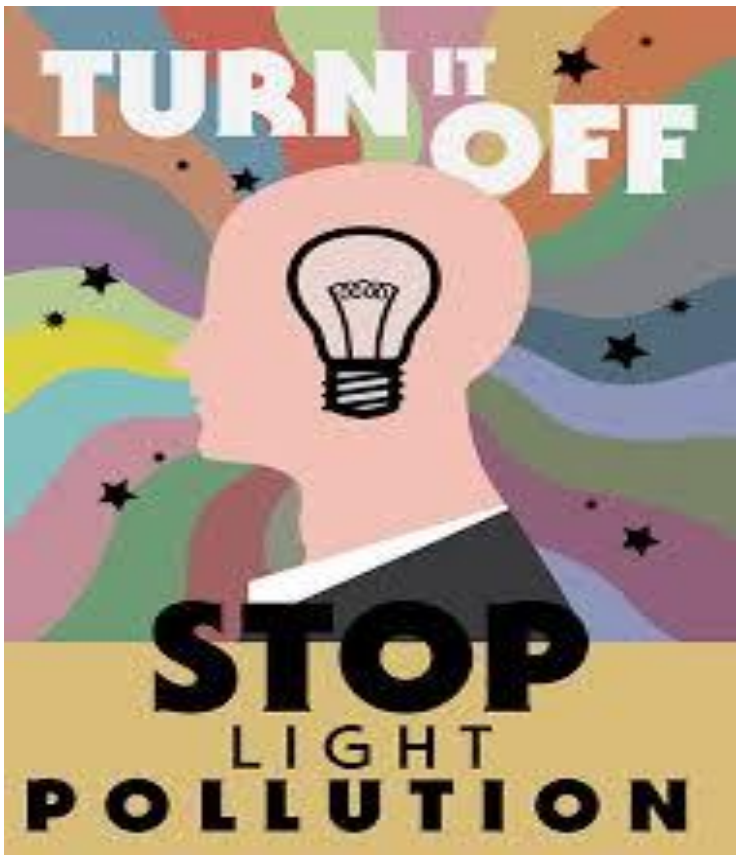
Egyptian Environmental Affairs Agency

LIGHT POLLUTION



Dr/ Reham Lotfy Abdel Aziz **Environmental health manager**

Light Pollution Affects Us All!

Wildlife

Health

Energy

Contents

1- Introduction

Light pollution:

It is the inappropriate or excessive use of artificial light.

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.

The fact is that much outdoor lighting used at night is inefficient, overly bright, poorly targeted, improperly shielded, and, in many cases, completely unnecessary. This light, and the electricity used to create it, is being wasted by spilling it into the sky, rather than focusing it on to the actual objects and areas that people want illuminated.

With much of the Earth's population living under light-polluted skies, over lighting is an international concern. If you live in an urban or suburban area all you have to do to see this type of pollution is go outside at night and look up at the sky.

Components of light pollution include:

1- Glare – excessive brightness that causes visual discomfort
2- Sky glow – brightening of the night sky over inhabited areas
3- Light trespass – light falling where it is not intended or needed
4- Clutter – bright, confusing and excessive groupings of light sources

For three billion years, life on Earth existed in a rhythm of light and dark that was created solely by the illumination of the Sun, Moon and stars. Now, artificial lights overpower the darkness and our cities glow at night, disrupting the natural day-night pattern and shifting the delicate balance of our environment. The negative effects of the loss of this inspirational natural resource might seem intangible.

2- Effects of light pollution

But a growing body of evidence links the brightening night sky directly to measurable negative impacts including:

1. Increasing energy and money consumption.
2. Disrupting the ecosystem and wildlife.
3. Harming human health.

- **Increasing energy and money consumption:**

Lighting that emits too much light or shines when and where it's not needed is wasteful. Wasting energy has huge economic and environmental consequences.

- **Disrupting the ecosystem and wildlife:**

There are many examples for environmental effects of light pollution:

1- The artificial lights that will come with these human activities will undoubtedly affect natural rhythms and biological processes of zooplankton.

2- The artificial light at night affects American Toad metamorphosis and growth image.

3- Some birds migrate at night and use moonlight and starlight to guide them. The light from urban centers can cause them to stray off course and wander into cities, sometimes confusing them so much that they fly into buildings and die. In addition, artificial light can disrupt their cycles and cause them to migrate too early or too late. Light pollution has also been found to cause birds to choose poor nesting sites.

4- Nocturnal animals have eyes that are sensitive to light. What appears to be darkness to humans can look like the brightness of day for animals such as raccoons, coyotes, bats, deer, and certain species of birds. So, affectingthe ability to sleep.

