

LIGHT POLLUTION: IT'S IMPACT ON ECOSYSTEM

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Abstract: Most of us are well familiar with the term pollution. The air pollution, water pollution, e-waste pollution and land pollution are known examples of pollution but ever we think about the light-which is a source of energy for the web of life, which dependent on and determined by, day and night, light and dark. But on the other hand artificial lighting, which has become a necessity to facilitate human activity at night-time, contributes to the so-called Light Pollution. When such pollution occurs, the visibility of the night sky is degraded and an unnecessary amount of energy is wasted. The inappropriate or excessive use of artificial light leads into serious environmental consequences for humans, wildlife, and our climate. Thus the present study focus on the impact of manmade light pollution on the ecosystem

Key words: Light Pollution, Photosynthesis, Wildlife, Ecosystem.

INTRODUCTION

Artificial lighting, which has become a need to facilitate human activity during night-time, contributes to the so-called Light Pollution. Which the result in to degradation of visibility of the night sky and wasting of unnecessary amount energy. Due to the unlimited expansion of human habitation near and within natural habitats, resulting into direct exposure to nearby rich ecosystems due to the artificial night lighting. This increased and widespread use of artificial light during the night time not only impairing the beautiful view of our universe but it also affecting our environment, our energy consumption and our health.(Longcore and Rich 2004) . Generally the light pollution divide in to two categories i.e annoying light and excessive light or indoor and outdoor light pollution. The light pollution is defined as “ the adding of the artificial light directly or indirectly in to the environment by the humans”. According to the International Dark-Sky Association the light pollution is defined as "any adverse effect of artificial light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste." Before 100 years ago, everyone could look up and could see the beautiful and spectacular view of night sky but now a days due to the urbanisation and industrial civilisation millions of children across the world never experience the Milky Way where they live. Astronomy is very sensitive to light Sky glow over the large cities is a major issue for many astronomers across the globe because it obscures stars, even in perfectly clear nights. The scientists all over the world stated that the sky brightness is at least 2 to 4 times above normal in large parts of urban areas in Europe and North America. Light pollution can have adverse health effects such as frequent headaches, fatigue, increased stress, decrease and increased anxiety. It is also noted that the light pollution destroys nitrate radicals thus preventing the normal night time reduction of atmospheric smog produced by fumes of cars and industries. Nemiroff and Bonnell(2010)Thus by protecting the night sky is valuable step to conserving the bio-diversity.

Types of Light Pollution:

Light pollution is a side effect of industrial civilization. Its sources includes building exterior and interior lightning, advertisement boards , out door lightening, factories etc. Light pollution can reach the environmental elements via three main paths: (i) direct illumination, (ii) scattered light by cloud cover and (iii) scattered light from a clear sky and thus it is categories into following types which includes over-illumination, glare, light clutter, sky glow .

1. Over- illumination: The over illumination is caused by misuse of lights. Lights that are left on or even street lamps that are not adjusted for daytime saving time. If we estimated the cost of it , it can cause millions of barrels of oil to be wasted. It can have the immediate effect of raising utility costs in an area as well as disrupting natural sleep patterns.

2. Glare: Glare is two fold problem in which lights are reflected off surrounding surface so that light scatters due to the excessive brightness and causes vision problems. It does not interfere with night vision, but makes it difficult to identify the place and objects.

3. Light Trespass: In this type of light pollution where the unwanted light get trespass and entered in to someone's private property. This is not just a pollution but it also a crime in many developed countries. A common light trespass problem occurs when a strong light enters the window of one's home from outside, causing problems such as sleep deprivation or the blocking of an evening view.

4. Light clutter: Light clutter is a mostly manmade issue and it seems from poor placement and designing of light. It also referred as the excessive grouping of lights which may generate confusion, distract from obstacles. A cluster of business lights or streetlights can create a contrast illumination that interferes with night vision and illumination. It can be strong enough to throw off the natural nocturnal system of animals.

5. Sky Glow: This is a term used to refer to the almost dome-like cover of lights to city area or populated area. The lights that get reflected from street lights, signs, homes and business area goes up to change the quality of light in the atmosphere and bounce back down to the city from the atmosphere. It can affect natural growth pattern and the ability of planes to navigate at night.

