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THE INVISIBLE IMPACT OF PHOTO TOURISM AND THE URGENT NEED TO REGULATE LIGHT POLLUTION: A CURIOUS CASE STUDY OF GALAXY FROGS

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ABSTRACT

Human interaction with nature has changed and the ways in which experiences are captured and shared have evolved over time, particularly in the digital era. This has brought people connect with the environment but has also added new pressures in non-obvious ways. One of the trends that is gaining momentum is photo tourism. A type of travel in which people go to certain locations primarily for the purpose of photographing wildlife, natural scenery, or cultural activities. Both professional and amateur photo tourists frequently go to ecologically sensitive regions for unusual and beautiful material. While it appears harmless, inappropriate use of this practice can affect natural habitat. Recently, this concern has been brought to the fore as a result of an incident in the Western Ghats in Kerala. Several rare and vulnerable Galaxy Frogs (*Melanobatrachus indicus*) were photographed several times and these frogs are now assumed to be dead. They were disturbed during these sessions and in front of strong camera flashes. Such disturbances may be detrimental for a species that requires stable and low-light conditions. This is an indication of a bigger problem of light pollution. Many species, particularly amphibians can be impacted by artificial light from flashes or torches regarding feeding, movement, and reproduction. This effect overlooked because it leaves no visible damage. This article will explore the links between photo tourism and light pollution. It highlights the need for ethical practices and better regulation to protect sensitive species and preserve natural conditions.

Keywords: Photo Tourism, Light Pollution, Galaxy Frog, Wildlife Conservation, Environmental Regulation

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I. INTRODUCTION

In the times of Instagram reels and wildlife documentaries, people have become so accustomed to taking photos of every aspect of their life. No forest hike or wildlife experience would be complete without pictures. These used to be found only in books and scientific journals, but now, they can be found in seconds on social media feeds. It has developed into a global culture. Today, tourists go to forests, wetlands, mountains and biodiversity hotspots primarily for the purpose of taking a once-in-a-lifetime photo or video. This growing trend is popularly known as photo tourism.³ Photo tourism or photographic tourism is a specialized form of traveling that focuses on taking photographs of natural, cultural or scenic locales.⁴

On the surface, photo tourism can seem like a benign activity. Unlike hunting or deforestation it does not directly destroy wildlife habitats. It even raises awareness of biodiversity and conservation in many ways. But as the demand for unusual wildlife photographs has grown, it has caused an undisclosed environmental issue. The pursuit of the perfect photographic shot has led to more human exploitation in sensitive environments. The perfect photographic shot has driven up human encroachments on sensitive environments. Visitors photographers and content makers now bring their camera, torches and artificial light equipment into remote habitats. As a result nature is no longer experienced quietly. It is constantly lit-up observed, recorded. This transformation of the relationship between human and nature is an overall trend of urbanisation, globalisation and technology development. Artificial light has become an integral part of modern society. The night is still bright with light in cities. Street lights, commercial buildings, highways, tourist resorts and public areas remain lit after dark. Artificial light has come to be seen as a sign of progress and modernity in life. Meanwhile, as the artificial light has become excessive and unchecked, it has turned into a serious environmental problem, called light pollution.⁵

The International Convention on Migratory Species, 1983 (CMS) defines light pollution as an artificial light that alters the natural patterns of light and darkness in ecosystems, interfering with the behaviour and biological cycles of nocturnal organisms.⁶ The sense of 'earlier darkness' was a natural occurrence in ecosystems. Today natural darkness is gradually disappearing. Artificial light now has spread into areas outside urban centres, such as forests, coastal areas, wetlands, and protected wildlife areas. Light pollution is a form of pollution

³ Ioannis Valachis, Nikolaos Trihas et.al., "Photographic Tourism: Motivations and Behaviour of Photo Tourists" in *Innovation and Creativity in Tourism, Business and Social Sciences* 321-336 (Springer, 2025).

