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A PATH FOR HORIZING YOUR INNOVATIVE WORK

LIGHT POLLUTION

BHARATI SUNIL SHETE,

Department of Civil engineering, Dr. Sau. Kamaltai Gawai Institute of Engineering & Technology, Darapur.

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Abstract

In Environmental Pollution, it's a new type of pollution that is increasing day by day and it is the light pollution. In this Paper, it is tried to discuss the issue of this light pollution which is mainly the effect of industrial civilization. So the sources, causes, effects, and methods to control this light pollution; which is disturbing our ecosystem are tried to discuss in this paper. *Light pollution* is a broad term that refers to multiple problems, all of which are caused by inefficient, unappealing, or (arguably) unnecessary use of artificial light. Specific categories of light pollution include light trespass, over-illumination, glare, light clutter, and sky glow. A single offending light source often falls into more than one of these categories. Preventive measures to avoid this light pollution are also discussed in the same.

Corresponding Author

Mrs. Bharati Sunil Shete,

INTRODUCTION

Light pollution, also known as photo pollution or luminous pollution, is excessive or obtrusive artificial light. Pollution is the adding-of/added light itself, in analogy to added sound, carbon dioxide, etc. Scientific definitions thus include the following:

- Degradation of photic habitat by artificial light.
- Alteration of natural light levels in the outdoor environment owing to artificial light sources.
- Indoor light pollution is such alteration of light levels in the indoor environment due to sources of light, which compromises human health.
- Light pollution is the introduction by humans, directly or indirectly, of artificial light into the environment.

Light pollution competes with starlight in the night sky for urban residents, interferes with astronomical observatories, and, like any other form of pollution, disrupts ecosystems and has adverse health

effects. Light pollution can be divided into two main types:

- Unpleasant light that intrudes on an otherwise natural or low-light setting.
- Excessive light (generally indoors) that leads to discomfort and adverse health effects

Light pollution is a side effect of industrial civilization. Its sources include building exterior and interior lighting, advertising, commercial properties, offices, factories, streetlights, and illuminated sporting venues. It is most severe in highly industrialized, densely populated areas of North America, Europe, and Japan and in major cities in the Middle East and North Africa like Tehran and Cairo, but even relatively small amounts of light can be noticed and create problems. Since the early 1980s, a global dark-sky movement has emerged, with concerned people campaigning to reduce the amount of light pollution. The International Dark-Sky Association (IDA) is one non-profit advocacy group involved in this movement.

A. WHAT IS LIGHT POLLUTION?

Light pollution is probably best described as artificial light that is allowed to illuminate, or intrude upon, areas not intended to be lit. It consists of several elements:

- **Intrusive Light**

Also termed as Light trespass. It is the intrusion of over bright or poorly directed lights onto neighbouring property, which affect the neighbor's right to enjoy their own property. A typical example would be an inconsiderately directed security light shining into a bedroom window. It is light spilling beyond the boundary of the property on which a light is located, sometimes shining through windows and curtains.

Over-illumination is the presence of lighting intensity ([illuminance](#)) beyond that required for a specified activity. The concept of over-illumination encompasses two separate but related concerns:

- Use of more artificial illumination than required is expensive and energy-intensive. This includes consideration

both of the appropriate level of illumination when spaces are in use, and when they are unoccupied.

- Clinical studies show that excessive levels of artificial light produce annoyance and health effects in a large fraction of the population. These effects may depend on the [spectrum](#) of the light as well as the overall brightness.

- **Glare** – Glare is difficulty seeing in the presence of bright [light](#) such as direct or reflected [sunlight](#) or artificial light such as car [headlamps](#) at night. Because of this, some cars include mirrors with automatic anti-glare functions. It is the uncomfortable brightness of a light source when viewed against a darker background. Glare can be generally divided into two types, discomfort glare and disability glare.

Discomfort glare results in an instinctive desire to look away from a bright light source or difficulty in seeing a task. Disability glare impairs the vision of objects without necessarily causing discomfort. This could arise for instance when driving westward at sunset. Disability glare is often

caused by the inter-reflection of light within the eyeball, reducing the contrast between task and glare source to the point where the task cannot be distinguished. Glare can reduce visibility by:

- reduction of brightness of the rest of the scene by constriction of the pupils
- reduction in contrast of the rest of the scene by scattering of the bright light within the eye.
- reduction in contrast by scattering light in particles in the air, as when the headlights of a car illuminate the fog close to the vehicle, impeding vision at larger distance.
- reduction in contrast by reflection of bright areas on the surface of a transparent medium as glass, plastic or water; for example when the sky is reflected in a lake, so that the bottom below or objects in the water cannot be seen (veiling glare).
- bloom surrounding objects in front of glare

1) *Light clutter*

Light clutter refers to excessive groupings of lights. Groupings of lights may generate confusion, distract from obstacles (including those that they may be intended to illuminate), and potentially cause accidents. Clutter is particularly noticeable on roads where the street lights are badly designed, or where brightly lit advertising surrounds the roadways. Depending on the motives of the person or organization that installed the lights, their placement and design can even be intended to distract drivers, and can contribute to accidents.



Fig. 1:

One such classic example of light clutter is shown in fig.1, which displays excessive groupings of colorful lights in Las Vegas.

Clutter may also present a hazard in the aviation environment if aviation safety lighting must compete for pilot attention

with non-relevant lighting. For instance, runway lighting may be confused with an array of suburban commercial lighting and aircraft collision avoidance lights may be confused with ground lights.

