



In the **Shadow** of **Progress**

Addressing the Impacts of **Light Pollution**

PRESENTED BY: AKASH SHRESTHA

Pavilion Hall, 11th December 2024
3.00 p.m to 5.00 p.m

Institute for Strategic and Socio-economic Research



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Presented by:

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Introduction

The Institute for Strategic and Socio-Economic Research (ISSR), in collaboration with its media partner Khabarhub, organized a research presentation titled "In the Shadow of Progress: Addressing the Impacts of Light Pollution" on December 11, 2024.

The event took place at the Pavilion Hall in Durbarmarg, Kathmandu. It brought together an audience from diverse backgrounds including academics, environmentalists, policymakers, and other professionals working to foster sustainable development.

The focus of the program was a detailed presentation by Mr. Akash Shrestha, whose research delved into the multifaceted effects of light pollution. The presentation highlighted how artificial lighting, as a part of modern development, has long-term negative impacts on ecosystems, human health, public safety, the economy, and even our shared global heritage.

By exploring these critical aspects, the presentation raised questions about the unintended consequences of progress and the urgent need to rethink our approach to urban and technological development.

The event was honored by the presence of Hon. Kalyan Shrestha, former Chief Justice (CJ) of the Supreme Court, who chaired the program. His leadership and insights underscored the importance of addressing light pollution not just as an environmental issue, but as a broader societal concern requiring immediate attention and action.

The program began with an opening remark by Hon. Shrestha, who emphasized the interconnected nature of light pollution's impacts, urging stakeholders to consider sustainable practices that balance development with the preservation of ecological and cultural integrity.

His reflections set the tone for an engaging and enlightening session, where attendees explored solutions and strategies to mitigate the adverse effects of light pollution.

Light Pollution Presentation by Akash Shrestha

The following is a summarized version of the presentation by Mr. Akash Shrestha

Introduction

Mr. Shrestha opened by underscoring the importance of lights, saying, "lights are good and adequate lighting is necessary. But the excessive or inappropriate use of light is light pollution." More specifically, light pollution refers to the adverse effects caused by the excessive or inappropriate use of artificial lights at night, disrupting natural darkness. It arises from various sources, including exterior lighting on buildings, interior lights escaping outdoors, illuminated billboards and inefficient street lights.

Light pollution manifests in three major ways:

- Glare: Overly bright lights cause visual discomfort and interfere with our ability to see.
- Light Trespass: Unwanted light spilling into areas where it is not needed, such as streetlights illuminating nearby bedrooms.
- Skyglow: Artificial lights scattering in the atmosphere, brightening the night sky and obscuring the stars.

Impacts of Light Pollution

...on Ecosystems

The effects of light pollution are wide-reaching. It disrupts ecosystems by affecting the behavior of living organisms, including mammals, insects, birds, amphibians, plants, and even microorganisms.

Fireflies, for instance, rely on natural light signals for survival. Artificial lights interfere with this, leading to a decline in their population. This has a knock-on effect, among other things, on agriculture, as fireflies are nocturnal pollinators and also a natural form of pest control. This often results in an increased reliance on chemical pest control, which has well-known impacts not just on the environment but also on the quality of our food.

...on Humans

The constant glow of artificial lights has significant health implications. A basic example would be visual impairment from glaring lights, but it doesn't stop there. Artificial light at night interferes with the body's circadian rhythm, an internal clock that all beings on Earth evolved alongside the Earth's natural day-night cycle.

This biological clock regulates sleep, mood, cognitive functions, and more. Disruptions can lead to insomnia, stress, fatigue, obesity, and even an increased risk of cancer. Multiple studies have noted a link between light pollution and various forms of cancer.

In fact, the International Agency for Cancer Research, a World Health Organization subsidiary, acknowledges that disruptions to the circadian rhythm are a probable human carcinogen.

...on Safety

When it comes to safety, brighter lighting does not always equate to safer environments. On the contrary, improper lighting setups often hinder visibility rather than enhance it. For instance, high-mast lights are brighter than normal streetlights.

