BRIDGING THE LEGAL GAP IN LIGHT POLLUTION: JUDICIAL INTERPRETATIONS AND GLOBAL INSIGHTS FOR EFFECTIVE REGULATION IN INDIA

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Abstract

Light pollution, often an unrecognized environmental concern, has become an emerging issue leading to several impacts on human health, astronomical study and to the whole ecosystem. It creates physiological consequences for the human body, disturbs the ecology of nocturnal birds, and it also obscures astronomical research. While many countries worldwide have recognized and implemented the measures to mitigate light pollution, India is still in its initial stages to acknowledge and address its legal and environmental consequences. This paper examines the concept of light pollution, exploring its environmental implications. It highlights the global efforts taken to regulate Light Pollution, emphasizing the effective solutions adopted by the other countries. Although in India there is no specific legislation that directly addresses light pollution, recent court rulings reflect the raising awareness of its adverse impacts in the country. By analyzing the significant judicial interpretations, this study also highlights the growing recognition of light pollution by Indian Judiciary as a pressing environmental concern. The paper concludes by advocating for a comprehensive Light Pollution Regulation for India drawing from the global best practices. Addressing light pollution through adopting proper sustainable urban planning and framing legislative measures are crucial to maintain ecological balance, preserving biodiversity and promoting human health.

Keywords: *artificial light, pollution, legal gap, judicial interpretation, environment conservation.*

Introduction

Since childhood, we have been educated about the significance of natural resources like soil, air, and water, along with the various sources of pollution. This awareness helps to remain vigilant to protect these abiotic components of the environment. However, light pollution has long existed but has rarely been recognized as a substantial environmental concern. It is not a recent form of pollution but the one that has been overlooked for years. The International Dark Sky Association was set up by the US in 1988 by Astronomers David Crawford and Tim Hunter. The aim behind the establishment of such an organization is to protect the dark sky and to work for the restoration and protection of light pollution before it becomes hard to handle it. Still, we are hardly aware of what Light Pollution is and the irreversible effects of Light Pollution on the Environment. There is not much awareness about how we can change our Lifestyle choices to protect nature and Dark Sky. People hardly consider how something as stunning as light could count as a Pollutant when the light is misused through overlighting on billboard advertisements, as exterior home decor, as shop decor outside the shops, overused streetlights, and to show lavish Nightlife.

Just like other types of pollution that emerged during the Industrial Revolution and escalated with rapid urbanization, light pollution has been a significant yet largely overlooked concern. Its adverse impacts were acknowledged only about four decades ago, despite its widespread and detrimental effects. However, a large fraction of the population remains ignorant of the damage excessive artificial lighting has already caused and the prevailing risks it poses to the environment(Rai, 2020).

Effects of Light Pollution

Less than a century ago, people could witness a breathtaking star-filled sky. Today, countless children

around the world may never see the Milky Way from their homes (*Light Pollution*, n.d.).

Several researchers have drawn attention to the irreversible effects of light pollution on the astronomical world and the living world, including insects, birds, the Human Body, and Plants. Astronomical light pollution refers to the obstruction of night sky visibility and celestial observations due to artificial lighting at night. Various astronomical organizations, including the International Dark-Sky Association (IDA), have highlighted this concern since the early 20th century. The IDA defines light pollution as any negative impact of artificial lighting, encompassing sky glow, glare, light trespass, excessive light clustering, reduced nighttime visibility, and energy waste(Komal Kaushik, Soumya Nair, Arif Ahamad, 2022). In the context of light pollution, researchers believe that the situation will worsen over time. Light Pollution directly or indirectly harms all living creatures.

Light Pollution alters many biological processes of the biotic components like breeding, hatching, migration, nesting, etc. It also has a high negative impact on the lives of nocturnal birds. Artificial Lighting at night interferes with the path of the nocturnal migration. Artificial light pollution near the coastal regions affects the sea turtle hatchlings and coral reefs, leading to a considerable decline near the beaches (Behera, Mohanta, n.d..). The use of artificial lighting at night has significantly reduced pollination in plant species across the globe. This disruption has negatively impacted their reproductive processes, leading to ecological imbalances (Knop et al., 2017). Some researchers, Neelima Meravi and Santosh Kumar Prajapati, conducted a study in 2018 to understand the effects of street lighting on near-growing plants to measure its effects on the biological processes of plants. Their experiment clearly shows the in-depth negative effects on the process of photosynthesis, the nocturnal pollination network, and the reproductive process of plants. The study discusses the severity of light pollution on the growth of plants.(Meravi & Kumar Prajapati, 2020)