⁴ *Ibid.*

⁵ Jack Falcón *et al.*, "Exposure to Artificial Light at Night and the Consequences for Flora, Fauna, and Ecosystems" 14 *Frontiers in Neuroscience* (2020) available at: <https://pmc.ncbi.nlm.nih.gov> (last visited on 15 May 2026)

⁶ CMS International Light Pollution Guidelines for Migratory Species, available at: https://www.cms.int/sites/default/files/document/cms_cop14_res.13.5_rev.cop14_cms-international-light-pollution-guidelines_e.pdf (last visited on 21st May 2026)

that does not leave any visible residue and is, therefore, not always considered. People tend to relate light with the development of comfort and security. However, scientific research has revealed that artificial light can have a significant impact on ecological balance when its too bright.⁷ Increasingly, Artificial Light at Night (ALAN) has been recognised as an emerging environmental concern. Research has revealed that prolonged exposure to artificial light disrupts biological cycles, natural rhythms and behaviour in humans and animals.⁸

Darkness is the key to the survival of many species. According to the study by Thomas W. Davies and James P. Duffy, “Marine Ecosystems,” artificial light has an impact on the feeding and reproduction cycles of marine wildlife, including turtles, fishes and plankton.⁹ Likewise In the article, “Missing the Dark: Health Effects of Light Pollution” (2009), Ron Chepesiuk explained that artificial lights at night interfere with the biological rhythms of sleep and negatively affect the health of humans¹⁰

Artificial lighting is especially detrimental to smaller, more sensitive species. Amphibians for example are extremely dependent on stable environmental conditions. They are sensitive to changes in humidity temperature and light intensity. They can be affected by artificial light, causing their movement feeding and reproductive activity to be disrupted.¹¹ These impacts may be overlooked, though, in smaller species, which often do not show obvious physical damage. However the ecological consequences may be serious and long lasting.

This has been compounded by the advent of social media culture. When there’s a picture of rare wildlife, it gets newsworthy attention right away online. Consequently, photographers are now looking for rare species in remote ecosystems. Artificial lighting like camera flash, torches and LED lights are used in many instances in order to get the images that are visually attractive during night photography. These practices result in high levels of light entering habitats that have evolved to function in a dark environment over many years. The continual exposure to this kind of lighting can cause stress and disturbance for wildlife, particularly for

⁷ Travis Longcore and Catherine Rich, “Ecological Light Pollution” 2(4) *Frontiers in Ecology and the Environment* 191–198 (2004).

⁸ Ron Chepesiuk, “Missing the Dark: Health Effects of Light Pollution” 117(1) *Environmental Health Perspectives* A20–A27 (2009), available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627884/> (last visited on May 21, 2026).

⁹ Thomas W. Davies, John Hopkins, et.al. ‘The Ecological Impacts of Night-time Light Pollution: A Mechanistic Appraisal’ 88 *Biological Reviews* (2013).

¹⁰ Ron Chepesiuk, “Missing the Dark: Health Effects of Light Pollution” 117(1) *Environmental Health Perspectives* A20–A27 (2009), available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627884/> (last visited on May 8, 2026).

¹¹ Kakuli Chowdhury, “Light Pollution Effects on Wildlife, Humans and Ecosystems” 3 *International Journal of Advanced Research in Commerce, Management & Social Science* (IJARCMSS) 6-9 (2020).

nocturnal and sensitive species.¹² What makes it a more serious problem is that photo tourism is considered a harmless practice. Current conservation debates predominately centre on habitat destruction, pollution from poaching and climate change. Comparatively less attention is given to disturbances caused by photography and artificial illumination. But the increasing intrusion of artificial light into natural environments is a subtle ecological stress. It does not destroy immediately the forests, nor kill immediately the species visibly. Instead, it gradually modifies the behaviour of nature and gradually degrades its stability over time.

In this context, the present article analyses the new link between photo tourism and light pollution. The article discusses the negative impact of excessive artificial lighting in wildlife photography and how it disrupts the ecological balance and poses a threat to biodiversity. The case of the Galaxy Frog is used to illustrate how the ecological effects of light pollution need to be assessed, and the need for better environmental governance and responsible wildlife tourism practices.