However, they create areas of harsh glare and deep shadows, which could obscure potential hazards. Unnecessary lights could also distract drivers on the roads, especially if there is an unnecessary clutter of lights used for decorative purposes. To truly ensure safety, an area must be well-lit, not just bright.

...on the Economy

Light pollution has a direct impact on the economy. DarkSky International, a recognized global authority on light pollution, estimates that in the US alone, 30% of all outdoor lighting is wasted. That amounts to \$3 billion annually.

While there isn't sufficient data in Nepal to make similar calculations, the Nepal Electricity Authority's annual report from 2023 provides a good starting point. Since the report, or any other official source, did not include concrete data for the percentage of electricity used for outdoor lighting, an assumption of 3-5% was made based on countries with similar lighting levels and economic statuses, such as Kenya, Cambodia, and Myanmar.

Using the lower estimate of 3% and applying a conservative 15% figure (instead of DarkSky's original 30%) for wasted outdoor electricity, we arrived at our calculations for Nepal.

This calculation gives us the price of wasted electricity at 393,737,850 NRs each year. And this is the price that consumers pay, not NEA, whose profits stand at over 12 billion NRs.

At the higher end of this estimate, with 5% outdoor use instead of 3% and keeping the original 30% figure from DarkSky International, this number jumps to 1,312,459,500 NRs. 1.3 billion rupees annually, paid by consumers, not to consume electricity but to waste it.

Additionally, the broader economic costs, such as treating health issues linked to light pollution and reduced productivity add to the financial impacts. Not to mention the possible economic gains Nepal could make by controlling light pollution. Which leads us to the next point.

[...on a global heritage](#)

Approximately, 60% of Europeans and 80% of Americans cannot see the Milky Way from where they live. To see it, they have to travel long distances, far from light polluted areas.

This has become a rapidly growing niche in tourism, known as astro-tourism. Nepal has an opportunity to establish itself as a leading destination for astro-tourism, which requires remote locations in high altitudes with clear skies and of course, minimal light pollution.

Promoting dark skies in less developed remote areas could attract tourists, create jobs, and drive rural development while alleviating pressure on heavily visited regions like Kathmandu and Pokhara.

Efforts to mitigate light pollution not only preserve the night sky but also offer an avenue for economic growth through sustainable tourism. The beauty of a star-lit sky could become a defining feature of Nepal's tourism offerings, helping the country embrace its natural heritage while encouraging environmental responsibility.

[Addressing Light Pollution](#)

An important step in addressing this issue is to learn from experts. DarkSky International has a large collection of resources on their website, including useful information, guides on lighting, public outreach and education materials, model laws and policies and more.

In Nepal, collaboration with experts, like the chairman of Nepal Astronomical Society (NASO), Mr. Suresh Bhattarai, is essential.

Efforts to mitigate light pollution require education, community involvement and policy change. We can learn from global examples. Policies and laws, both nationwide and local, are being

adopted in places like France, New York, South Korea focus on reducing the impacts of light pollution.

There are also community-driven efforts such as Globe at Night and all the DarkSky chapters around the world, including DarkSky Nepal, established by Mr. Suresh Bhattarai and his team.

We can learn from, and then build on those efforts to address the issue, working together to set and enforce standards around the use of light.

The Five Principles of Responsible Outdoor Lighting

The Five Principles of Responsible Outdoor Lighting, as published by DarkSky International, is a fairly basic, yet important guideline we can follow.

- Useful: All lights should have a clear purpose and only be used where necessary.
- Targeted: the light fixture should be shielded and aimed downward to ensure that it doesn't spill where it is not needed or intended.
- Low-level: the light should not be brighter than necessary.
- Controlled: using lights that can be controlled with timers and motion sensors to be dimmer or turned off completely when not needed.
- Warm-Toned: the amount of white/blue LED lights should be limited. Instead, it would be better to opt for warm colored lights of 3000 k or lower.

