clauses (a) and (b) of Article 14** of the Convention imposes an obligation on the States to inculcate certain procedures and arrangements that are required for assessing the environmental impacts of the projects, programmes and policies that are likely to have the adverse impacts on the biological ecosystem, which can include the lights that are affecting the human beings, animals and plants affecting their physiological functions, vision and their reproduction abilities, respectively.

3.1.2 United Nations Framework Convention on Climate Change (UNFCCC, 1992):

- **Article 4(1)(c)** of the Convention mandates the State to promote sustainable management and conservation of energy which can include the efficient use of lights and to avoid the effects of wasteful lighting on ecosystem.
- **Article 4(1)(f)** of the Convention requires the States by taking into account the climate change considerations, to take appropriate steps in view of mitigating the adverse impacts on ecosystem. This provision can be applied where the impacts of excessive and unwanted artificial light have been affecting the human beings, animals and plants as well.

3.1.3 Paris Agreement, 2015:

- According to **Article 4** of the Agreement, the States are under the responsibility to reach the global peaking of greenhouse gas emissions and undertake the rapid reductions, thereby contributing to the sustainable development and in eradication of poverty. This provision indirectly requires the States to adopt energy-efficient lighting so that the impacts of light pollution can be mitigated.

3.1.4 Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO World Heritage Convention (1972)):

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- This Convention lays down the responsibility on the States to ensure the protection, conservation, identification, presentation and transmission to the future generations of the cultural and natural heritage.¹⁴ It also requires the Parties to ensure adequate measures are taken for such protection and preservation of the cultural and natural heritage.¹⁵ Since nightscapes¹⁶, observatories¹⁷ and cultural landscapes¹⁸ are affected by light pollution, it falls under the obligation of the States to control light pollution under this provision.

3.1.5 Convention on the Conservation of Migratory Species of Wild Animals(CMS) (Bonn Convention), 1979:

- Under this Convention, it is the duty of the States to take appropriate steps for conserving the migratory species and their habitat.¹⁹ So, whenever there is an impact of artificial light interference on those species, it is the inherent duty of the States to provide necessary protection for those species under this Convention.
- **Article III(4)(b)** imposes an obligation on the State Parties to prevent and mitigate the adverse effects of activities those that seriously prevent the migration of those species. Thus, the impacts of light pollution shall in no way affect the migration of the species and appropriate protective measures should be taken in this regard.
- There shall be agreements between the State Parties for the purpose of conserving and restoring the habitats and protecting such habitats from any disturbances.²⁰ Whenever, there

¹⁴UNESCO World Heritage Convention, Article 4, 1972

¹⁵*Id*, Article 5 (d).

¹⁶ Locations such as the Spiti Valley, Coorg, and the Rann of Kutch in Gujarat are valued for both their natural beauty and nightscapes (stars, Milky Way) as well as their cultural significance (traditions, local populations, folklore). These are being advertised more and more for "astro-tourism." However, the beautiful nighttime experience is threatened by light pollution from surrounding communities, festivals, tourist infrastructure, and external light spills, Stargazing places India: Top 5 places in India for stargazing and astrophotography- Times of India, <https://timesofindia.indiatimes.com/life-style/travel/things-to-do/top-5-places-in-india-for-stargazing-and-astrophotography/articleshow/121129882>, (last visited 05 Oct 2025).

¹⁷Some examples include Hanle Dark Sky Reserve/ Indian Astronomical Observatory, Ladakh which has very low levels of light pollution, ideal clarity and large number of "clear nights" per year(<https://www.iap.res.in/outreach/hdsr/preserving-dark-skies/>) and Devasthal Observatories, Uttarakhand (<https://www.indiatoday.in/science/story/a-blurry-telescope-three-quarters-of-global-observatories-hit-by-light-pollution-2314616-2022-12-28>), (last visited 05 Oct 2025).

