MIT | Academy of Engineering

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

**A REPORT ON**

# "LIGHT POLLUTION"

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# INTRODUCTION

## System Engineering

Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge.

A logical sequence of activities and decision that transform an operational need into a description of system performance parameters and a preferred system configuration.

Manage and guide the development of complex engineered systems over their life cycle.

There are three major activities in system engineering

1) Development phasing
2) System Engineering Process
3) Lifecycle integration

## PROJECT OBJECTIVE

As the time is passing by people are using technology more and more and thus the urbanization is at its peak. Due to increasing urbanization there are some side effects also and light pollution can be a major concern for the future, right now it is not that big but as we know prevention is better than cure so we must start taking steps as early as possible.

**Light pollution**, also known as **photo pollution**, is the presence of anthropogenic light in the night environment. It is exacerbated by excessive, misdirected or obtrusive uses of light, but even carefully used light fundamentally alters natural conditions.

Our goals:

- More and more people should be aware about it.
- Every person should know the harmful effects of the light pollution.
- To aware people about the prevention of it.
- Try to prevent it before it becomes a major concern.

# Light pollution

## DEFINITION:

Light pollution is the adding-of/added light itself, in analogy to added sound, carbon dioxide, etc. Adverse consequences are multiple; some of them may not be known yet. Scientific definitions thus include the following:

- The degradation of photic habitat by artificial light.
- The alteration of natural light levels in the outdoor environment owing to artificial light sources.
- The alteration of light levels in the outdoor environment (from those present naturally) due to man-made sources of light. Indoor light pollution is such alteration of light levels in the indoor environment due to sources of light, which compromises human health.
- The introduction by humans, directly or indirectly, of artificial light into the environment

## EFFECTS:

- **Wildlife Implications**

  Hundreds of wildlife such as deer and zebras are killed on the roads in the evenings since the glares blind and distort their night locomotive aspects.

  Hence, any amounts of artificial lights introduced in their respective environments can seriously alter their natural cycles and operations.

- **Ecosystem Disruptions in General**

In general, artificial lighting heavily impacts and threatens the balance of the ecosystem because numerous wildlife including plants and animals highly depend

on the nocturnal and diurnal influences. Light pollution negatively impacts on animal and plant physiology thereby modifying the competitive interactions of the animals, tampers with their migratory patterns, and distorts predator-prey relations.

Light reflections can equally prevent natural UV rays from reaching the planet which is responsible for the continuity of plant life.

- **Effects on Humans**

Spillovers and glare are some of the lighting outcomes that cause eye strain, loss of clear vision, aging of the eyes, and stress.

Too much light can damage human eyes and even harm the hormone melatonin which is responsible for regulating diurnal and nocturnal visions. This can result in sleep disorders and other health implications such as stress, exhaustion, headaches, increased anxiety, and some forms of obesity may develop.

## PREVENTIONS:

- **Use Core Glow stones for all your Outdoor Night Lighting:**

Core Glow stones only emit 5-7 candelas of light, and do not 'cast' light as electric lights do. The ambient glow from Core Glow stones is not a source of light pollution, and does not contribute to bright skies at night

- **Only purchase IDA Approved light fixtures:**

The International Dark Sky Association certifies dark sky friendly light-fixtures that meet their rigorous guidelines. Look for this symbol when you are purchasing new lights

- **Talk to your local representatives and support Dark Sky initiatives**

Illuminating Engineering Society of North America approved the Model Lighting Ordinance, an outdoor lighting template designed to help municipalities develop outdoor lighting standards that reduce glare, light trespass, and sky glow.