II. PHOTO TOURISM AND THE CURIOUS CASE STUDY OF GALAXY FROGS

A recent article in the Indian Express talked about a disturbing incident in the Western Ghats of Kerala where one of the world's rarest amphibians called 'Galaxy' frog was spotted.¹³ The report highlighted the negative aspects of contemporary wildlife photography and serious concerns about the effects of photo tourism on sensitive ecosystems. Wildlife photography has gained a lot of popularity in recent years because of content creation with the help of digital cameras. Rare species are continually pictured and posted online. Due to this, the photographers who visit the country and the content creators have been going to the remote forests and biodiversity hotspot to capture the images which are unique and visually appealing to capture the images of the wildlife. These activities may appear benign, but can cause serious ecological disturbances if performed in an unabated manner.



¹² The impact of Artificial Lighting on Nocturnal Wildlife, "National Institute on Environmental Health Sciences", available at: <https://kids.niehs.nih.gov/topics/natural-world/wildlife/ecology/lighting> (Last visited on 20th May, 2026)

¹³ Alind Chauhan, "7 of World's Rarest Frogs Presumed Dead, Study Blames Rise in Photo Tourism" *The Indian Express*, Jan. 3, 2026.

(Image Source: Mongabay, Liz Kimbrough, 'Photo Tourism Threatens Rare Galaxy Frog Population in India's Western Ghats,' Dec. 18, 2025.)

Galaxy Frog *Melanobatrachus indicus* is one of the rare species of amphibians in India. It is found in the Western Ghats only and is endemic only to certain forest micro habitats.¹⁴ The species is small, quiet and very reliant on undisturbed, rotten logs and wet forest habitats for cover and life. It is already listed as Vulnerable By The International Union for Conservation of Nature as a result of limited habitat and depleted numbers. Amphibians, such as the Galaxy Frog, are very sensitive to changes in their environment due to their soft skin and sensitive biological systems. They are sensitive to slight changes in the structure or temperature of their humidity habitats and also in light levels. In 2025, seven Galaxy Frogs were reported as presumed dead in a study published in Herpetology Notes, following numerous disruptions related to wildlife photography.¹⁵

This incident is one of many environmental problems that are overlooked. Eco-stressors; artificial light can come from camera flashes, torches and portable LED lights, all of which can be an ecological stressor in natural habitats.¹⁶ Stable dark conditions are vital to the feeding motion, reproduction and protection from predators for wildlife, particularly nocturnal species.¹⁷ They can be sensitive to intense artificial lighting which can disrupt their behaviour and cause physiological stress. Amphibians are even more sensitive as their survival is dependent on critical and stable environmental conditions. Exposure to artificial light could affect feeding behaviour, alter movement patterns and disrupt reproductive behaviour if the animals are repeatedly exposed.¹⁸

For the Galaxy Frog, the intense flashes of the camera in a sensitive forest ecosystem is likely to cause behavioural and biological disturbance. This is a more serious issue because this type of disturbance may not result in any actual damage in the immediate aftermath. While deforestation and hunting light pollution operate in silence. But the ecological impacts can be just as devastating over time. The Galaxy Frog incident also demonstrates how photo tourism is changing the nature of human interaction with wildlife. The primary interest in wildlife observation was rather scientific and conservation. In today's era, the increasing need to click rare photos for online fame has turned wildlife habitats into visual areas for online consumption. Artificial lighting equipments are also used by photographers to get clearer as well as more dramatic pictures, particularly in night photography. Consequently, light

¹⁴ Liz Kimbrough, "Photo Tourism Threatens Rare Galaxy Frog Population in India's Western Ghats" Mongabay, Dec. 18, 2025, available at: <https://news.mongabay.com/2025/12/photo-tourism-threatens-rare-galaxy-frog-population-in-indias-western-ghats/> (last visited on May 12, 2026).