Effects of Light Pollution and Its Impacts:

The excess use of light or abundant use of unwanted electricity may cause their effects not only on the human beings but also on the plant kingdom, animal kingdom, surrounding ecosystem and lastly on the entire universe. Plants and animals depend on daily cycle of light and dark rhythm to govern life sustaining behaviours such as reproduction, nourishment, sleep and protection from predators. Awareness of the deleterious effects of light pollution began early in the 20th Century. Many workers around the globe work on this serious issue to solve and ensure the safe use of electricity but still it is not fully understood. While light pollution is eminently detrimental to nocturnal and migratory animals and to animals in flight, it also produces harmful effects on plants. Hence, the scientific evidence suggests that the artificial light at night has negative and serious effects on many creature includes plants and animals.

Impact on Plants: Waste light at night can have a strong negative impact on plants. Plants, shrubs and trees use sunlight for photosynthesis during daytime, but at night they need darkness to regenerate a key compound called phytochrome which regulates a number of key processes in plants like photoperiodism, abscission, dormancy and also regulates seed germination. Recent studies suggest that light pollution around lakes prevents zooplankton, such as *Daphnia*, from eating surface algae, causing algal blooms that can kill off the lakes plants and lower water quality. Cheung, Mari(2009)The light pollution may also affect ecosystem in other ways, that night time light may interfere with the ability of moths and other nocturnal insects to navigate Longcor,et.al (2004)The night blooming flowers that depends on the moths for the purpose of pollination may be disturbed by night lighting, as there is no other replacement pollinator that would work in artificial light leads to species decline of plants that are unable to reproduce and change an area's long term ecology Moore,et.al (2000).

Impact on Animals: When artificial light affects organisms and ecosystems it is called ecological light pollution. Some species get benefited by the artificial light where as other they do not get benefited. For example-some species of spiders avoid light area, where other get happy to build their spider web. Light pollution poses serious threat in particular to nocturnal wildlife. It can confuse animal navigation, alter competitive interactions, changes prey-predator relationship and cause physiological harm. Longcore and Rich.(2004). Some nocturnal animal searching for food at night can be blinded leading to an increase in road kills.

a) Impact on Birds: Birds are more sensitive to light. Near about 450 species of migratory birds depends on the position of moon and stars. The birds that migrates or hunt at night navigate by moonlight and starlight. Artificial light can cause them to wander off course and towards the dangerous night time landscapes of cities. Every year millions of birds died due to colliding needlessly illuminated buildings, high rise towers and light houses. In birds migration is very important and necessary activity to continue their race. In birds migration depends on cues from properly timed seasonal schedules. Artificial light can cause them to migrate too early or too late and miss ideal climate conditions for nesting, foraging and other behaviour. Catherine Rich and Longcore(2006).

b) Impact on Reptiles and Amphibians: Change in the natural light give signals o start the activities like feeding, sheltering, mating, reproducing and communications but the artificial light alter the circadian rhythm of these animals. There are some species that are site specific in nature, always choose specific site for their daily activity get change due to the anthropogenic light. Examples are turtles, frogs, rodents and some bats. The sea turtles lives in ocean but during their hatching time, specially at night the female turtles they come towards the beach for laying the eggs. Hatchlings find the sea by detecting the bright horizon over the ocean, but the artificial light draw them away from the ocean resulting in death of newly hatched young ones. Salmon(2003).Glare – the artificial light can also impact on wetland habitat that are the home to amphibians such as frogs and toads whose night time croaking is a part of the breeding ritual. Artificial light disrupt this nocturnal activity, interfering with reproduction and thus reducing population. Perry,et.al(2008)

c) Impact on Human Health: The recent studies in the medical research showed the effect of excessive light on human body suggest that the variety of adverse health effect may caused by artificial light or more exposure to light. Gary Seratteffy(2001). The over-illumination of light may lead to headache, fatigue, stress, decrease sexual functions and increase anxiety. Burks and Susan(1994). In the year 2007, the study carried out on night time shift workers in south Korea and it was listed that due to increase carcinogens leads to incidence of breast cancer in women and prostate cancer in men.(International Agency for Research on Cancer release press note No 180).Multiple studies have documented a correlation between night shift and increased incidence of breast and prostate cancer. Hansen(2001), Schernhammer and Schulmeister (2004).

CONCLUSION

The excess use of light due to the civilization, industrialization by the literate society of the world in a wrong way become most dangerous to keep the ecosystem in safe mode.The night darkness is essential for various natural processes performed by the plants and animals i.e circadian rhythm, resting, celestial navigation, mating, reproduction etc. Due to overuse of anthropogenic light we are losing the flora and fauna resulting in to decreased in their population. The protecting the ecosystem is important for the healthy functioning of animals and plants.

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