¹⁸Taj Mahal Lighting attracts insects, which damage marble surfaces. The Archaeological Survey of India (ASI) has raised those issues and have asked for switching off of unnecessary lights. (<https://timesofindia.indiatimes.com/india/switch-off-lights-as-insects-polluting-taj-asi-tells-cisf/articleshow/49460247>), (last visited 05 Oct 2025).

¹⁹Convention on the Conservation of Migratory Species of Wild Animals, Article II, 1979.

²⁰*Id*, Article V(5)(e).

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is migration of species or habitat, the State shall take necessary measures to mitigate the adverse impacts of artificial lights, at the backdrop of such agreement.

3.1.6 Convention on Wetlands of International Importance especially as Waterfowl Habitat, (Ramsar Convention) 1971:

- This Convention requires the Contracting Parties to formulate and implement their planning to promote the conservation of the wetlands and the wise use of those wetlands in their territory.²¹ Therefore, it is the duty of the States to take adequate measures in protecting the species in those wetlands from the artificial light interference.

3.1.7 Convention on the Conservation of European Wildlife and Natural Habitats, (Bern Convention), 1979:

- It is the responsibility of the States to conserve wild flora and fauna and their natural habitats.²² Whenever, there is excess of artificial lighting that disrupts the biodiversity as a whole, the statutory obligation to protect those habitats, should be taken into account by the States and thereby appropriate measures should be taken in this aspect.

3.1.8 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space including the Moon and Other Celestial Bodies (Outer Space Treaty), 1967:

- It is the duty of the States not to undertake any activity that would cause potential harmful interference in the peaceful exploration and use of outer space.²³ It is an inherent obligation of the States to take steps regarding the artificial light interference that induces a local sky glow effect which ultimately disturbs the nocturnal ecosystems.

3.1.9 Declaration in Defence of the Night Sky and the Right to Starlight (La Palma Declaration), 2007:

- It is considered an inalienable right of humankind, the right to an unpolluted night sky that allows the enjoyment and contemplation of the firmament.²⁴ This provision indirectly directs

²¹Convention on Wetlands of International Importance especially as Waterfowl Habitat, Article 3(1), 1971.

²²Convention on the Conservation of European Wildlife and Natural Habitats, Article 1, 1979.

²³Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space including the Moon and Other Celestial Bodies, Article IX, 1967.

²⁴Declaration in Defence of the Night Sky and the Right to Starlight, Article 1, 2007.

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the States to take necessary steps in terms of artificial skyglow and harmful contamination of space affecting the biodiversity as a whole.

- **Article 4** imposes an obligation on the States to undertake activities that include the duty to maintain a clear and unpolluted sky, which includes the responsibility to reduce the impacts of excessive artificial lights on the environment.

4. Need for Dark Sky Protection:

The term "dark sky protection" refers to any community, scientific, and governmental initiatives to reduce artificial light at night (ALAN), which contributes to light pollution, in order to maintain or restore natural darkness at night. It therefore, involves policies, technologies and planning measures that minimize sky-glow, glare, trespass and clutter, thereby protecting nocturnal ecosystems, astronomical observation and human health. A "Dark Sky Park/ Reserve/ Sanctuary/ Place" is an area that meets certain standards of sky brightness, lighting policy, legal protection, etc., often. Dark sky parks are areas designated to shield the night sky from light pollution, creating an atmosphere that supports the growth of the local ecosystem. These locations support research for astronomy enthusiasts in addition to being significant for the environment and fauna. Humans and animals are impacted by the use of artificial lighting to improve visibility, which also makes it more difficult to see clearly into the sky.

4.1 How Dark Sky can be protected?

- **Shielding of fixtures/ Full Cutoff shielding**, by which lights shall be directed to illuminate downward only. This limitation will also improve the comfort and visual performance of road users by lowering the direct glare from fixtures.²⁵ Bad unshielded lighting wastes energy, money and creates unnecessary greenhouse gas emissions.²⁶
- **Limiting Intensity (Lumen Output)**, is the technique by which brightness is restricted to the minimum required for safety.

