Global Light Pollution: A Developing Problem

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Abstract

At the Beginning of the 21st Century, humanity is losing a valuable and beautiful part of its heritage. For the first time in history, poorly designed and badly aimed lighting is denying vast numbers of humanity a view of the night sky. Many people in urban, suburban and even relatively rural areas have never seen a truly dark night sky due to light pollution. Light pollution is generally considered to be the excess "waste" light given off by outside light source at night such as street lights, illumination around buildings, automobile headlights and the light emanating outdoors from the interior of illuminated buildings. The present paper dealt with the meaning, types, causes, effect and remedies of light pollution.

Introduction:

A basic evolutionary fact is that we humans are diurnal (active mainly during the day) species. Humans have eyes that are adapted to living in the sun's light. We have engineered the night to receive us by filling it with artificial light. This engineering is almost the same like damming a river. It has benefits, but also consequences. These consequences are light pollution.

Light pollution (i.e.; photo-pollution or luminous pollution) occurs at night and is obtrusive (bothering), misdirected, inappropriate, or excessive artificial light. Components of light pollution are: Urban Sky Glow, which is the brightening of the night sky over inhabited areas; Light Trespass, when light falls where it is not intended or needed to fall; Glare, visual discomfort caused by excessive brightness and high levels can decrease visibility.; Clutter, light sources which are bright and excessive. These light sources can be found in over-lit urban areas.It is the brightening of the night sky and it diminishes the view of stars and planets.

What is light Pollution?

Light Pollution is the popular name for "Sky glow"- a brightening of the night sky caused by the scattering of the artificial light by aerosol particles (e.g. water droplets) and dust in the air.[1]

In many communities, the sky at night is never fully dark, but rather glows due to all the excess light in the local atmosphere. The light further reflects off clouds, dust and atmospheric pollution. This phenomenon of light pollution is often referred to as "sky glow" and many people now grow up thinking that this is how the sky naturally appears! The image of the earth at night compiled by NASA from various space crafts missions also shows the extend of light pollution across the whole world.

For many years astronomers in particular, both amateur and professional, have bemoaned light pollution. Light pollution can make it very difficult to see celestial objects at night, even with sophisticated, high-powered telescopes. It has been estimated that under natural conditions (without light pollutions) on a clear, cloudless night, one can observe with the unaided eye the Milky Way and over 10,000 stars. However today in many urban areas, the

residents can no longer identify the Milky Way and, even on the clearest night, a big city dweller might see only around 100 stars. It is reported that during a power onstage in Los Angeles during the 1990s many residents were actually afraid of the strange illuminated "Cloud" in the night sky that they had seen before. In fact they were observing the Milky Way for the first time.[2]

Types of light pollution:

Urban Sky-glow: Sky-glow exists in large cities. It is the 'glow' which we can see over many cities and towns in the evening. Urban Sky-glow is the brightening of the night sky. It is caused when artificial light escapes from misdirected and badly designed light sources into the atmosphere. It is scattered by particles (pollen, bacteria, dust, spores, and mineral particles) or by water droplets while it travels through the atmosphere. The light gets reflected and masks the background stars and cases a hazy glow over the night sky. This type of light pollution is a concern to astronomers, because it creates a hazy glow over the night sky. Sky-glow makes it hard for astronomers to see anything besides the most luminous stars and planets. Sky-glow also caused behavioral disorders in many species of animals, for example; sea turtles and birds, who rely on the night sky for breeding and to find their way.

In heavily polluted areas Urban Sky-glow is worse. It will always exist if the air quality is poor.

Clutter: Light clutter is the excessive groupings of light. These groupings of light may cause confusion, distraction from objects, and possibly cause accidents. Clutter light pollution is caused by things like street lights; these can be dangerous to the people driving since the drivers can be distracted by these lights.