¹⁵ *Supra* Note 12.

¹⁶ Kathryn L. G. Russart & Randy J. Nelson, "Artificial Light at Night Alters Behaviour in Laboratory and Wild Animals" 329 *Journal of Experimental Zoology Part A: Ecological and Integrative Physiology* (2018).

¹⁷ *Ibid.*

¹⁸ Carolyn S. Burt, Jeffrey F. Kelly, et. al . "The Effects of Light Pollution on Migratory Animal Behaviour" 38 *Trends in Ecology & Evolution* (2023).

pollution is slowly filtering into centuries-old forest interiors and protected ecosystems, which have never seen the light of any polluting 'man-made' source.¹⁹

This case is another example of the critical regulatory loophole in wildlife protection systems. The major areas of concern in environmental laws are against poaching, habitat destruction and illegal wildlife trade. Comparatively less attention is given to disturbances caused by non-consumptive activities such as wildlife photography and artificial lighting.²⁰ Very little are specific guidelines to regulate flash photography or light exposure in ecologically sensitive habitats. As a result, those species are still subject to continual disturbance from humans, but with a lack of legal protections.

The incident thus underscores the importance of ethical wildlife photography and environmental law enforcement. Combating light pollution and limitations on flash photography were critical for wildlife conservation. The Galaxy Frog's disappearance cannot just be taken as an isolated case. Rather, it should be seen as a cautionary tale about the unseen ecological toll of unchecked photo tourism and artificial lighting in natural ecosystems.

III.ECOLOGICAL AND BIOLOGICAL IMPACTS OF LIGHT POLLUTION ON WILDLIFE

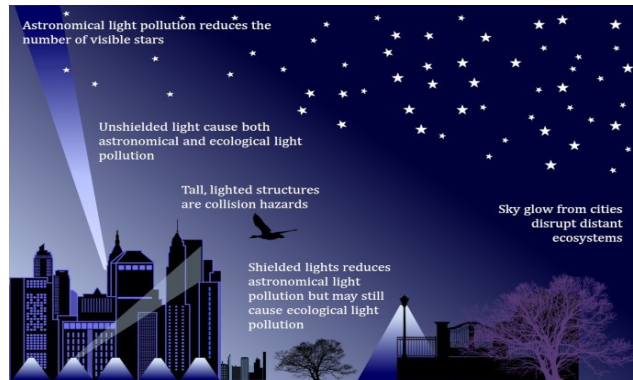
The issue of light pollution has become a significant environmental problem in the last few years. Artificial lighting was primarily found in urban areas in the past. Now it has extended its distribution to forests, wetlands and coastal areas and wildlife habitats. ALAN, or 'Artificial Light at Night' is a widely occurring man-made light source that is disrupting the natural balance of ecosystems around the globe.²¹ Increasingly, artificial light is impacting wildlife species that rely on darkness to feed, migrate, and reproduce and survive. This has led to the disturbance of many biological and ecological processes. The natural light and darkness is an important part of ecological systems.²² Numerous species are adapted to regular day/night patterns. These cycles are disrupted by artificial lights, and influence the behaviour of wildlife species. This is particularly harmful for nocturnal and migratory species, which depend on the dark for orientation and survival. Artificial lighting is often more intense, more continuous and disorienting than the natural moonlight. The rapid shift in the night-time world of wildlife brings stress confusion and behavioural disturbances to wildlife species.

¹⁹ Pavithra R. and Sangeetha Sriraam, "Let There Be Light, But Not Too Much: The Need to Legally Address Light Pollution in India" 43 *Indian Journal of Environmental Protection (IJE)* 257–262 (2023).

²⁰ Jessica Damiano, Outside lights are deadly to birds, especially this time of year, *available at*: <https://phys.org/news/2024-10-deadly-birds-year.html> (last visited on 22nd May, 2026)

²¹ Kakuli Chowdhury, "Light Pollution Effects on Wildlife, Humans and Ecosystems" 3 *International Journal of Advanced Research in Commerce, Management & Social Science (IJARCMSS)* 6-9 (2020).