²⁵ Fabio Falchi and Pierantonio Cinzano, *Limiting the Impact of Light Pollution on Human Health, Environment and Stellar Visibility*, Volume 92, Journal of Environmental Management, pages 2714-2722, 3, 2011, (last visited 11 Oct 2025).

²⁶ 5 Things You Can Do to protect the Night Sky, <https://darksky.org/news/5-things-you-can-do-to-protect-the-night-sky/>, (last visited 11 Oct 2025).

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- **Color Temperature Control**, by which “warm” lights (<3000 K) shall be preferred to limit blue-rich light that scatters and disrupts wildlife.
- **Timing/ Curfew Controls**, can be employed by which lights shall be switched off or dimmed during low-activity hours i.e., from 11 p.m. to 4 a.m.
- **Zoning techniques**, by which different lighting standards for urban, suburban, rural and protected areas can be employed.
- Using of **Spectral Filters** that reduce short-wavelength emissions harmful to nocturnal fauna.
- **Limit Growth in Installed Lighting**, by which limiting the increase of the new installed flux should be implemented. A 1% yearly increase could be allowed at first for each administrative area, followed by a halt in the increase of total installed flux and then by a decrease.²⁷

4.2 India's Initiatives:

- **Pench Tiger Reserve, Maharashtra** is the first International Dark Sky Park in India. This was declared to be the India's first Dark Sky Park in January 2024. With funding from the district planning committee and the space near Bagholi set aside for stargazing, a night observatory has been erected at the Pench Tiger Reserve. In order to reduce light pollution in the villages of Wagholi, Sillari, Pipariya, and Khapa, all of which are located inside the Paoni UC Range buffer area, more than 100 street lights have been swapped out for ones that face the ground.²⁸
- **Hanle Dark Sky Reserve, Ladakh:**

One of India's darkest skies can be found in the Hanle area in Ladakh. The Indian Astronomical Observatory (IAO) of the Indian Institute of Astrophysics (IIA, Bengaluru) is located there because of the excellent sky conditions. The Hanle Dark Sky Reserve (HDSR) will be established within the Changthang Wildlife Reserve, encompassing an area of approximately 22 km around Hanle. The main element of HDSR is astro-tourism, a rapidly developing field worldwide. 18 telescopes have been acquired and given to neighbourhood volunteers who are receiving training on how to use them.

²⁷*Supra* note 25, at 4.

²⁸Gaze into the Clear Skies at Pench Tiger Reserve- India's First Ever Dark Sky Park, <https://www.penchnationalpark.com/blog/pench-dark-sky-park/>, (last visited 11 Oct 2025).

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HDSR will be advertised as a tourism destination to enjoy the dark skies, and the increased tourism influx, along with employment as astro-tourism guides, will lead to socio-economic development. HDSR is also giving the villagers light control tools like thick curtains, warm light bulbs, lamp shades, etc. to lessen light overflow for the telescopes in order to maintain these dark skies for future advancements in astronomy research. Hanle is one of the top astronomy locations in India and is home to numerous telescopes operated by the Indian Institute of Astrophysics. Therefore, it is necessary to protect Hanle's gloomy skies for the nation's ongoing scientific studies.²⁹

- **State Policy Promise:**

In August 2025, the Chief Minister of Maharashtra pledged that Maharashtra will be the first Indian State to draft a Dark Sky Conservation Policy. The commitment, which embraces contemporary science, sustainable lighting, and public engagement while paying homage to India's long-standing stargazing customs, aligns well with this year's theme, Bridging the Past and Future. Maharashtra has the potential to transform the night sky into a resource for tourism, education, environment, and public health if the policy is developed with precise guidelines and strict deadlines.