5- Many animals depend on nighttime for their reproductive cycles. For instance, frogs and toads croak at night as part of their reproductive ritual. Light disrupts the ritual because the frogs do not know when it is time to croak. Frogs and toads have been known to cease their mating activities altogether in areas where light pollution occurs.

6- Fireflies depends on the darkness to send their bioluminescent signals, using the signals for mating and to warn of predators. Stray light interrupts their ability to communicate and reduces populations by disrupting mating.

7- Excessive light not only affects animals, it also affects the ability of plants to breed. Nocturnal moths play an important role in the pollination of certain crops and plant species, so declining moth populations have a significant effect on plant populations and productivity, especially night blooming plants. Moths are attracted to light and will often be killed when they come into contact with hot components. The light also makes them more likely to become a nighttime meal for birds and bats.

8- Light pollution upsets the balance of predators and prey. Nocturnal animals sleep during the day and do most of their hunting and food gathering at night. Light pollution changes their cycle and transforms the dark of the night into daylight. Prey species, such as mice, rely on the darkness for cover, depending on the inability of their predators to see in the darkness.

9- Coyotes howl more during the dark of the moon to assist each other when hunting larger prey and to mark their territory. Coyote territories have been known to change when the sky is bright all the time near cities. This can cause an over or under population of prey animals. For instance, when coyotes do not keep populations of mice, voles, and deer in check, it can

have a cascade effect on agricultural crops and disease infestations in human populations.

10- Creatures of ponds and streams suffer from many of the same maladies as land creatures when exposed to light pollution. Many fish depend on the intensity of the light as a cue for certain behaviors, such as breeding. Dragonflies and other insects lay their eggs in ponds, freshwater streams, and lakes. Artificial light can make them mistake man-made objects for water, especially those that have dark, shiny surfaces. Light can make asphalt, black plastic sheeting, or glass look like a good place to lay eggs.

11- Everything is connected and when light pollution impacts one species, this affects the species that depend on it for survival. The main effects of light pollution are increased predation and interrupted breeding cycles for a number of species. Combined, these two factors place an increased strain on animal and plant populations.

12- Light pollution affects species in the foundation of the food web more profoundly than those of the upper echelons. Insects, amphibians, and nocturnal animals experience decreased numbers. This will eventually have an effect on the entire food chain and the ecosystems.

13- The flowering plants that bees rely on for their food source is also impacted by artificial light at night. Light pollution does not just affect plants' cycles directly – it also affects them indirectly by interfering with the lifecycles of their pollinators or other animals that interact with them.

14- The familiar glowing patterns of fireflies are a crucial part of their mating rituals. Each species of firefly has a characteristic pattern of flashing light that helps its male and female individuals recognize each other. The males fly and flash, while the usually stationary females respond with their own flashes.A recent study suggests that light pollution may disrupt this carefully conducted ritual.

- **Harming human health:**

Exposure to Artificial Light at Night Can Harm Your Health

Humans evolved to the rhythms of the natural light-dark cycle of day and night. The spread of artificial lighting means most of us no longer experience truly dark nights.

Research suggests that artificial light at night can negatively affect human health, increasing risks for obesity, depression, sleep disorders, diabetes, breast cancer and more.

Circadian Rhythm and Melatonin

Like most life on Earth, humans adhere to a circadian rhythm (our biological clock) a sleep-wake pattern governed by the day-night cycle. Artificial light at night can disrupt that cycle.

Our bodies produce the hormone melatonin in response to circadian rhythm. Melatonin helps keep us healthy. It has antioxidant properties, induces sleep, boosts the immune system, lowers cholesterol, and helps the functioning of the thyroid, pancreas, ovaries, testes and adrenal glands. Nighttime exposure to artificial light suppresses melatonin production.

3- To solve/ reduce light pollution

Light pollution affects every citizen. Fortunately, concern about light pollution is rising dramatically. A growing number of scientists, homeowners, environmental groups and civic leaders are taking action to restore the natural night. Each of us can implement practical solutions to combat light pollution locally, nationally and internationally.

Light pollution, unlike many other forms of pollution, is reversible and each one of us can make a difference! Just being aware that light pollution is a problem is not enough; the need is for action. You can start by minimizing the light from your own home at night.