Insects are highly sensitive to the rising use of artificial lighting at night. Over the years, populations of moths, butterflies, and various other insect species have significantly declined due to increased exposure to artificial light. (Komal Kaushik, Soumya Nair, Arif Ahamad, 2022). Artificial Light also has critical impacts on human beings, resulting in circadian rhythms, vision disturbances, skin cancers, retina agitation, sleep deprivation, metabolic disturbances, and disturbing the biological clock in the brain. LED lamps affect vision perceptions, etc., and have several physiological effects on the human body.

Researchers conducted a study exposing Sprague-Dawley albino rats to artificial light for 20 to 90 days, which led to a reduction in TH-positive dopamine neurons. This finding suggests that light pollution may be a potential factor in the development of Parkinson's disease in humans, though further research is required for conclusive evidence.(Romeo et al., 2013) This study can demonstrate how severe light pollution can become.

International Perspective

IDA (International Dark Sky Association): Awareness of light pollution first emerged in the United States, where leading astronomical observatories in California and Arizona have long studied the increasing sky brightness and its impact on dark skies.(Komal Kaushik, Soumya Nair, Arif Ahamad, 2022) The USA came out with the establishment of the International Dark Sky Association (IDA) as a non-profit organization in the year of 1988 by astronomer founders David Crawford and Tim Hunter. The IDA focuses on promoting awareness of the importance of dark, star-filled night skies and advocates for their preservation and restoration. Through education on the challenges of light pollution and effective outdoor lighting solutions, the organization works to reduce its impact. Their efforts now extend to 51 countries, engaging members, advocates, and designated dark sky areas across North America, East Asia, Europe, Latin America and the Caribbean, the Middle East, Africa, Oceania, and South Asia.

Established in 2001, the award-winning International Dark Sky Places (IDSP) Program was created to promote the conservation of dark sites by encouraging communities, parks, and protected areas worldwide to implement responsible lighting policies and raise public awareness. The program grants five distinct designations: International Dark Sky Communities, International Dark Sky Parks, International Dark Sky Sanctuaries,

International Dark Sky Reserves, and Urban Night Sky Places. ("Wild Boyz Photography," 2023)

There are various organizations other than IDA formed at the international level working to protect the dark sky.

ISTIL (Light Pollution Science and Technology Institute): ISTIL i.e. Istituto di Scienza e Tecnologia dell'Inquinamento Luminoso of Italy specifically works to develop and promote the scientific research on Light Pollution. It keeps on doing research and spreading innovative methods and technologies to limit overlighting and the adverse effects of vanishing Night Sky.

CieloBuio (Coordinamento per la protexione del cielo notturno): It is a non-profit organization in Italy formulated in the year 1997 to control light pollution. It works in conducting information campaigns on light pollution and protecting the night sky by promoting the culture of eco-compatible lighting.("Light Pollution Intelligent Lighting," n.d.)

Light Pollution Abatement Program of Canada: Royal Astronomical Society of Canada coordinates with the Light Pollution Abatement (LPA) Committee's effort to raise awareness of and mitigate the detrimental effects of light pollution on human health, the environment, and the night sky. ("RASC," n.d.)

Cel Fosc: Cel Fosc is an independent citizens' organization dedicated to increasing public awareness about the importance of improving both private and public lighting systems. By promoting responsible lighting practices, the association advocates environmentally friendly solutions that ensure efficient resource utilization. ("Light Pollution Intelligent Lighting," n.d.)

ICE (International Commission on Illumination): This is an organization of France, Commission Internationale de l'Eclairage which is devoted to cooperation and exchange of information among its member countries on all matters related to the science and art of lighting. ("Light Pollution Intelligent Lighting," n.d.)

ANPCN (Association Nationale pour la Protection du Ciel Nocturne): It is an association created in France to preserve the night environment from heavy artificial lighting.

SAF (Societe Astronomique de France): The French Astronomical Society, is a non-profit association, founded by Camille Flammarion in 1887. Its purpose is to popularize the universe's sciences, involve as many people as possible in their progress, and promote the development and practice of astronomy. ("Astronomers Without Borders," n.d.) The foundation is working in France for the protection of the Night environment to save the dark sky.