A dark sky policy is fundamentally straightforward but effective. In order to ensure that progress is measured rather than guessed, it calls on cities, municipalities, infrastructure agencies, and enterprises to implement fully shielded fixtures that direct light downward, warmer colour temperatures that minimise glare and skyglow, reasonable curfews for non-essential lighting, and routine monitoring. The benefits are instantaneous. As strong glare is lessened, roads become safer. Eliminating useless spill lights lowers energy bills. When there is less blue-rich light at night, people sleep better. Wildlife that is nocturnal, such as owls and pollinating insects, can move and feed more easily.³⁰

- **Judicial Action:**

In October 2025, the Supreme Court of India directed the governments to enforce a ban on *unauthorised strobe lights, red-blue flashing lights, illegal hooters*, and set maximum

²⁹Hanle Dark Sky Reserve, <https://www.iap.res.in/centers/iao/hdsr/> , (last visited 11 Oct 2025).

³⁰https://www.business-standard.com/content/press-releases-ani/on-national-space-day-fadnavis-pledges-india-s-first-state-dark-sky-policy-and-what-it-could-unlock-for-maharashtra-125082500447_1 , (last visited 11 Oct 2025).

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permissible luminance and beam angles for headlights.³¹ In High Court and other public interest litigation, there have been cases challenging decorative lighting (e.g. trees in Mumbai), installation of colourful LEDs for beautification etc., on grounds of aesthetics, light pollution, etc.³²

- **Public Awareness:**

Studies measuring “Artificial Night Sky Brightness” in Indian cities (e.g. by architecture / planning scholars) have identified major metros (Bengaluru, Kolkata, Hyderabad, Delhi, Mumbai) among most light-polluted.³³ The discussion about the light pollution and its impacts is increasing among the Media and NGOs.

4.3 Gaps and Limitations in Legal/ Regulatory Status:

- **Lack of Specific Statutory Framework regulating Light Pollution:**

The Central Pollution Control Board (CPCB) has expressed before the National Green Tribunal that there is no specific statutory framework in India to regulate the problem of light pollution and its impacts.³⁴ Though the Environment (Protection) Act, 1986 is broad, it does not explicitly regulate light pollution and also the subordinate rules and notifications do not clearly define standards for artificial lighting in urban / rural / protected area contexts (other than vehicle lighting etc.).

- **Fragmented Regulation:**

The Supreme Court of India ordered the Vehicle lighting standards through the Automotive Industry Standards (AIS).³⁵ In 2024, the Kerala High Court addressed the after-market LED/

³¹In October 2025, the Supreme Court in a new PIL (filed under Article 32) addressed “dazzling LED headlights, unauthorised strobe lights and hooters”, noting that high-intensity lights cause visual disorientation, glare, and risk to pedestrians / drivers. The Court characterized such modifications not merely as technical violations but as “active contributors to road trauma and fatalities”, https://timesofindia.indiatimes.com/india/ban-use-of-unauthorised-strobe-lights-hooters-supreme-court-directs-governments/amp_articleshow/124433612, (last visited 11 Oct 2025).

³² Blinding Glow, <https://www.downtoearth.org.in/pollution/blinding-glow>, (last visited 11 Oct 2025).

³³<https://www.indiatoday.in/health/story/light-pollution-india-obesity-diabetes-cancer-circadian-disruption-2736214-2025-06-05>, (last visited 11 Oct 2025).

³⁴Deccan Herald, <https://www.deccanherald.com/amp/story/india/karnataka/bengaluru/no-statutory-framework-in-india-to-regulate-light-pollution-cpcb-tells-green-tribunal-3515178>, (last visited 11 Oct 2025).

³⁵ In India, vehicle lighting (headlamps, beam patterns, etc.) is regulated via Automotive Industry Standards (AIS), overseen by bodies like ARAI under MoRTH. For example, AIS 15.1 defines headlight and beam parameters (upper beam / lower beam definitions, etc.), https://morth.gov.in/sites/default/files/ASI/5_15_2008_3_54_12_PM83.0%20SS%2015-1, last visited 12 Oct 2025.

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laser/ neon lights on vehicles, calling for compliance with AIS-008 standards.³⁶ In the cases of environmental/ wildlife protection in protected areas, buffer zones, etc., light pollution is sometimes taken into account, but through the overlapping legal regimes i.e., Forest Laws, Wildlife Protection Act, etc., and often handled by a case-by-case or discretionary basis.