You can do this by following these simple steps:

1- Only use lighting when and where it's needed.
2- Dimmers, motion sensors and timers can help to reduce average illumination levels and save even more energy.
3- Outdoor lighting should be fully shielded and direct light down where it is needed, not into the sky.
4- Unnecessary indoor lighting, particularly in empty office buildings at night should be turned off.
5- Keep your blinds drawn to keep light inside.
6- Then spread andexplaining the issues to others, you will help bring awareness to this growing problem and inspire more people to take the necessary steps to protect our natural night sky. Many people either don't know or don't understand a lot about light pollution and the negative impacts of artificial light at night.
7- Use new lighting technologies can help conserve energy

4- The main important point in light system:

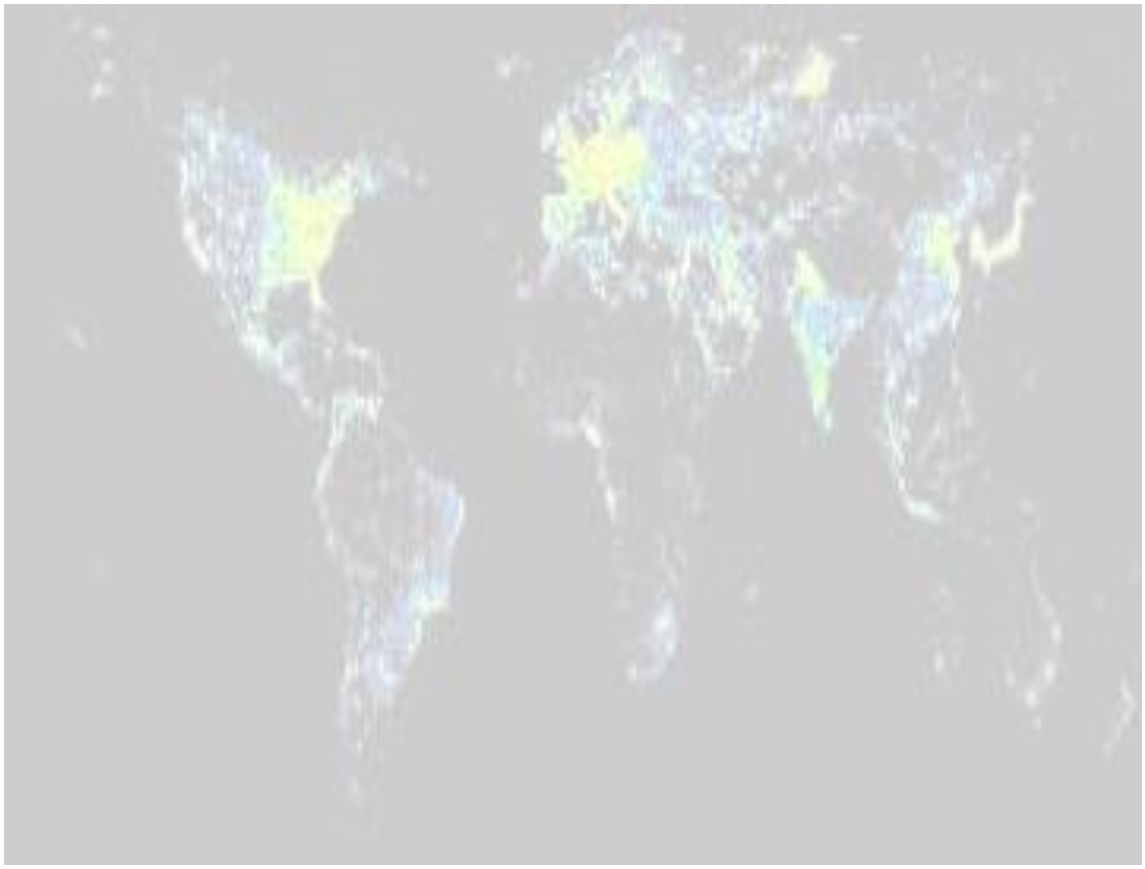
1- The curlicue compact fluorescent light bulbs and LED lights are much more energy-efficient than the old-fashioned incandescent light bulbs we grew up with. But they also tend to produce more blue light.

2- Exposure to blue light at night is particularly harmful. Unfortunately, most LEDs used for outdoor lighting — as well as computer screens, TVs, and other electronic displays — create abundant blue light.

3- It is crucial to have fully shielded lighting, but we the color of light is also very important. Both LED and metal halide fixtures contain large amounts of blue light in their spectrum. Because blue light brightens the night sky more than any other color of light, it's important to minimize the amount emitted. Exposure to blue light at night has also been shown to harm human health and endanger wildlife. IDA recommends using lighting that has a color temperature of no more than 3000 Kelvins.

5-Light pollution map:

(https://www.lightpollutionmap.info/#zoom=4&lat=5759860&lon=1619364&layers=B0FFFFTFFFF)



6- References

1- Site of the International Dark-Sky Association (IDA).

2- The 7th Annual Northeast Pharmacy Research Conference of 2015. Light exposure and sleep quality in students with different sleep patterns.

3-EMEA 2007, European Medicines Agency . Evaluation of Medicines for Human Use. ASSESSMENT REPORT FOR CIRCADIN .Procedure No. EMEA/H/C/695, 2007.