That last point should be emphasized because the effects of light pollution are multiplied by lights of white/blue tones as opposed to amber/orange tones. Not only are glare and sky glow significantly worsened, it also impacts the production and release of Melatonin, which is a tumor suppressing hormone, 5 times more than warm toned lights.

Concluding Thoughts

Light pollution presents a significant challenge to the environment, human health and safety, the economy, and a global heritage. Addressing this challenge requires collaborative efforts, education, policy changes and the adoption of responsible practices.

By doing so, we can not only reduce light pollution but also improve energy efficiency and unlock new economic opportunities in the form of astro-tourism.

The deep-rooted social dogma that bright lights are development should be addressed through education and public outreach. Because if left unaddressed, the impacts of light pollution will forever hide **In the Shadow of Progress**.

Discussion

The program also created a platform for an exchange of ideas among experts, fostering discussions on actionable policies and innovative approaches to manage and reduce light pollution. By bringing together stakeholders from various fields, the event aimed to bridge the gap between research findings and practical implementation, ensuring that the knowledge shared could translate into meaningful change.

On the occasion, Dr. Bindu Nath Lohani, former Vice President of Asian Development Bank (ADB), highlighted several critical issues regarding impacts of light pollution during his discussion.

He noted that the issue regarding light pollution has not yet been talked about in Nepal due to lack of public awareness. Dr. Lohani suggested that the media, research institutions and decision makers of the country should work towards addressing the topic through public platforms. He further added that when we talk about light pollution, it is mostly about excessive, misdirected, unnecessary usage of light but never asking why.

With regards to the presentation by Mr. Akash, he noted that the negative impacts of light in astronomy and protected areas are still not explored enough. Dr. Lohani emphasized the need for energy saving which will in return limit the wastage of money of an individual as well as the country.

As an initiative from personal level, Dr. Lohani suggested in installing lights downwards instead of upwards to avoid glare in the neighborhood. He also advised to avoid blue rich white lights since it has adverse effects in human health as well as the atmosphere.

He also noted that Nepal can take examples from countries like United States of America, China, Hong Kong, Germany and France. Additionally, France is very much ahead in this as they are initially focused in regulating the consumption of energy in urban areas and the protected areas.

Henceforth, if Nepal plans to work towards limiting the unnecessary usage of light, Dr. Lohani suggested that the government should first start from urban areas followed by protected areas. In the context of Nepal, light pollution in the urban areas is a very serious issue and nobody has been talking about it as of yet.

There is a lot of potential in controlling the issue. With regards to this, Dr. Lohani suggested to first demonstrate, study and differentiate the installed street lights to those that are needed for enhancing the beauty of heritage sites without compromising public safety with the lights that are causing disturbance in the community.

In conclusion to his remarks, Dr. Lohani mentioned that developed countries have shifted towards optimum usage of electricity by minimizing unnecessary lights mainly in urban, ecologically and culturally protected areas.

He added that we should work towards addressing this issue with the assistance of the local level government. He further added that light pollution can be integrated into EIA (Environmental Impact Assessment) reports in upcoming projects.

Biraj Bhakta Shrestha, Member of Parliament (MP) started by applauding ISSR's effort in starting a conversation addressing the impacts of light pollution as it is the need of the hour. He started with a personal experience mentioning how certain temples in Nepal do not encourage the use of artificial lights especially during festivities and instead they urge the local community to light butter lamps or oil lamps.

Through this personal experience, he stated that the disturbance caused by excessive usage of sound and light has always been discarded in the local communities. He further added that the output of light should be focused on "Lower noise and higher output" rather than "Higher noise and lower output" of light energy which has been practiced currently.

Lawmaker Shrestha mentioned that he is currently working on a private bill in parliament for this assembly as Climate Change Act, therefore the presentation by Mr. Akash regarding light pollution has helped in giving him a new direction to work towards the issue.