- Issues in Enforcement, Definition and Standardisation:

There are no legally mandated and quantified standards for ALAN, as to how much sky brightness is permissible, spectral composition, beam angles, etc., in most of the jurisdictions of India. It is noted that there is weak monitoring in many places. Retrofits³⁷ or shielding of lights are ad hoc.

4.4 Legal/Constitutional Basis in India that Could Support Dark Sky Protection

- Fundamental Right to Life (Article 21, Constitution of India):

Environment, pollution, and related harms are part of the scope of the right. Courts have held that enjoyment of a right to healthy and clean environment is part of Article 21.³⁸ Thus, protection from harmful light pollution could be argued under Article 21.

- Environment Protection Act, 1986:

Section 3 gives power to the Central Government to take measures to protect and improve environment and to prevent, control environmental pollution. Under that power, subordinate legislation / rules / notifications could be made. However, this power has not yet been substantially used to define ALAN regulation.

- Wildlife Protection Laws / Forest Laws / Protected Area Management:³⁹

For areas like sanctuaries, reserves etc., the management authorities could enforce policies on external lighting under their general powers.

³⁶Anoop K.A. v. Biju Prabhakar, CC NO. 1728 OF 2021(S) IN WP(C) 39574/2018.

³⁷ Lighting retrofit is a common technique to reduce lighting energy use and to improve lighting quality. It is usually performed by replacing the lamps in the existing luminaires with more efficient lamps, Jeffrey Y C Cheng, *A case study of lighting retrofit to improve building energy efficiency and lighting quality by using luminaires with nano optical coating*, https://www.researchgate.net/publication/348392717_A_case_study_of_lighting_retrofit_to_improve_building_energy_efficiency_and_lighting_quality_by_using_luminaires_with_nano_optical_coating?enrichId=rgreq-6faeab71ec6a208855dd14503b10ad1f-XXX&enrichSource=Y292ZXJQYWdlOzM0ODM5Mjc5NztBUzoxMTQzMjI4NDUyODY0NkAxNzAzNjU3OTg0MTE0&el=1_x_2&_esc=publicationCoverPdf, (last visited 12 Oct 2025).

³⁸ M.C. Mehta v. Union of India, (1987) 1 SCC 395.

³⁹ Wildlife (Protection) Act, 1972 and Forest (Conservation) Act, 1980.

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- Pollution Control Laws:⁴⁰

While these do not currently explicitly cover light pollution, CPCB / State PCBs / NGT might interpret “pollution” broadly to include light pollution given scientific evidence, especially under the umbrella of “environment” in EPA, 1986. But that remains a piecemeal.

5. Comparative Laws on Light Pollution:

- France:

France’s national measures⁴¹ impose quantified limits such as restrictions on upward light ratio, ULR, curfews, and obligations to limit lighting toward the sky, integrate biodiversity objectives, and apply to public procurement and municipal installations. This is a statutory-administrative approach that sets binding technical norms at national level. This law provides for legal clarity, enforceability and uniform national baseline, whereas it demands for strong administrative capacity and monitoring.

- Spain:

Spain recognises light pollution⁴² and requires public authorities to promote its reduction and the implementation is largely devolved to regional/local regulations and municipal ordinances. It thus combines national recognition with regional execution. This legislation provides for flexibility to tailor to local geography such as coastlines and observatories. However, it is limited to heterogeneous protection and it depends on the regional political will.

- European Union:

The EU uses eco-design and energy-labelling rules for lighting products to reduce wasteful and blue-rich emissions, and Green Public Procurement guidance to push municipalities toward low-glare fixtures. The EU approach leverages market-regulation (product standards)

⁴⁰ Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981

⁴¹Articles 2&3, Arrêté / Decree 2018, https://www.unoosa.org/documents/pdf/psa/activities/2021/DQS2021/Day2/Sess8/D2S8_6_ALWG_Haenel.pdf, (last visited 12 Oct 2025).