²² Supra note 8.



(Image Source: “What is the Ecological Impact of Light Pollution?” *Encyclopaedia of the Environment*, May 1, 2025).

Migratory birds are one of the most impacted species. Bright urban lighting has been proven to disrupt birds' migratory patterns by scientific studies. Lit structures such as buildings towers and city lights can be a source of attraction to migrating birds leading to collisions and high mortality rates.²³ According to the American Bird Conservancy more than one million migratory birds die annually in the United States due to artificial lighting.²⁴ Another study by Carolyn S. Burt Jeffrey F. Kelly and others showed that light pollution is a both an attractant and a repellent to wildlife species. The study found that the artificial light influences the production of hormones that regulate the timing of migration, feeding behaviours and reproductive behaviour.²⁵ The impact of such disturbances on survival and ecological stability of species that require natural light-dark cycles.

The effects of artificial light on the migratory birds are also observed in India. More and more disturbance in bird movement and resting are being observed in urban centres like Delhi, Mumbai, Bengaluru etc. because of excessive outdoor lightings. Birds are confused by city lights at the time of migration and are forced to take alternative routes around the city. Ongoing exposure to bright lights while moving at night can cause birds to become exhausted, injured or disoriented, in many cases.²⁶ These disturbances over time impact biodiversity and ecological balance. Likewise, the coastal ecosystems are under severe ecological stress due to light pollution. Some of the most sensitive species impacted by artificial light are sea turtle hatchlings.²⁷ The Wildlife Institute of India and a number of studies report that lighting along the coastlines of Goa and Odisha often confuse turtles when

²³ Ibid.

²⁴ Jessica Damiano, Outside lights are deadly to birds, especially this time of year, *available at*: <https://phys.org/news/2024-10-deadly-birds-year.html> (last visited on 22nd June, 2025)

²⁵ Carolyn S. Burt, Jeffrey F. Kelly, et. al . “The Effects of Light Pollution on Migratory Animal Behaviour” 38 *Trends in Ecology & Evolution* (2023).

²⁶ Ibid.

²⁷ Wildlife Institute of India, Impact of Artificial Illumination on sea finding behaviour of sea turtle at Gahirmatha rookery, Odisha, *available at*: https://forestsclearance.nic.in/writereaddata/Addinfo/0_0_4112123512121WildLifeInstituteReportFinal.pdf (last visited on 3rd July 2025)

they hatch. Naturally hatchlings move towards the brightest horizon which under normal conditions is the ocean reflecting moonlight. But, artificial beachfront lighting throws them off and makes them go inland rather than out to sea. Huge numbers of chicks perish from dehydration, road accidents or predation before they get into the ocean. This is a good example of the damage that can be done at a very large scale, even from indirect contact with artificial lighting.²⁸

Artificial lights are also very attractive to insects, causing them to become exhausted and die or interrupt their pollination activities. Plants, birds, amphibians and other organisms that are linked in the food chain are also impacted by the decline of pollinators and nocturnal insects. One of the other ecological effects of light pollution is disturbance of circadian rhythms.²⁹ All kinds of wild animals have internal biological clocks that determine the timing of their sleep, feeding and migration, and breeding. These rhythms are disrupted by the use of artificial light and physiological stress results. These biological changes may have a long-term effect on species abundance and populations, as well as lower survival rates.

