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Issue:

Adressing the effects of air- and light pollution on the environment

Forum:

Economic & Social Council (ECOSOC)



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Introduction

If we would go back in time to a hundred years ago at nighttime and look up to the sky, we would see the Milky Way and thousands of stars. The sky would be bright blue and very clear. Nowadays, if you were to walk outside at nighttime, you would barely see any stars and definitely no Milky Way. This is caused by light pollution. In this research report, the causes of light pollution and the effects of it will be discussed. Thereafter any previous and possible new solutions will be talked about. Additionally, air pollution is an issue that keeps coming up more and more and is becoming a more pressing issue. As smog, ozone holes and carbon emissions occur at an increasing rate the environment continues to suffer. These are all examples of air pollution that affects us and our world that will be explained.

Definition of Key Terms

Hydrofluorocarbons (HFCs)

Organic compounds that contain both carbon and fluorine. Created and used to combat ozone-depleting substances in the stratosphere

Chlorofluorocarbons (CFCs)

Organic compounds that contain both carbon and chlorine. They break down ozone in the stratosphere.

Pollution

Pollution is when harmful products such as toxins come into an environment, disrupting their normal patterns and functions. With an example of our atmosphere, "pollution refers to the introduction of chemicals, particulates, and biological matter that can be harmful to humans, plants and animals, and cause damage to the natural environment". (Williams 2016)

Glare

When a source of light causes visual discomfort with its excessive brightness. Glare can be either disability glare or discomfort glare. Disability glare is when visibility is reduced by the bright light sources in the field of view, discomfort glare causes pain or annoyance.

Light trespass

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When outdoor lighting is poorly controlled and shines onto properties while it was not intended to. Volt.org gives the following definition:

“It occurs when unwanted light shines on our property or in our windows. When a bright, uncontrolled lighting installation occurs near residential areas, the tranquility of the nighttime environment is disturbed and the quality of life diminished.”

Skyglow

Skyglow occurs when light from either a natural or human-made source is reflected in the sky. It is then scattered throughout the air by gas molecules or dust, resulting in a luminous glow. The level of skyglow is very dependable on the weather conditions. In poor weather conditions, skyglow is worse.

General Overview

Light Pollution

The dangers of light pollution are quite often overlooked. It can disrupt ecosystems, damage the health of many species and cost us a lot of energy and thereby money. Luckily, these effects can be reduced relatively easy if enough effort is put into it.

There are several different forms of light pollution; glare, light trespass and sky glow being the main ones. All of these are caused in different ways. Glare is a very bright and uncontrolled light against a dark background that can cause discomfort or have a disabling effect. Especially for older people this is an issue, because of the ageing of their eyes. This form of light pollution is commonly seen in street lights and headlights of cars.