CDS (Campaign for Dark Skies): The British Astronomical Association organizes a Campaign for Dark Skies to create awareness and restore the night sky beauty. The campaign was against excessive and irresponsible lighting.

ILPAC (The Irish Light Pollution Campaign): Established in the early 2000s by Colm O'Brien, ILPAC became Ireland's representative within the International Dark-Sky Association in 2003. Ireland boasts three internationally recognized dark sky sites. The Kerry International Dark Sky Reserve and Mayo International Dark Sky Park have both received gold-tier status for their exceptionally clear, unpolluted night skies, making them valuable contributors to the country's natural night sky heritage. Om Dark Sky Park is the most recent addition to Ireland's list of internationally acknowledged dark sky locations. ("Dark Sky Ireland," n.d.)

The European Greenlight Program: The Green Light Programme is a voluntary pollution prevention initiative encouraging non-residential electricity consumers (public and private), referred to as Partners, to commit to the European Commission to install energy-efficient lighting technologies in their facilities when (1) it is profitable, and (2) lighting quality is maintained or improved. Green Light was launched on 7 February 2000 by the European Commission Directorate General Energy & Transport. ("Joint Research Centre," n.d.)

ILE (The Institute of Lighting Engineers): ILE is the UK and Ireland's largest and most influential professional lighting association, dedicated solely to excellence in lighting. ("Light Pollution Intelligent Lighting," n.d.)

Light Pollution Law: In 2007, the Government of the Republic of Slovenia enacted a Light Pollution Law aimed at reducing excessive artificial lighting. The legislation is anticipated to bring several benefits by restricting upward-directed illumination, which is a major contributor to light pollution. It mandates the use of fully shielded lighting fixtures and prohibits most forms of light emission above the horizon.

The enactment of this law was the outcome of extensive collaboration between Slovenia's Environment Ministry, the Government Office for Growth, various government agencies, lighting specialists, and environmental conservationists. It plays a crucial role in enhancing nighttime quality of life while promoting environmental and ecological preservation. With this legislation, Slovenia emerges as a frontrunner among EU nations in addressing light pollution, setting an example for other countries that have yet to establish legal regulations in this domain. ("StarLight," n.d.)

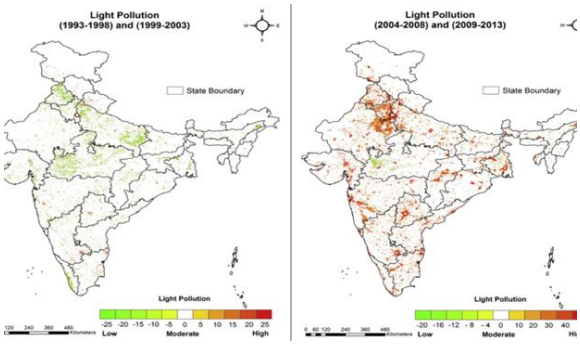
These are the few role model organizations that show concern for Light Pollution all over the globe. As of now, India does not have any statutory provision that governs or regulates the issue of light pollution. It is the right time to identify it, which could become a serious concern for future conservation.

Light Pollution in India

The rate of Light Pollution with a continuous increase in the graph is observed in our country, and the scenario is worse in the developed cities as compared to the developing ones or the rural areas of India.

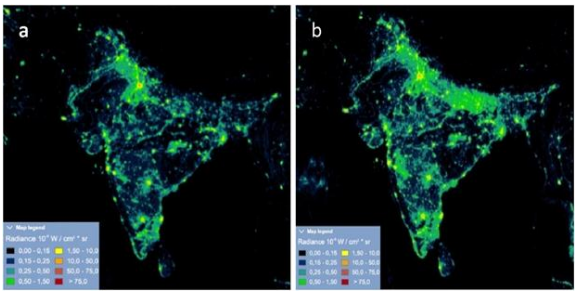
If we compare the situation of India regarding Light Pollution since 1993, then we can clearly observe that the condition is getting worse day by day.

Indian government data says over 21 lakh LED streetlights have been installed across the country under the Street Light National Program.(Ghosh, 2019) It is always praised to install Lights in the cities but it's just that with caution and care that the lights should be bright up to a level that is necessarily required. We need to add smart engineering for the installation of such lights that will not hamper our Night Environment.