Further, he stated that in urban biodiversity, the number of sparrows is decreasing significantly due to which diseases like dengue, malaria cases are increasing rapidly inside the valley. Being a representative of two very important world heritage sites of Nepal, Mr. Shrestha expressed his concerns regarding the usage of light in these premises.

He mentioned that the unnecessary usage of lights in the name of development is compromising the beauty of these heritage sites therefore he has asked the local government to take action to prevent this. According to Mr. Shrestha, although his team lacks technical expertise for this matter, Kathmandu Metropolitan City has allocated about Rs.20 crore budget to fix the light installation in and around the heritage sites.

He further added that the issue of light pollution that should be resolved soon should be time relevant as well since there was an era of industrial revolution where the importance of light was discovered. However, the times have changed and as new avenues open, new problems arise. Therefore, we need to take a conscious effort to come together and start a conversation addressing the issues to start somewhere and work towards fixing it.

He also mentioned about the effects of blue light from mobile phones in human health. He stated that it has become a psychological problem in human society as it has adverse effects in cognitive thinking ability. In recent times, the effects of lower cognitive skills have lessened human interaction. This has made people detached from one another despite being together.

Sharing his personal experience, Mr. Shrestha mentioned that in his early days, they used to gather in the neighborhood and do stargazing and story-telling. But this practice has significantly disappeared because the society has been disconnected.

Furthermore, regarding light pollution, Mr. Shrestha pointed out the recent initiative taken by K.M.C in removing the installation of decorative lights on trees within the metropolis. He stated that reports have shown that nocturnal animals have moved out of the city. This is very harmful for the biodiversity of the area which can eventually affect human health.

Regarding the negative impacts of artificial lights in human health, Mr. Shrestha mentioned that it can disrupt the sleeping patterns in humans. Therefore, artificial lights can not only harm the

psychological health but also physical health as low quality of sleep can hamper the vital organs of a human body.

Mr. Shrestha further emphasized on the issue stating that light pollution is against the “Natural Law of Justice” as it impacts the galactic clock, biological clock and human body anatomy.

In his closing remarks, Mr. Shrestha put forth few suggestions regarding light pollution. He suggested that we need more research-based awareness as the initial step towards finding solutions. More discussions and conversations should be encouraged addressing the issue.

The installation of lights should be followed by stricter regulatory framework under the jurisdiction of the local government. With the support of local government, world heritage sites should be in primary focus with regards to the optimum installation of lights.

He further suggested that Nepal needs to do comparative analysis study of the countries who have taken a step in addressing the issue. He added that astro-tourism is relatively new concept for tourism sector in Nepal hence, stargazing can be an added value which shall be explored more and promoted.

Mr. Shrestha suggested that pilot projects can be another solution starting with the constituency he represents in collaboration with the local government and local community. He further added that he will be open to introduce and draft new regulatory framework like “National Light Pollution Act”. This can start a subject of argument in the parliament.

According to him, our society is very resilient so we can start by harm-reduction measures rather than not challenging the understanding of the development of the people but to approach it decently. We have to make general public understand the impact of light pollution on an individual level and how it is harming them.

Additionally, another alternative to make people understand about the issue is through economic perspective by explaining how as taxpayers, the energy consumption is getting higher and we need to reduce it. Therefore, making people understand the concept of “saving is earning”, can be another alternative.

Lastly, he emphasized on considering post-modernism theory. Based on the theory, Mr. Shrestha recommended to not repeat the mistakes that developed countries have made in the process of development. Therefore, post-modernism theory can be a good consideration for our society and country and do a comparative analysis with other countries based on the theory.

Dr. Deepak Shrestha, an ophthalmologist, in his discussion mentioned that tungsten bulbs have never really been a cause for light pollution instead the increase in usage of led lights have contributed negatively towards the issue of light pollution. He further added, based on human nature, people tend to pay less but expect higher output therefore, development and usage of led and CFL lights have risen.