Light pollution has also been demonstrated to impact ecosystems as a whole and not just individual species in scientific research. Gaston and others found that artificial light disturbs ecological cues that are vital for survival, reproduction and predator prey relationships.³⁰ Likewise, Kyba and other researchers in the report, which appeared in *Science Advances*, found that the brightness of artificial light on the planet is rising at almost 2.2 percent annually as LED lighting grows in popularity. This means that the natural darkness is fast disappearing all over the world.³¹

The issue of light pollution has also been taken up by the courts in India. The death of flamingos around DPS Lake Wetland, Navi Mumbai, came to the knowledge of the National Green Tribunal in Original Application No. 637 of 2024 suo motu.³² The Tribunal noted that flamingos are unable to see the new lights on the structures and were disoriented when flying, causing them to collide with the lights and die. The observation was a clear recognition of the impact of light pollution on wildlife conservation and wildlife survival.³³

Despite the scientific evidences, light pollution is not regulated well in India. Currently, environmental legislation primarily addresses issues of air pollution, water pollution, noise, and hazardous pollution. There has been minimal concern about artificial lighting as an environmental hazard. In addition, the Wildlife Protection Act 1972 does not make specific

²⁸ Ibid.

²⁹ Rajaratnam, S. W. (2023). *Interview on circadian rhythms and artificial light*. Down to Earth. Available at : <https://www.downtoearth.org.in/pollution/bright-light-disrupts-circadian-rhythm> (last visited on 3rd May 2026)

³⁰ Kevin J. Gaston, Jonathan Bennie, Thomas W. Davies and John Hopkins, "The Ecological Impacts of Night-time Light Pollution: A Mechanistic Appraisal" 88 *Biological Reviews* (2013).

³¹ C. M. Kyba, T. Kuester, A. S. de Miguel, K. Baugh, et al., "Artificially Lit Surface of Earth at Night Increasing in Radiance and Extent" 3 *Science Advances* (2017).

³² NGT Order dated 30.05.2024, Original Application No. 637/2024

³³ Ibid.

reference to light pollution or disturbance from an excessive amount of artificial light in wildlife habitats. This is a serious regulatory void at a time when technological developments and urbanisation tourism are increasing artificial light use in natural habitats. Therefore, it is urgent to adopt sustainable lighting practices, increase environmental awareness and establish effective laws to safeguard wildlife species from this undetectable but harmful form of pollution.

IV. ENVIRONMENTAL GOVERNANCE OF LIGHT POLLUTION: COMPARATIVE PERSPECTIVES AND REGULATORY GAPS

Many nations have been compelled to acknowledge light pollution as an environmental problem that has to be regulated by law due to the increasing ecological impact of artificial lights. In the past, excessive illumination was mostly seen as a problem with energy use or urban planning. However scientific investigations and increased ecological concerns have increasingly modified this perception. Uncontrolled artificial lighting can disrupt biodiversity, harm ecosystems, and endanger the existence of species, as many nations increasingly recognize. In order to control artificial light and protect natural darkness, several legislative frameworks and policy measures have been implemented worldwide.

One significant example is France, where the government implemented the Decree on Night Time Lighting of Non Residential Buildings in an effort to lower energy use and light pollution.³⁴ On January 1, 2019, the decree became operative. It controls non-residential buildings lighting, including exterior lighting and internal lights that are projected outdoors at night. The law encourages prudent use of artificial illumination and restricts needless lights at night. Such legislation marks a significant change in environmental governance, as artificial lighting is now seen as a potential ecological threat as well as a symbol of progress.

Another noteworthy example is Spain, which implemented the well-known Sky Law, often referred to as Law 6 of 2001, on the Canary Islands.³⁵ The primary purpose of this regulation was to shield environmentally vulnerable places and astronomical observatories from excessive artificial lights. The rule sets stringent restrictions close to environmentally sensitive areas and controls lights both inside and outside. Crucially, the law acknowledges the need to shield ecosystems, wildlife, and plants from the damaging impacts of artificial lighting. One of the best instances of striking a balance between growth, environmental protection, and the preservation of natural darkness is Spain's Sky Law.