New Delhi, Maharashtra, Telangana, Karnataka, and Uttar Pradesh experienced an increase in "very high light pollution intensity" from 1993 to 2013. Gujarat, West Bengal, and Tamil Nadu witnessed a remarkable change from low to high light pollution. (Ghosh, 2019)

In 2017 results of a global study news release pointed out the "loss of night" due to excessive artificial light at night for India is three times faster than the global average.(Ghosh, 2019) A 2018 news report highlighted that India is losing its natural night sky at a rate three times higher than the global average. This excessive artificial lighting has significantly disrupted the natural rhythms of both humans and wildlife, more than in any other country or region. (Rai, 2020)



Light pollution map of India in (a) 2013 and (b) 2019. Delhi, Uttar Pradesh, Bihar, Maharashtra, Telangana, Karnataka, Tamil Nadu and West Bengal have recorded high rates of light pollution. (Taken through Light Pollution Maps)(Komal Kaushik, Soumya Nair, Arif Ahamad, 2022)

The Map taken from the Light Pollution Maps show the intensive increase of Graph in some states in India from 2013 to 2019. We need legislation to curb ongoing disasters happening to our Night Environment. Light pollution may not seem as critical as soil, air, or water pollution, which is why many people remain unaware of its impact. This lack of awareness makes it even more essential to implement policies that educate the public and involve relevant authorities in taking corrective measures to address the issue effectively (Rai, 2020). Growing pollution is a global concern for which all the countries need to have collective measures along with separate national legislations to identify a solution.

Judicial Interpretations by the Indian Judiciary on the Recognition of Light Pollution

Nowadays, the Indian judiciary has started recognizing light pollution as a significant environmental concern. Through several judicial pronouncements, courts have acknowledged the adverse impacts of excessive artificial light and its effect on ecological balance. This shift indicates an essential step to integrate light pollution into the environmental legal framework of India. Notably, judicial bodies are now contemplating light pollution alongside conventional forms of environmental degradation, paving the way for enhanced legal protection and regulation. These developments highlight the rising awareness and urgency to address the effects of artificial lighting in urban and rural landscapes across the country.

In the case of (*Madanmohan C Gupta (HUF) & Anr v. Maharashtra Coastal Zone Management Authority (MCZMA) & Anr*, 2019)The petitioners challenged the NOC (No Objection Certificate) requirement from the MCZMA (Maharashtra Coastal Zone Management Authority). The case concerned the six advertising hoardings in Mumbai's Coastal Regulation Zone-II (CRZ-II). In this case, concerns related to the structural safety of the hoardings, their illumination, and potential hazards for pedestrians and motorists were taken into consideration by the Bombay High Court

It was explained at the time of the proceedings that the hoardings at Peddar Road, Kalpataru Apartments, did not fall within CRZ regulations. It was making MCZMA approval unnecessary. However, it is important to comply with all the municipal and other licensing conditions; only then can hoardings be permitted. It will give assurance regarding safety and environmental regulations.

The case emphasized the issues of public safety due to the Lighted hoardings. The court raised the potential concerns of distracting drivers and the issue of creating disturbances to the nearby residents. The case proves a growing concern for light pollution by seeking input from MCGM (Municipal Corporation of Greater Mumbai) about the intensity, duration, and safety measures of those illuminated hoardings.

The case of (*Rajendra Tiwari v. Union of India & Ors.*, 2021) The adverse effects of light Pollution on the wildlife of Nahargarh Wildlife Sanctuary were examined. Several people, including the authorities and the environment conservationists, have raised concerns regarding the impact of Light Pollution and its effect on the ecological balance. The major concerns before the court were creating a hindrance in the usual behavioral patterns of wildlife, especially the nocturnal species, as they rely on natural darkness for all their life activities, including predator evasion, reproduction, and foraging.

The court mentioned that Light Pollution affects the various biological rhythms of wildlife, resulting in alterations in their daily behavioral patterns. Artificial lighting may help predators track and hunt more effectively, while prey animals may struggle to adapt, leading to disruptions in the food chain and an imbalance in the ecosystem. The extended operational hours of several commercial activities, including Light and Sound shows, leaves further ecological imbalance in the region.

Various regulatory loopholes were highlighted during the proceedings by the court, including Light Pollution through many commercial activities taking place with no approvals from the Forest Department. It was mentioned that there is a combined impact of Light Pollution to numerous species like bats, which completely depend on natural environmental cycles for navigation and hunting.