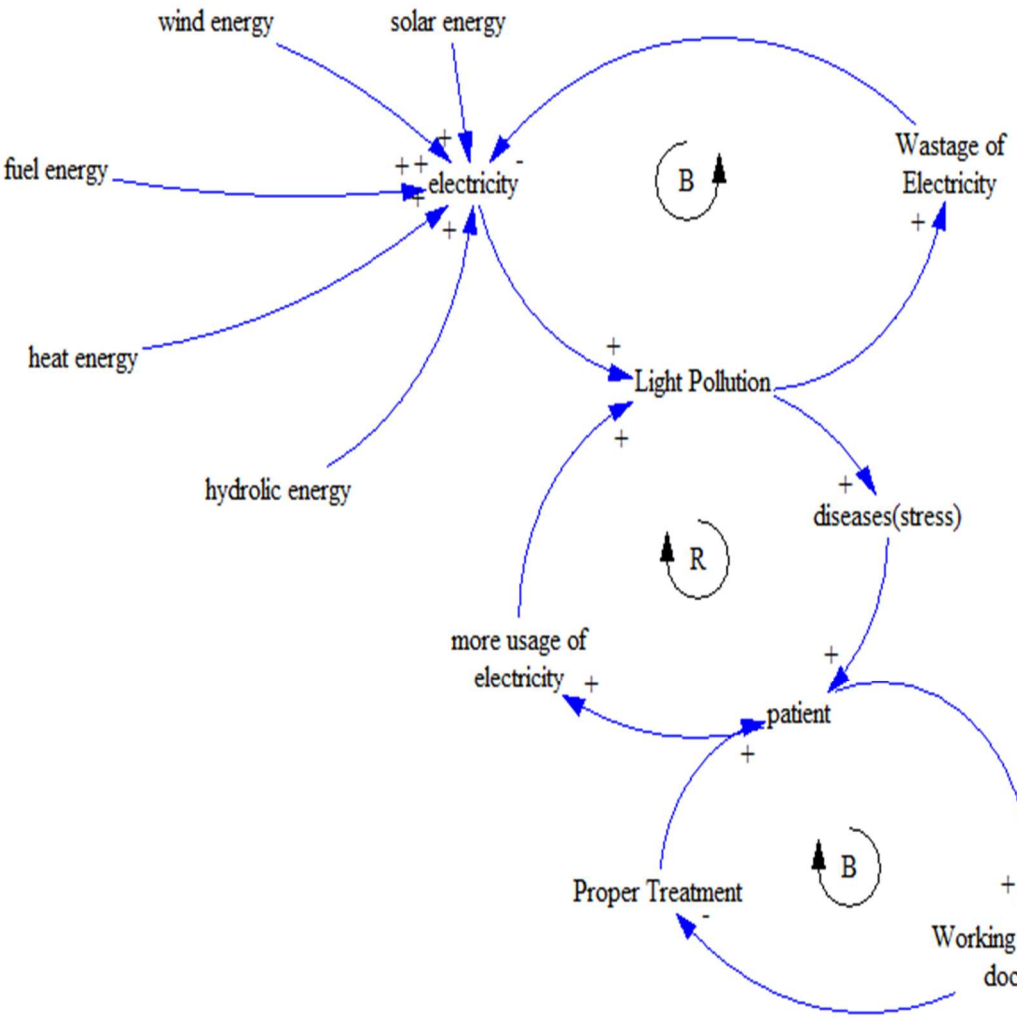
- **Set an example - Turn your lights off!**

The easiest way to help reduce light pollution - turn your lights off! Not only does this help reduce light pollution, it also reduces your energy bill and carbon emissions, as well as revealing the beauty of our world in darkness

- **AWARNESS**

The best way to start helping is to spread the word about light pollution is to start talking about it. Do some of your own research, and visit a Dark Sky approved site close to you to see the difference light pollution makes.

# CAUSAL LOOP DIAGRAM



## PROJECT DETAILS:

When we walk on the street nowadays we can see light everywhere and that's because of the street light which helps a lot to people to walk on the street with full visibility.
But we look into this matter carefully we can see that these lights are glowing all time unnecessarily even when there is no one walking down the street.
To solve this problem we came up with the idea of intelligent/smart street light system. In this system lights will be glowing faintly as soon as it senses a person walking down it will glow at full intensity and then will again faint thus reducing the light pollution and also will help in saving electricity.