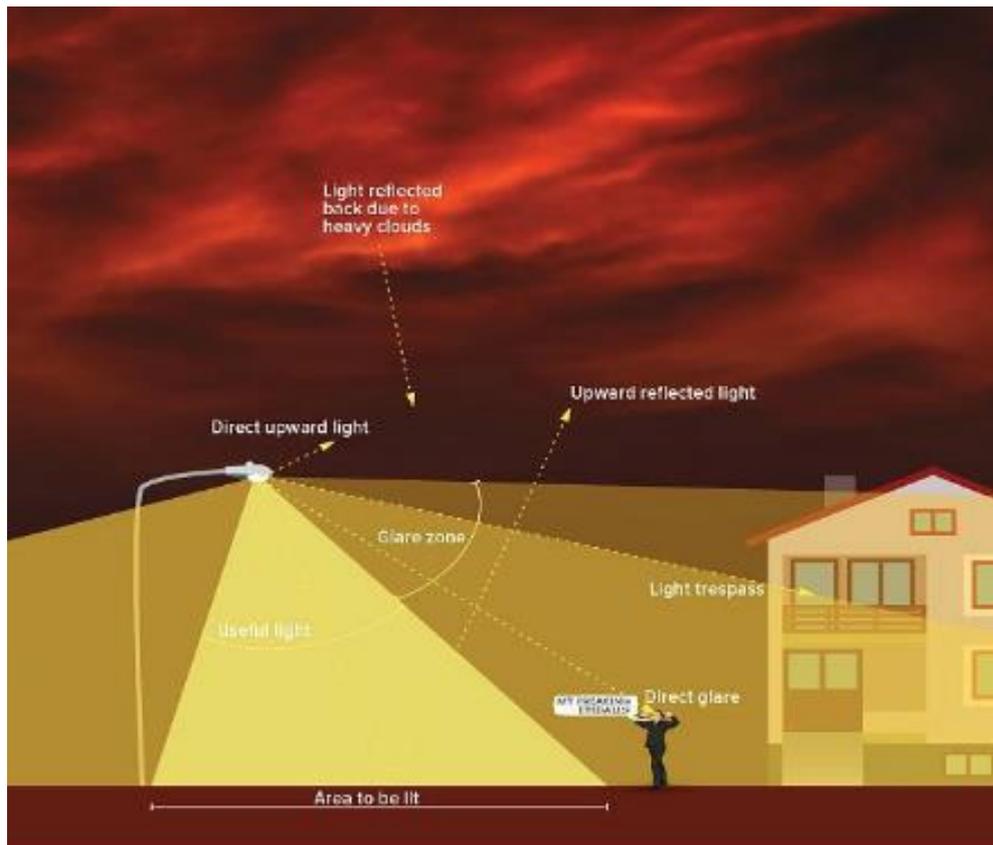


Image 1: Light pollution

Source: 1000 Bulbs

As can be seen in image 1, the entire enlightened area outside of the intended area is part of the glare zone and causes harm.

Light trespass is also caused by light that is outside of its intended zone. When unwanted light shines onto or into a building, and that was not the intention, it can be seen as light trespass. This problem is one of the most common causes of complaints by citizens, but luckily it can be resolved very easily. The thing that causes light trespass is poorly aimed light fixtures, which could be helped by creating a shielding for this light source. The problem, however, is how to determine when a light source is actually unwanted and causing light trespass.

Skyglow is a slightly different form of light pollution. It can be caused by both human-made and natural sources. These natural sources are not what is causing an issue, but mainly the human-made sources. Skyglow occurs when luminaires shine light directly up towards the sky because of poor shielding, or when the light that lands in the intended area is reflected upwards. This light is then scattered by dust or gas molecules in the sky, causing a luminous glow (see image 2).



Image 2: Skyglow
Source: Down to earth

Skyglow is mainly causing a problem for astronomers, as it limits their ability to view the stars and other celestial objects.

Light pollution has some very important effects, that cannot be overlooked. It disrupts ecosystems and wildlife simply by lighting up the earth. Nearly all life on earth depends on the cycle of day and night and by contributing to light pollution, humanity is disturbing this cycle. This has negative effects on wildlife such as sleep, nourishment, reproduction and the protection from possible predators.

Humans too are affected by light pollution. The increased levels of lighting disrupt the creation of melatonin in our bodies and thereby disrupts our sleeping cycle which can then lead to further health problems. The eyes are also affected. Glare can cause problems, especially for ageing eyes.

Air Pollution

Air pollution is a problem that has in recent years received much attention, especially regarding the automobile industry and large-scale factories. Air pollution can be caused by many things yet the main causes and the ones most sought after to be reduced or eliminated are natural causes such as volcanic activity, fires, and dust and anthropogenic causes which include fossil fuel emissions, agriculture, waste.

Effect on the Atmosphere

One of the most important reasons to control air pollution is to preserve the state of the atmosphere. The atmosphere is so important to life on Earth because it shields us from most damaging elements outside of it. The harmful UV light, radiation and debris get filtered through the atmosphere and makes it possible to maintain life on

earth. Air pollution plays a large role in breaking down the ozone in the stratosphere. Chlorofluorocarbons are substances that have been used since the 1930s in refrigerating aerosol cans, insulation and air conditioning (Elkins 2005). These chlorofluorocarbons deplete the ozone layer and create Ozone Holes, through which harmful ultraviolet radiation can then pass and reach the Earth's surface. These ozone holes have been reported in places such as Australia, where skin cancer rates are higher than anywhere else, created by the UV light (Ashfaq 2012).

Fossil Fuel Emissions and Greenhouse Gases

Fossil fuel emissions are the air pollutants that create the largest and most harmful effect on the environment. Combustion of fossil fuels is very common such as the combustion of coal, petroleum and other factory combustibles. Big users of these fossil fuels are power plants, waste incinerators, furnaces and factories. Another factor that expels a lot of fossil fuel emissions is gasoline vehicles (Williams 2016). Additionally, fuels such as carbon require natural resources such as trees for which cutting them down additionally affects the environment due to the loss of forest cover in forests as well as the loss in the production of oxygen from carbon dioxide. Another consequence of anthropogenic gases is increased wildfires. Some trees and areas produce volatile organic compounds which when mixed with these gases react to start fires (Williams 2016).