Skyglow

Skyglow refers to the glow effect that can be seen over populated areas. It is the combination of all light reflected from what it has illuminated escaping up into the sky and from all of the badly directed light in that area that also escapes into the sky, being scattered (redirected) by the atmosphere back toward the ground. The pink or orange glow we see for miles around towns and cities caused by a scattering of artificial light by airborne dust and water droplets. This is a serious problem for astronomers as the artificial brightness of the sky overpowers distant stars, especially those low in the night sky. It is becoming more and more difficult to find areas where our view of the night sky is unaffected by illumination. The light from distant stars can take hundreds, even thousands, of years to reach our eyes - so it

is a pity to lose it on the last moment of its journey!

B. Causes (Sources of light pollution)

Sources of light pollution as shown in fig. 2 include,



Fig.2

- security lights that light up buildings and their surroundings
- floodlights used to illuminate games pitches, places of entertainment and buildings
- street lighting
- advertising and display lighting

Lighting unoccupied areas is a significant waste of energy. Many office buildings are illuminated overnight and on weekends. Lighting of unoccupied areas can be reduced by installation of occupancy sensors or timers.

Energy can also be wasted by operating outdoor lighting during daylight. In many

cases this arises because the lights are controlled by timers, which must be reset periodically as the times of sunset and sunrise vary throughout the year.

Retail stores, especially those with large windows, are sometimes illuminated overnight as a measure of crime prevention. The idea is that, with the lights on, burglars are visible from the outside and bypassers can raise an alarm.

C. The impact (Effect) of light pollution

This can:

- Harm people's quality of life.
 - For example, it can disturb sleep when it shines into homes.
 - Interfere with our view of the night sky.
 - Waste energy and is therefore a waste of resources and money.
 - Have an impact on the ecology and wildlife of an area, affecting the behavioural patterns of mammals, birds, insects and fish.
- Light pollution refers to annoying, harmful and just plain wasteful lighting. Unnecessary lighting also contributes to global warming by making wasteful demands on energy.
 - Health effects of over-illumination or improper spectral composition of light include increased [headache](#) incidence, worker [fatigue](#), [medically defined stress](#), decrease in [sexual](#) function and increase in anxiety.
 - Lighting is responsible for one-fourth of all electricity consumption worldwide and case studies have shown that several forms of [over-illumination](#) constitute energy wastage, including non-beneficial upward direction of night-time lighting.
 - Light pollution poses a serious threat in particular to [nocturnal](#) wildlife, having negative impacts on plant and animal physiology. It can confuse [animal navigation](#), alter competitive interactions, change predator-prey relations, and cause physiological harm

II. WAYS TO REDUCE LIGHT POLLUTION

- **Reduce the light escaping from your home** - Put your exterior lights on motion detectors so they only come on when needed. Minimize wattage, and direct illumination toward the ground, not upward, where it's of little use but contributes to sky glow (or goes into your neighbour's home). If you live in a multistorey building, use blackout blinds at night so birds aren't fatally attracted to your windows, and talk with your building manager or tenant's association about turning your high-rise into a Bird-Friendly Building.
- **Cool it with the indoor lighting**
Put as many household lights as possible on dimmer switches so you can save energy while you enjoy mood lighting. Stick with table and floor lamps, not harsh overheads.
- **Turn the lights off at work**
Collisions with man-made structures are the number one cause of death among migrating birds – many of which are already facing extinction from habitat

loss. Ask your office building's management to turn off the lights during bird migration season in the spring and fall.

- **Harness your spending power**
Ecotourism is a booming industry. Stay at hotels, inns and resorts that tread lightly on the earth through energy-conservation measures that enforce strict lights-out or light-blocking measures in bird-migration paths, sea turtle-nesting areas, and other particularly light-sensitive wildlife areas.
- **Get involved in municipal politics**
Write, e-mail or phone your local councilor, as well as the mayor's office, to talk about city lighting. Suggest ways to reduce lighting consumption in municipal buildings. And lobby for high-efficiency, lower-energy, flat-lens streetlight fixtures. Not only do they produce less greenhouse gases, but they also reduce glare, increasing driver, cyclist and pedestrian safety.
- **Lobby for lights-out**
Start a letter-writing campaign to get your local landmark to follow suit –

perhaps on Earth Day/Night. Also, ask local sports arenas and stadiums to turn off lights when games aren't playing.

- **Lights out in the wilderness**

When camping and cottaging, keep exterior lights off as much as possible as they can interfere with the body clocks of nocturnal creatures like salamanders, giving them fewer hours to scavenge for food. And keep interior light indoors with blackout curtains.

How to prevent light pollution

If lighting is necessary, a number of measures can be taken to avoid causing a nuisance:

- If lighting is the best option then only the right amount of light for the task should be installed. Lighting will become a problem if it is poorly designed or incorrectly installed.
- For domestic security lights a 150W lamp is adequate. High power (300/500W) lamps create too much glare reducing security. For an all-night

porch light a 9W lamp is more than adequate in most situations.

- Make sure that lights are correctly adjusted so that they only illuminate the surface intended and do not throw light onto neighbouring property. Security lights should be correctly adjusted so that they only pick up the movement of persons in the area intended and not beyond.
- To reduce the effects of glare main beam angles of all lights should be below 70 degrees.
- Direct light downwards. If uplighting has to be used then install shields or baffles above the lamp to reduce the amount of wasted upward light.
- Do not install equipment which spreads light above the horizontal.

CONCLUSION

Though not now, Light pollution becomes a serious issue in few days and we must have to be aware of that. If we have to protect the environment, we must have to take care of our natural ecosystem, then

increasing awareness among public is also necessary and strict actions against these concerning issues are also required.

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