To reduce light pollution, Italy has also enacted strict regional legislation. Streetlights are not allowed to project light above the horizontal plane due to Lombardy's Law No. 17 of 2000, which established a zero upward light norm.³⁶ For both public and private use, completely

³⁴ France's Order (Arrêté) of 27 December 2018 (NOR: TREP1831126A) on the Prevention, Reduction, and Limitation of Light Pollution

³⁵ Law 6/2001 on Environmental Planning of Lighting for the Protection of the Night Environment, Catalonia, Spain (May 31, 2001),

³⁶ Law of the Lombardy Region no. 17 of 03/27/2000 'Urgent measures to fight the light pollution and to achieve energy saving in the use of outdoor lighting'.

protected lighting systems are also mandated by law. Lighting must typically be turned off before midnight, and historic structures may only be illuminated within specified bounds. Decorative lighting and advertising signs have also been subject to restrictions. Several other Italian regions, including Veneto Emilia Romagna Marche and Abruzzo, later adopted comparable legal systems after being influenced by Lombardy.

In a similar vein, South Korea passed the Act on the Prevention of Light Pollution Due to Artificial Lighting in 2012, which underwent revisions between 2016 and 2019.³⁷ The goal of the law is to prevent excessive artificial lighting from harming the environment and public health. It mandates the creation of light pollution prevention strategies and the designation of lighting management zones by national and local authorities. Additionally, the law acknowledges the wider environmental effects of unregulated artificial illumination and encourages environmentally beneficial lighting methods.

In 2002, the Czech Republic became the first nation in the world to enact a national law that specifically addressed light pollution, which was a very significant event.³⁸ In order to lessen upward lighting skyglow and needless illumination, the Anti-Air Pollution Act mandated the use of shielded lighting fixtures. In addition to conserving energy, the goal was to protect dark sky and lessen the negative environmental effects of artificial lights.

Another noteworthy example is Chile, whose Supreme Decree No. 1 of 2022 established the Emission Standard for Artificial Luminosity created by Lighting.³⁹ The primary purpose of the regulation was to safeguard Chile's astronomical observatories and night sky, which are vital to the world. The law sets criteria to lower dangerous light emissions and controls artificial luminosity. In order to protect natural darkness and ecological equilibrium, environmental authorities, research organizations, and policy makers work together.

These global developments unequivocally show that light pollution is becoming more widely acknowledged as a significant environmental problem in various countries. Legally binding regulations governing artificial illumination have replaced voluntary guidelines in many nations. Crucially, these regulations recognize the biological value of darkness and the necessity of shielding biodiversity from excessive artificial lighting in addition to emphasizing energy efficiency.

India, on the other hand, still lacks a thorough legal structure that addresses light pollution. The Wildlife Protection Act of 1972⁴⁰ and the Environment Protection framework are two examples of current environmental legislation that mainly address habitat loss, pollution management, and wildlife trading. Artificial lighting has received very little attention as a

³⁷ Artificial Light Pollution Prevention Act, South Korea, adopted on Nov. 26, 2019.

³⁸ The Czech Act on Protection of the Air, including Light Pollution Prevention, Czech Republic, Act of Feb. 14, 2002, effective June 1, 2002.

³⁹ Supreme Decree No. 1 of 2022 (Norma Luminica), Chile, issued by the Ministry of the Environment, regulating light-emitting sources and prevention of light pollution across Chile, Oct. 18, 2023.

⁴⁰ The Wild Life (Protection) Act, 1972, No. 53 of 1972.

danger to the environment. There are currently no national regulations controlling excessive artificial lights near forests, wetlands, coastal ecosystems, or protected wildlife areas, despite the fact that India is home to millions of nocturnal species and four key biodiversity hotspots.

In light of the increasing urbanization of tourism and photo tourism, the lack of regulation becomes even more troubling. Even in environmentally sensitive places, wildlife photography using camera flashes, torches, and LED lights is still widely practiced. This regulatory gap is exemplified by the Galaxy Frog incident from the Western Ghats. The ecological disruptions brought on by artificial illumination and frequent wildlife photography are not sufficiently addressed by current conservation frameworks. Vulnerable species continue to be subjected to subtle but severe environmental stress as a result.