⁴²Law on Air Quality & Protection of the Atmosphere, Spain’s Law 34/2007, https://climate-laws.org/documents/law-34-2007-on-air-quality-and-atmosphere-protection-last-amended-by-law-11-2014_953a?id=law-34-2007-on-air-quality-and-atmosphere-protection-last-amended-by-law-11-2014_43fa, (last visited 12 Oct 2025).

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and public purchasing power rather than uniform national public lighting law.⁴³ The legislation reduces bad lighting at source and incentivises industrial compliance.

- India and its Current Status and Gap Analysis:

i. **No comprehensive statutory framework nationwide:**

The CPCB declared that there is no national statutory regime for light pollution⁴⁴ and the protection is currently ad hoc via protected-area management, municipal by-laws, pilot Dark-Sky designations (Pench⁴⁵, Hanle⁴⁶) and judicial interventions.

ii. **Fragmentation:**

The vehicle lighting is regulated through AIS/CMVR standards⁴⁷ and the public/procurement standards for municipal lighting are not uniformly aligned with dark-sky parameters (ULR, spectral limits, lumen caps).

iii. **Enforcement and monitoring lacunae:**

There is an absence of national measurement protocols in case of sky-brightness baselining and a limited capacity in local bodies to retrofit⁴⁸ or procure compliant fixtures.

6. Conclusion and Recommendations:

The Recommendations shall include:

- **State Recognition under the Environment (Protection) Act, 1986:**

The Ministry of Environment, Forest and Climate Change (MoEFCC) should promulgate a separate light pollution control rule, defining ALAN, establishing permissible lumen and ULR limits, and prescribing ambient sky-brightness benchmarks. The Rules could derive authority from Section 6 of the EPA 1986, similar to existing Noise or Plastic Waste Management Rules.

- **Integration of Biodiversity and Climate Policies:**

⁴³Light Sources, https://energy-efficient-products.ec.europa.eu/product-list/light-sources_en, (last visited 12 Oct 2025).

⁴⁴*Supra* note 34.

⁴⁵*Supra* note 28.

⁴⁶*Supra* note 29.

⁴⁷*Supra* note 35.

⁴⁸*Supra* note 37.

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Light-pollution mitigation should be integrated into National Biodiversity Action Plans, State Biodiversity Strategies, and climate-adaptation frameworks, acknowledging its role in disrupting circadian rhythms, pollinator behaviour, and nocturnal species ecology.

- **Zoning and Land-Use Regulation:**

State governments and urban local bodies should designate “**Dark Sky Zones**” or “**Nocturnal Habitat Conservation Areas**” around sanctuaries, wetlands, and observatories. Municipal by-laws and building codes should mandate downward-facing, fully-shielded fixtures and lighting curfews in designated areas.

- **Adoption of Technical Standards:**

The Bureau of Indian Standards (BIS), in consultation with the Automotive Research Association of India (ARAI) and the Bureau of Energy Efficiency (BEE), should develop **Indian Standards for Outdoor Lighting** harmonised with CIE and EU directive, that prescribes limits on spectral distribution (≤ 3000 K CCT), beam angle, and total lumen output per hectare.

- **Monitoring and Enforcement Mechanism:**

The CPCB and State Pollution Control Boards should establish **night-sky monitoring networks** using sky-quality meters and satellite data, incorporating ALAN metrics into Environmental Impact Assessments (EIA) and periodic compliance audits.

Light pollution represents an emerging frontier in environmental law, one that directly implicates biodiversity conservation, human health, energy efficiency, and the protection of cultural and astronomical heritage. Yet, despite its ecological and social externalities, the issue remains largely unaddressed within India’s statutory framework. The comparative survey of jurisdictions reveals that effective light-pollution governance arises from explicit legal recognition of darkness as an environmental value, coupled with enforceable standards and participatory local implementation. Establishing a Dark Sky Framework for India is not merely a technical exercise but a legal and ethical imperative, to reconcile developmental illumination with the fundamental right to a balanced environment. By embedding darkness preservation into environmental governance, India can illuminate a sustainable path forward, where the night sky remains a shared heritage for both biodiversity and humankind.

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