The court ordered the shutdown of all the bars, restaurants, and other tourist-related establishments in the region of Nahargarh Fort and Wildlife Sanctuary from 1st December 2021. Some of the restaurants, namely Once Upon a Time Restaurant, Forest Café, Padao Restaurant, and Sky Waltz Café, were recognized as creating excessive noise and light pollution and disrupting the natural environment. The court also ordered the discontinuation of the light and sound shows in the region. The court emphasized that the Forest Department should supervise these activities under the Wildlife Protection Act and the Forest Conservation Act to ensure the protection of the natural environment.

This is a landmark judgment related to Light Pollution, which tried to maintain a harmonious construction between human activities and environmental conservation. It can set a precedent to ensure the sustainability of protected ecosystems and a recommendation for the future policy framework to regulate Light Pollution.

In *Anil Mehta v. State of Rajasthan & Ors. (2024)* (*Anil Mehta v. State of Rajasthan & Ors.*, 2024) NGT Bhopal addressed the issue of light pollution in eco-sensitive areas near Sajjangarh Wildlife Sanctuary and Fatehsagar Lake in Udaipur City. The case highlighted the impacts of excessive artificial lighting and noise pollution from several commercial establishments on local wildlife and wetland ecosystems. The tribunal criticized the regulatory lacunas, noting that the Rajasthan State Pollution Control Board had issued only a common notice to hotels instead of enforcing targeted action.

In this case, the tribunal stated that,

"It is not disputed that to date, no authenticated investigation or research concerning light pollution has been conducted in the context of Indian conditions and at least none has been placed on record. It cannot be doubted that in certain circumstances, high-intensity lights may be detrimental to wildlife and other species of different categories and nature as such. But this aspect requires a detailed study of the matter, and if necessary, appropriate guidelines/regulations need to be framed. On this aspect we find it appropriate to direct Ministry of Science and Technology, Government of India to take up requisite study on the issue of light pollution and take appropriate action to regulate such pollution in the context of Indian conditions and if necessary different provisions may be made for different areas depending on nature of flora, fauna and other relevant factors available in those areas."

The tribunal, in its final judgement, stated that the use of Laser lights and laser light systems should be heavily regulated in the area.

The court recognized the lack of scientific research on light pollution in India, emphasizing the need for comprehensive studies to review its ecological consequences. It directed the Ministry of Environment, Forest, and Climate Change, along with the Ministry of Science and Technology, to conduct in-depth research into the recommendations for policy frameworks. The tribunal mentioned that there is a requirement for region-specific regulations to regulate Light Pollution in different ecological areas. The case shows the growing public concern regarding emerging light pollution and a requirement for scientific guidelines to mitigate its adverse impacts.

In the case of (*News Item titled "7 flamingos spotted near DPS Lake Wetland killed activists blame CIDCO's development plan" appearing in The Indian Express dated 28.04.2024, In re*, 2024) The National Green Tribunal took a **suo motu** cognizance through a newspaper report regarding the death of 7 flamingos at DPS Lake Wetland in Navi Mumbai, Maharashtra. In the proceeding, Judicial members and the expert members analyzed the effect of ongoing construction activities by the City and Industrial Development Corporation, which resulted in altering the complete ecosystem of the wetland. The tribunal mentioned that the construction activity has obstructed the water inlets in the region, subsequently causing water stagnation and making the area unsuitable for flamingos.

The report mentioned that the LED streetlights installed in the area near the wetland had disoriented the birds and resulted in their collision with various objects, leading to their deaths. This is the first case that came to the Indian Judiciary where the explicit adverse effects of Light Pollution can be observed.

The NGT highlighted serious concerns about environmental protection and compliance with the laws, including the Wetland (Conservation and Management) Rules, 2017, the Biological Diversity Act, 2002, and the Environment (Protection) Act, 1986. The court also issued notices to several authorities, including the Principal Chief Conservator of Forests (Maharashtra), Maharashtra Wetland Authority, CIDCO, and the District Collector of Thane (Navi Mumbai), to direct them to file their report regarding this.

The case proves a precedent to recognize light pollution as an emerging environmental concern. It shows that there is a need for stringent regulatory measures to protect biodiversity.