As a result, the overconsumption and overuse of these kinds of lights have resulted in light pollution as these lights are brighter and provides higher output than tungsten lights. Dr.

Shrestha suggested that in the course of development, people should be mindful in the installation of lights by not installing lights haphazardly.

Before construction of any house, a conscious effort should be taken by the authorities to only give permission to install only a certain number of lights in and around the premises. Therefore, a stricter regulatory framework should be imposed.

People generally believe that higher number of lights in and around the house uplifts the aesthetics and their social status without considering the adverse effects of their actions hence solution to this should be discussed and addressed as soon as possible.

Lastly, Dr. Shrestha emphasized that we should take long-term impacts of light pollution into serious consideration and not just short-term impacts as in future, the overexposure to UV lights can alter the DNA of humans and the animals.

Deepak Raj Joshi, CEO of NTB (Nepal Tourism Board) highlighted the importance of knowledge regarding light pollution in the tourism sector for Nepal as it is increasing in an alarming rate.

Sharing his personal experience from about 15 years ago, delegates from Delhi were mesmerized by the stars they were able to see from Kathmandu after which a new concept of stargazing as a tourist attraction was introduced in Nepal.

According to Mr. Joshi, around 80% of the Americans have not seen the milky sky through naked eyes; therefore, Nepal can take this as an opportunity to promote astro-tourism.

Mr. Joshi further shared that when NTB was preparing for “Visit Nepal 2020”, in 2018-19, the board was visiting heritage sites to start campaign called “Kathmandu Heritage by Night”.

The primary objective of this campaign was to enhance the travel experience of tourists around the heritage sites during the night and also as a new economic opportunity for the heritage sites as well as the local communities.

During the site visit to Patan Durbar Square, he mentioned that the installation of lights was optimum which enhanced the beauty of the heritage site and the temples around the area.

However, in Bhaktapur Durbar Square, the installation of lights was done haphazardly causing disturbance to the eyes, for photography and most importantly it was affecting the authentic beauty of the heritage site.

Mr. Joshi added that in this era, the global tourism is moving towards experiential economy. The tourists are now looking for more authentic and immersive experiences. Authentic experience lies in the originality of the place but the overuse of unnecessary lights is harming the authenticity in most of the sites. In our current timeline, the most powerful tool that inspire travel and tourism are photos posted and shared on online platforms about travel and food experiences.

Based on this information, Mr. Joshi emphasized that the discussion on light pollution is extremely relevant for the tourism industry as well since the mismanagement of lights can hamper the travel experiences for tourists coming to Nepal.

Mr. Raju Maharjan, a representative of LMC (Lalitpur Metropolitan City) shared that he is an avid stargazer himself but in recent times, big hoarding boards with lights around the city are blocking his view and causing disturbances in his stargazing experience.

Mr. Maharjan mentioned that LMC has allocated budgets for heritage lighting but since the Local Procurement Act simplifies the process of assigning tender to install lights, LMC has made a conscious decision of only installing the optimum number of lights around the heritage site. LMC has taken this decision considering the glare overuse of street lights are causing and the compromise in the beauty of the heritage sites.

Additionally, he stated that LMC is the first local government to work with NEA in installing street lights of 100 watts with dimming feature which also helps in efficient energy consumption. Dimming feature allows us to control the brightness of the light which is useful during the night after 10 p.m.

This feature is also very sustainable and eco-friendly. LMC has also installed high-mask lights around ring-road which too have dimming feature. These steps taken by LMC has reduced unnecessary energy consumption during the night and also controls light pollution to a certain extent.

Roshan Bhandari, Researcher and Environmental Engineer highlighted that the presentation on Light Pollution by Mr. Akash Shrestha is first of its kind in Nepal as it is a very new topic of discussion but a very important one for what is happening around the world.

He stated that light pollution is constantly evolving research presently. As an environmentalist, Mr. Bhandari stated that environment has been studied in various dimensions for example EIA. However, the impacts of light pollution have never really been addressed or studied.