Glare: Glare is a visual sensation that is cause by excessive and uncontrolled brightness. Glare from street-lights, car-yard and security lights can shine directly into the eyes and cause discomfort. This makes it hard for the eye to adjust effectively to changing levels of illumination, so compromising night vision. There are three forms of glare:

Discomfort glare: The sensation of annoyance or pain induced by overly bright sources. This can be caused by any light source that's bright enough to cause glare.

Disability glare: The reduction in visibility caused by intense light sources in the field of view. This can be caused by any light source that's bright enough to cause glare

Blinding glare: When there is a light source that's so bright that it can cause a moment of blindness, the amount of time the blindness lasts depends on the brightness of the light source.

Light trespass: Light trespass is unwanted and uncontrolled light that shines outside the area that it is designated to illuminate. It causes discomfort, distraction, annoyance, or a reduction in visibility, and wastes energy and money.

These are several characteristics of nighttime lighting that can cause Light trespass:

Spill light: The light that illuminates surfaces beyond the property line.

Brightness: The presence of bright sources which are in a person's field of view which can cause discomfort glare, disability glare or blinding glare.[7]

What causes light pollution?

Artificial light, responsible for light pollution, gets up into the sky in two ways. By far the greater proportion of upward light arises because the design or installation of many light fittings allows a significant fraction of the light produced to be emitted above the horizontal, so

it goes up into the sky- this is the direct upward light. A much smaller proportion is upward light reflected upward from roads, pavement and buildings- this is indirect upward light.[3]

What are the effects of light pollution?

The Key detrimental effects of light pollution are:

- Damage to the global environment through waste of energy: Unnecessary light waste energy. Also much of the electricity comes form fossil fuels ultimately, and thus adds to the greenhouse effect.
- Negative effect on wildlife: Scientists now recognize some of the damaging effect of light pollution on flora and fauna. The Migration of birds may be impacted, and birds may be attracted to artificial lit areas. The cycles of many nocturnal species, such as various mammals, frogs and other amphibians and even aquatic worms, may be disrupted.[4]
- Negative effects on human health and safety: Recent medical research has shown that artificial night-time light has detrimental psychological effects and can stimulate an adverse physiological effect which reduces the body's resistance to disease. There is a research indicating that artificial light can disrupt natural hormone production & circadian rhythms.[5]
- Another concern is the right to privacy: Bright lights from elsewhere shining on one's property may be seen as violating privacy at night.
- Badly directed, over-bright lights have been the cause of many driving accidents. For exampled, in the early 2000s, a court of law in the UK ruled that a security light was the cause of a fatal accident.[6]
- Loss of an area of outstanding natural beauty-the nocturnal environment- through urbanization of rural areas at night.[3]

How to reduce light pollution?

Obviously the "solution" is to simply turn off unnecessary lights, yet, many things can be done to reduce the problem of light pollution:

- Use of flat glass and ultra low profile light fittings for exterior use and in particular for all street lighting. Shielded lights are available that shine down in a directed manner so as to illuminate only the areas meant to be lit.
- Prevent 'over lighting', i.e. use only the correct amount of lighting for the task in hand.
- Particularly in sensitive (rural) areas ensure that lighting is used only when there is no better alternative.
- Encourage industry to use efficient lighting and to minimize the amount of energy waste associated with light pollution.
- Make external light a subject to planning control. Ordinances can be passed against one property owner shining unwanted light on another property. (violations of which are some times known as "Light Trespass")

Conclusion:

Light pollution is an environmental problem that has been mostly overlooked, but this problem is also threatening our environment. Light pollution is the artificial light which is wasted. There are lot of bad consequences of it, but most people have never heard of it and some of the people who do know it, don't think it's a big problem. But there are a lot of people that are trying to fight light pollution. They want to protect human health and wildlife.

Countries are starting to realize the big effects and problems, light pollution is causing. They are starting to look for solutions that will make a big difference. Many scientists are trying to find good solutions to this problem. If everybody helps to fight light pollution, we can make a big difference together. We think that it's not that hard to turn off some lights and use better lightning. Appropriate lighting, not too bright or harsh and properly directed can be utilized for the purpose at hand. So to overcame this problem let's use light and not waste it.

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