In (*Panchtatva Foundation v. Ministry of Environment, Forest and Climate Change & Ors.*, 2024), the NGT Delhi, addressed the adverse impact of Artificial Light at Night. The petition highlighted its effects on wildlife, human health, and plant life. It was mentioned regarding the way it troubles migratory species, circadian rhythms, and overall nocturnal ecosystems.

The case underscored the lack of a regulatory legal framework to control artificial lighting in India. The petitioner referenced prior judicial precedents, including

Anil Mehta v. State of Rajasthan & Ors. (2024) (*Anil Mehta v. State of Rajasthan & Ors.*, 2024) and *In re: 7 Flamingos Spotted Near DPS Lake Wetland Killed* (2024) (*News Item titled "7 flamingos spotted near DPS Lake Wetland killed activists blame CIDCO's development plan" appearing in The Indian Express dated 28.04.2024, In re*, 2024), which identified light pollution as an emerging environmental concern. The NGT issued notices to the Ministry of Environment, Forest, and Climate Change, requiring responses by April 17, 2025. This case represents a significant step toward legal recognition of light pollution in a developing country like India and would set a precedent for future regulatory measures aimed at mitigating the ecological impact of Light Pollution.

In *Rohit Manohar Joshi & Ors. v. Tree Authority, Thane Municipal Corporation (2024)*(*Rohit Manohar Joshi & Ors. V. Tree Authority, Thane Municipal Corporation*, 2024) The Bombay High Court addressed concerns over the adverse effects of decorative artificial lighting on trees in Mumbai. The Public Interest Litigation (PIL No. 13/2024) contended that Artificial Light, particularly during festive seasons, has detrimental effects on tree health and urban biodiversity.

The petition filed by activist Rohit Manohar Joshi states,

"Presence of such cables, wires, lighting et cetera are detrimental to the health and growth of the trees upon which the lights, wires, cables are wrapped and draped across. Exposure to artificial light can impact and reduce the efficiency of the process of photosynthesis, a process in which plants generate glucose molecules (or other sugars) from water and carbon dioxide, and oxygen is released as a byproduct".

Recognizing such issues related to Light Pollution, the court also issued notices to municipal authorities and the Maharashtra government. This case highlights the overall ecological imbalance that Light Pollution is creating and the rising legal recognition of light pollution in India. It emphasizes the need for sustainable urban lighting practices that balance aesthetics with ecological preservation.

In the case of (*Sagardeep Sirsaikar v. State of Goa*, 2023), the Bombay High Court addressed the issue of Light pollution growing at the coastal regulation zones at Goa. It discussed the adverse effects of Light Pollution on wildlife in the region. The complaints were regarding the **excessive artificial lighting and loud music** from resorts and beachside establishments near the **protected nesting sites of Olive Ridley turtles** at Morjim, Ashwem, and Mandrem. It was argued that the flickering bright light from these commercial properties disturbs the natural nesting patterns of turtles. The petitioners mentioned that the concern is well documented in various research papers.

The court has analyzed scientific proof establishing that Light Pollution affects turtle hatching and creates hindrances for them to reach the sea. Generally, turtles use moonlight reflection on water for navigation, but the high-intensity artificial light near nesting areas confuses them, resulting in higher mortality rates.

The court has upheld that there is a need for strict enforcement of CRZ guidelines regarding the use of high-intensity artificial light near eco-sensitive zones. Direction was given to the Goa Coastal Zone Management Authority (GCZMA), the Forest Department, and local authorities to conduct inspections regarding the damage and impose strict restrictions on the use of bright artificial light, creating Light Pollution near turtle nesting areas. Specific orders were passed against a resort named Ukiyo Beach Resort, restricting it from using loud music and outdoor light, and violation of this order would result in automatic revocation of permits. Authorities were also directed to submit **periodic compliance reports** to ensure adherence to the orders related to Light and Noise Pollution.