One reason being we do not have a standard set in government level; identification of what is light pollution and what is not has also not yet been explored.

Mr. Bhandari further stated that as a scientific researcher, high-resolution satellite data should be used in localized study in terms of optimization and a sustainable installation of lights.

Light-mapping technique can be integrated to decide the locations where there is a need for street lights. Therefore, high-resolution satellite data can be useful for research based light installation as this can reduce night time light pollution.

From biodiversity aspect, Mr. Bhandari mentioned that light pollution has impacted animals and birds as they are moving away from the city due to disturbances caused by light. This issue has been neglected and has not been talked about enough while the focus still lies mainly only on noise, air and water pollution.

Regarding the research presentation, Mr. Roshan Bhandari suggested that more quantitative data should be added for an in-depth knowledge. He further suggested to connect the issue with a nexus approach to explore the impact in different dimensions and prioritize them accordingly.

Suresh Bhattarai, Chairperson of NASO and DarkSky Nepal mentioned that when the organization was established in 2007, they started a campaign against light pollution. During the load-

shedding period, DarkSky Nepal turned the challenge into an opportunity by promoting the idea that the absence of artificial light reveals the beauty of the starlit sky and also promoted astro-tourism.

He mentioned that NASO was featured in BBC Nepali Sewa in 2009 Oct. The team also did an Everest expedition on November of 2009 to film and capture more appealing pictures of the sky. Following that the organization did another Everest expedition on 2011 and another one on 2015 whose pictures were featured on National Geographic.

Over the years, NASO has been linking up with like-minded people and the presentation by Mr. Akash Shrestha has amplified the message regarding light pollution. The presentation has highlighted the loss of economic value due to excessive energy usage which NASO had not previously noticed. It advocated the importance of well managed light system.

The advocacy is not against development but rather towards optimum utilization of energy and light and sustainable and ecofriendly development. For eg. integrating the idea of light pollution in EIA (Environmental Impact Assessment).

It would be brilliant if everyone from grassroot to international communities' advocate for DarkSky Nepal including today's audience which represents academia, experts, MPs (Member of Parliament), local representatives and enthusiasts. The event has supported to create a good network to advocate the impact of light pollution.

Former Chief Justice Shrestha, in his closing remarks, emphasized on the importance of optimum utilization of light. He stated that overutilization of light is not for prosperity but in turn it creates a loss in economic value. For general public to realize and understand this issue, more campaigns should be conducted to make them more sensitized towards the issue of light pollution. He further added that the issue should be addressed in a multi-dimensional approach by involving people from health sector, environmental sector, tourists, entrepreneurs, students, urban planners, educators, researchers, social mobilizers etc. in order to control the harms caused by light pollution.

Additionally, he suggested that we need to develop a sector-wide approach in order to mainstream the whole mission of controlling light pollution. Underlining the importance of controlling the light pollution and making people understand about it should be the primary objective.

In order to create awareness, he advocated for the importance of more literatures and research. He further mentioned that all the tiers of government i.e. local municipalities to the federal government, they will have to respond at different levels according to their capacities and their requirements.

He added that this is a long journey in which a multi-dimensional approach needs to be developed and more resources need to be allocated. The government as a whole will have to prepare for effectively combatting the problem of light pollution.

Lastly, he appreciated the effort by Mr. Akash Shrestha in presenting an eye-opening subject about light pollution. He hopes that people from all sectors come together to join hands in

addressing the problems and can come up with a long-term solution. He added that this presentation has inspired him to collaborate to work for this mission personally and will show his solidarity to proliferate the idea of controlling light pollution.

Conclusion

This report seeks to encapsulate the key themes, discussions, and outcomes of the presentation, offering a comprehensive overview for those who attended and an insightful summary for researchers, academics and policymakers for study purposes. Through this documentation, we aim to amplify the message delivered during the event and inspire continued efforts to address one of the often-overlooked challenges of our time that is light pollution.