Agriculture and Animal Husbandry

The increase in agriculture around the world to keep up with the demand has affected the environment in different ways. First of all, agriculture can take up a lot of space and when areas aren't available then space is made such as the clearing or burning of forests and conversion of ground to become more suitable to the type of agriculture. Additionally, the keeping of cows for agriculture and their food produces a lot of methane, a gas that in excessive amounts becomes harmful to the environment.

Major Parties Involved



Image x: *Light pollution in the USA*

Source: Igmur

United States of America

The USA is a very developed country and therefore has a lot of light pollution. Especially areas like Chicago and New York are very polluted. Light pollution is a fairly local problem so not in all of the USA is this a big problem. 18 of the 50 states have laws to reduce light pollution. Sadly, not all of the states with the highest levels of light pollution are among these 18.



Image x: *States with light pollution laws*

Source: NCSL

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The Russian Federation

Russia is also a country with high levels of light pollution. Once again not in every area in Russia is a lot of light pollution, but in several places the levels are very high. Russia, in contrary to the USA, does not seem to be actively decreasing their light pollution levels.

People's Republic of China

China is one of the countries in the world with the highest smog rates in the world due to their large amounts of industry relying on factories. Because of the consequences of smog, China is now trying to fight it and has promised to "make our skies blue again" with rapid innovative solutions (Longobardi 2017).

Pakistan

Pakistan is considered to be the most polluted country in the world due to its industry and lack of timely action to go against it. In the past few years, the breathing quality and smog has been so bad that activist movements are protesting and calling it a human rights crisis as general public health is failing in citizens (Hadid 2020).

Timeline of Key Events

1760-1820	The Industrial Revolution
1950s	LED lights became very popular causing an increase in light pollution
1969	National Environmental Policy is passed in the US due to smog and smoke conditions
2001	The International Dark-sky Places Program by the IDA was founded
2013	Air pollution in China increases to such a scale that it is estimated that due to it people are losing five years of life expectancy
Nov. 4, 2016	Paris Agreement on Climate Change goes into effect

Previous attempts to resolve the issue

An organisation that has been working on resolving light pollution is the International Dark-sky Association (IDA). They work on solving this issue as effectively as possible. One of their most knowledgeable programs is the International Dark-sky Places

Program. The program was founded in 2001 and aims to preserve dark-sites through means such as lighting policies and education.

In the late 1900s, the US passed something called the Clean Air Act, an act to combat air pollution and have standards for air quality and control. It is considered one of the most modern and influential clean air laws at this time.

The Paris Agreement on Climate Change is another very important document signed by multiple countries to address greenhouse gas mitigation, adaption and the finance of it, setting deadlines for countries to reach and for which certain standards and rates should be met. The important part about the Paris agreement is that it includes less developed countries into its agreement in the hopes that countries with better economies and developments can help the lesser developed countries finance the adaption and mitigation asked.

Possible Solutions

To reduce light pollution as much as possible there are a couple of very clear and logical options. The main solution would probably be ensuring that light is shielded



properly and doesn't cause glare or light trespass. Most of the luminaires are already fairly well shielded, but nowhere near close enough. Especially in areas that are being affected by light pollution a lot should be

focusing on doing this. Any developing countries that are still in the process of installing street lights could avoid using street lights that aren't shielded well enough to prevent light pollution.

Something else to help fight light pollution is looking at the type of light that is used. Since the introduction of LED lights light pollution has been increasing. LED lights use a lot of blue light which causes more damage than for example amber lights.

Then finally the use of timers, motion sensors and dimmers can reduce light pollution. That way lights are only used when, and how, they are absolutely necessary. And if the lights are deemed not necessary at all they could not be placed, or if they already have been, they can be removed.

Possible solutions for air pollution can fall between two categories. The restoring of the damage that has been caused and the prevention of more damage to the environment as a consequence of air pollution. Multiple previous attempts have tried to solve the latter issue, yet the important part is being able to reverse or

mitigate the damage already done. This requires a more innovative perspective with new technologies that could reverse the changes in the environment by breaking down sulfur oxides, a component of smog. However, when addressing this, it is important to notice that just reversing the changes will not bring an end to the issue. Provision of cleaner energy for the decrease of fossil fuels and changes in industries have to be wrought to take a more preventative measure towards the effect that air pollution has on the environment.

Appendix/Appendices

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