In India's environmental jurisprudence, this case serves as a precedent to recognize the adverse impacts of Light Pollution on the coastal ecosystem. It shows that there is a need for a **national policy framework** to regulate Light Pollution based on the nature of specific zones. The Judgement also highlights the need to extend similar guidelines related to Light and Noise Pollution to other coastal regions of India, including **Tamil Nadu, Odisha, and Kerala**, which host major turtle nesting sites

Conclusion

The increasing legal recognition of light pollution in India, as seen in cases such as *Panchtatva Foundation v. MoEFCC (2024)*(*Panchtatva Foundation v. Ministry of Environment, Forest and Climate Change & Ors.*, 2024),

Rohit Manohar Joshi v. Tree Authority (2024)(*Rohit Manohar Joshi & Ors. V. Tree Authority, Thane Municipal Corporation*, 2024), *Sagardeep Sirsaikar v. State of Goa (2023)*(*Sagardeep Sirsaikar v. State of Goa*, 2023), and the suo motu actions taken by the National Green Tribunal (NGT) in the *DPS Lake Wetland* case(*News Item titled "7 flamingos spotted near DPS Lake Wetland killed activists blame CIDCO's development plan" appearing in The Indian Express dated 28.04.2024, In re*, 2024)emphasizes the need to regulate Light Pollution through framing a strict regulatory Legal Framework. All these cases show the detrimental effects of Light Pollution on Human Life, Plants, and wildlife and unbalance the whole ecosystem. From interrupting migratory birds and nesting sea turtles to altering plant growth and human circadian rhythms, Light Pollution poses severe environmental risks. To regulate Light Pollution in India, lessons from the global best practices can be helpful, like through **Dark Sky Reserves in the United States**, the **EU's Environmental Noise and Light Pollution Regulations**, and **Australia's lighting guidelines for wildlife conservation**. The following measures should be prioritized:

1. **Light Pollution Impact Assessments:** Integration of *Light Pollution Impact Assessments* in the provisions of Environment Impact Assessment.
2. **Public Awareness:** To persuade responsible lighting practices, it is important to spread awareness and inculcate community engagement for the dark sky policies.
3. **Wildlife Conservation Strategies:** It is necessary to restrict artificial lighting in coastal zones, wetlands, forest regions, and other ecologically sensitive areas.
4. **Legislative Reforms:** It is significant to frame a Comprehensive *Light Pollution Regulation* in India and to mention specifications for artificial lighting based on several ecological zones.
5. **Urban Planning Policies:** The Incorporation of sustainable lighting designs is required for Light Pollution as a new emerging environmental concern. It should include the use of warm-colored lighting, shielded Lights, and regulatory control over decorative lights.

Judicial interventions serve as landmark precedents toward recognizing light pollution as an emerging environmental issue. For India to mitigate the adverse impact effectively, a comprehensive legal framework to regulate Light Pollution is required, complementing with legal precedents to ensure a sustainable future.

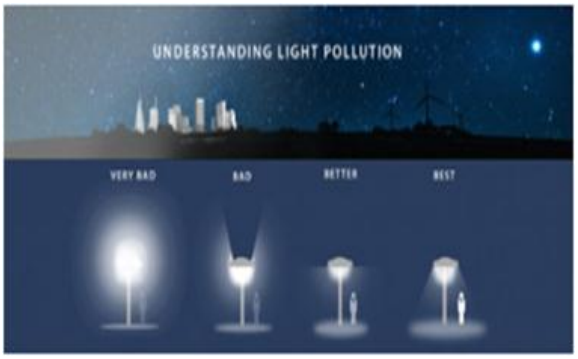
Suggestions

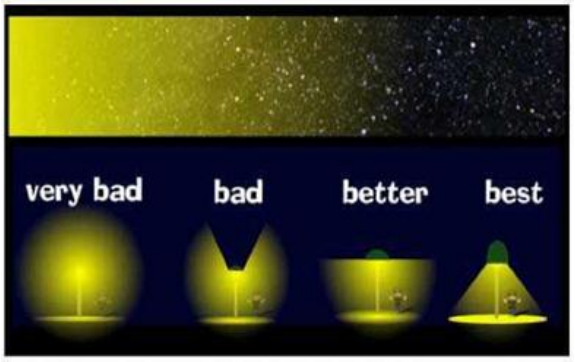
Light pollution is a growing concern worldwide, and India is no exception. Here are some suggestions to help control light pollution in India:

1. Promote Dark Sky Awareness: Spread awareness among people regarding the negative impacts of light pollution on human health, the environment, and wildlife. Encouraging people, different organizations, and communities to adopt Lighting Practices sensibly can help us to curb the issue of Light Pollution.
2. Protect Astronomical Observatories: The protection of existing and potential astronomical observatories should be our first step. The government should take action to preserve astronomical observatories. Like other countries, India needs to establish Light Control Zones in the near areas of these observatories to restrict the excessive light encroaching on the Astronomical Observatories.
3. Encourage Responsible Advertising: The checks and limitations need to have for the flashy and bright advertisement boards. Regulations should be implemented to control the time and intensity of these billboards and illuminated signboards to reduce sharp lighting.
4. Raise Awareness among Industries: To encourage and create awareness among industries, especially with sharp outdoor lighting, including factories, stadiums, commercial complexes, etc.
5. Foster Community Engagement: It can be proven to be an effective step by involving the local communities and organizations to frame the initiatives and work for the reduction of Light Pollution. They can also help to conduct awareness programs, workshops, and other such events that engage the public and educate them on the importance of protecting the dark skies.
6. Preserve Ecologically Sensitive Areas: This is an important step that needs to be taken in time. It is required to identify and work for the preservation of

Ecologically Sensitive Areas, including coastal regions and wildlife habitats, from excessive Light Pollution. Implementation of legal frameworks and regulations is needed to curb excessive artificial lighting in specified areas and motivate responsible lighting practices to protect the Ecosystem and Natural Environment.

7. Support Research and Development: Encourage research and development in the field of smart lighting and adapt technological advancements to control excessive lighting. The collaboration of scientists, lighting designers, and engineers can be effective in coming up with environment-friendly and more efficient lighting solutions.
8. Observatories should implement programs to regularly measure sky brightness based on location, wavelength, and time. Additionally, the astronomical community should develop a system to support and coordinate these monitoring efforts effectively.(K W Riegel, n.d.)
9. Properly Design Street Lighting: As per the records, streetlights play a vital role in the category of Light Pollution. They need to be designed with precision, specifically aiming to illuminate the walkways and the roads to minimize light pollution. The use of dim yellow lights or lights of low intensity during off-peak hours can also serve the purpose.
10. Using innovative Lighting Techniques can also work to curb Light Pollution. If it genuinely helps, we can keep a check through legal frameworks to use it compulsorily. We can opt for lights that do not directly face upward toward the sky.





11. Studies have shown that street lighting contributes approximately 35%–50% to overall light pollution. (Komal Kaushik, Soumya Nair, Arif Ahamad, 2022) So, this technique can specifically be helpful for streetlights.
12. Implement Lighting Regulations: Develop and enforce regulations on outdoor lighting. Set guidelines for lighting fixtures to ensure they are energy-efficient, shielded, and directed downward to minimize light spillage and glare. Encourage the use of motion sensors and timers to control lighting when not needed. There is genuinely a need to formulate legislation in India related to Light Pollution, with such possible clauses that can be a part of the legislation:
    a. Before drafting any such legislation, we need to ensure that the legislation is flexible, as commercial and service industries are part of it and generally have a dynamic approach regarding the operation depending on the need and circumstances.
    b. As per the basis of overconsumption of power, if any provision is violated, it should be backed by the exemplary penalty for the defaulter.
    c. Following the measures we have taken to limit the prevailing noise pollution; we can also curtail Light Pollution by setting a time limit at night after which the lights over the billboard advertisements and decorative lights in cities must be switched off. It can exclude exceptional cases with permission of reduced limits for the necessary ones.
    d. Through the laws, we can also put a limit on the size of the advertisement boards and billboards

because if its size is compact, it will use comparatively less light and power to highlight it. We can appoint Local Management body members to follow up regarding the legal violations by the people in the specified area and penalties can be put accordingly.

13. Use Energy-Efficient Lighting: Promote the use of energy-efficient lighting options such as LED lights. LEDs consume less energy, last longer, and can be directed more effectively. Encourage individuals, businesses, and local governments to transition to LED lighting, especially in public spaces.
14. We should follow the several recommendations passed from time to time by different organizations including the International Dark-Sky Association, The Commission Internationale de l'Éclairage (CIE), and the Illuminating Engineering Society of North America (IESNA 2000), etc., illustrating how local lighting ordinances and innovative designs may promote low-impact, energy-efficient, and aesthetically pleasing lighting systems.(Franz Hölker et al., 2010)
15. We can also propose a plan to preserve dark skies that the people visiting the National Parks can willingly pay to preserve Night skies. Such steps can create awareness in India to start preserving dark skies. Similar steps were proposed and taken by Western America as well to protect the night sky by Barak Obama.

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