The urgent need for more robust environmental governance in India is thus highlighted by the mounting scientific evidence and comparative international practices. It is important to acknowledge artificial light as an environmental contaminant with immediate ecological repercussions. Sustainable lighting policies restrictions on artificial illumination in eco sensitive areas and ethical wildlife photography guidelines are necessary to protect biodiversity and preserve natural darkness. Without proper legal intervention the increasing spread of artificial lighting may continue to threaten wildlife habitats and ecological stability in the years ahead.

V. CONCLUSION

Light pollution is no longer only an urban or aesthetic issue. It has emerged as a serious environmental concern with direct ecological and biological consequences.⁴¹ The increasing use of artificial lighting in forests wetlands coastal regions and wildlife habitats is gradually disturbing the natural balance of ecosystems. The case of the Galaxy Frog clearly shows how even non consumptive activities such as wildlife photography can create silent ecological harm when combined with artificial illumination and repeated human intrusion. Despite growing scientific evidence light pollution still remains largely ignored within environmental governance frameworks especially in India. Existing laws focus mainly on visible forms of pollution while the ecological importance of natural darkness continues to receive limited legal recognition. Therefore there is an urgent need to recognise light pollution as an environmental pollutant and develop stronger legal and policy mechanisms for the protection of biodiversity and ecologically sensitive habitats. Conservation today must not only protect land and species but also preserve the natural darkness upon which wildlife survival depends.

Suggestions

1. **Recognition of Light Pollution as an Environmental Pollutant:** Light pollution should be formally recognised as a distinct category of environmental pollution under Indian environmental laws. Presently laws mainly focus on air water and noise

⁴¹ Komal Kaushik, Soumya Nair et. al., "Studying Light Pollution as an Emerging Environmental Concern in India" 11 *Journal of Urban Management* (2022).

pollution while artificial lighting remains largely ignored despite its ecological consequences. Legal recognition would help in developing proper standards monitoring mechanisms and liability for excessive artificial illumination.

2. **Special Protection for Eco Sensitive Zones and Biodiversity Hotspots:** National parks, wetlands, coastal areas, biodiversity hotspots, and eco-sensitive zones should all implement strict lighting controls. Restrictions on high-intensity LED installations and nighttime illumination should be used to manage artificial lighting close to wildlife areas. These steps are required to minimize disruption to migratory and nocturnal animals and maintain natural darkness. These lighting restrictions may be prescribed through notifications or rules issued under the Environment (Protection) Act, 1986, thereby ensuring uniform implementation across protected and ecologically sensitive areas.
3. **Regulation of Wildlife Photography and Photo Tourism :** Guidelines for ethical wildlife photography should be established by authorities, particularly for endangered and unusual animals. In protected environments, nocturnal photography using camera flashes, torches, drones, and portable LED lights should be prohibited. Uncontrolled photo tourism can cause ecological disruption, which can be mitigated by monitoring photographic activity and using regulated access permission systems. Appropriate guidelines may also be framed under the Environment (Protection) Act, 1986 and relevant wildlife conservation laws to regulate artificial lighting used during wildlife photography and photo tourism.
4. **Species Specific Conservation Measures for Rare Wildlife:** Additional legal and biological protection against artificial light exposure should be provided for sensitive species like amphibians, migratory birds, sea turtles, and nocturnal organisms. Plans for conservation should identify species that are more susceptible to light-related disruptions and set illumination guidelines tailored to each habitat. For uncommon species like the Galaxy Frog, whose life depends on steady climatic circumstances, this is especially crucial. Species-specific lighting standards and habitat protection measures may be incorporated through subordinate legislation under the Environment (Protection) Act, 1986, in consultation with wildlife authorities and scientific experts.
5. **Development of a Comprehensive National Law on Light Pollution:** While India may eventually enact a comprehensive national legislation specifically addressing light pollution, immediate regulatory measures can be introduced through subordinate legislation under the Environment (Protection) Act, 1986, including rules, notifications, and environmental standards governing outdoor lighting, illumination limits, and lighting restrictions near ecologically sensitive areas. Such an approach would provide an effective interim legal framework while paving the way for dedicated legislation in the future.