# SYSTEM ENGINEERING PROCESS

## REQUIREMENT ANALYSIS:

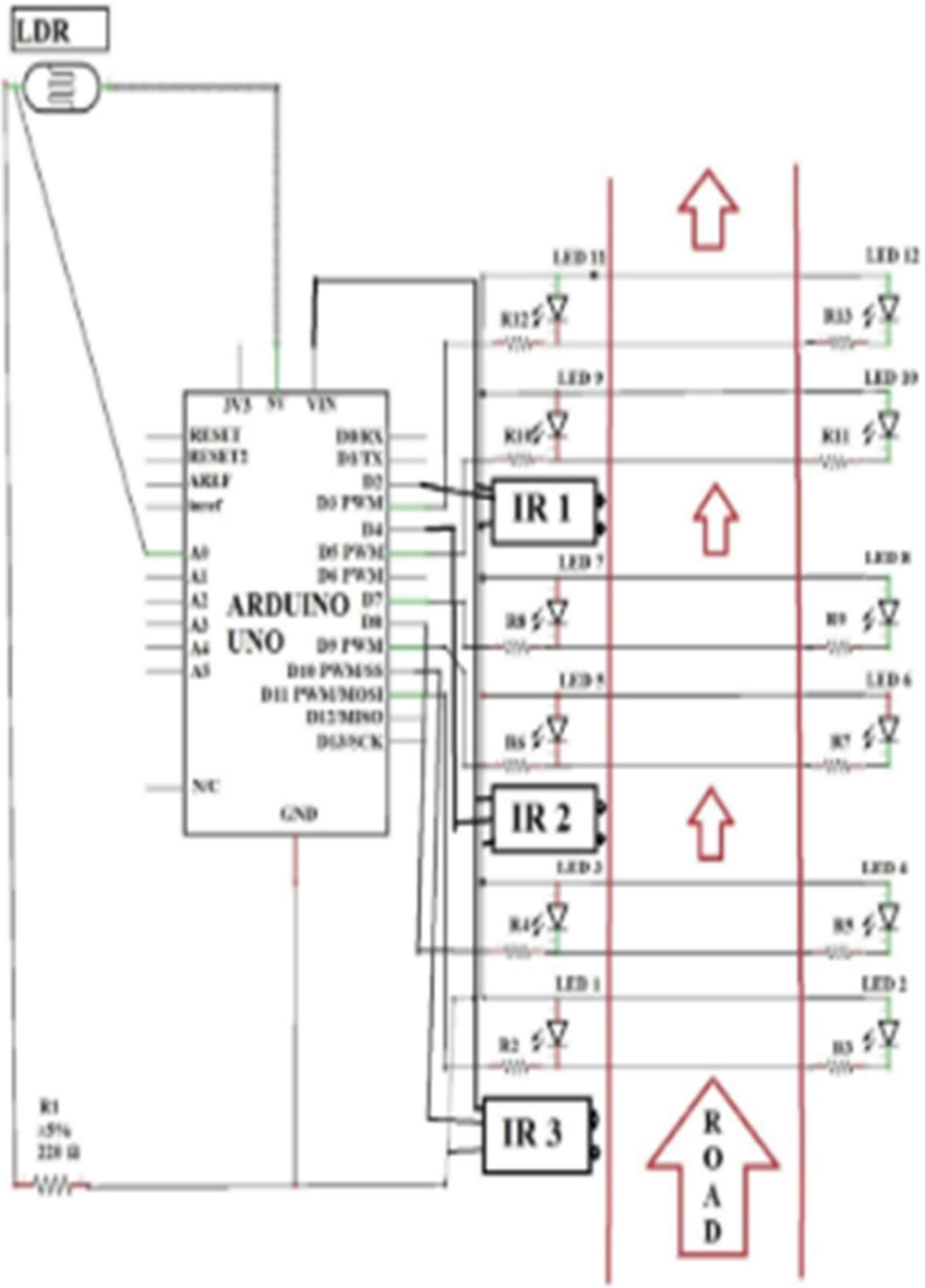
1. Resistors (100 ohm, 220 ohm)
2. LDR Voltage: (DC 3-5V, 5mm, 1.8 gm.)
3. LED's (5 mm, operating voltage 5V)
4. Arduino (22 pins, operating voltage 6-20V)
5. IR obstacle avoidance sensor (Voltage: DC 3-5V, Range 2-30cm, Angle 35)
6. Connecting wire

## FUNCTIONAL ANALYSIS

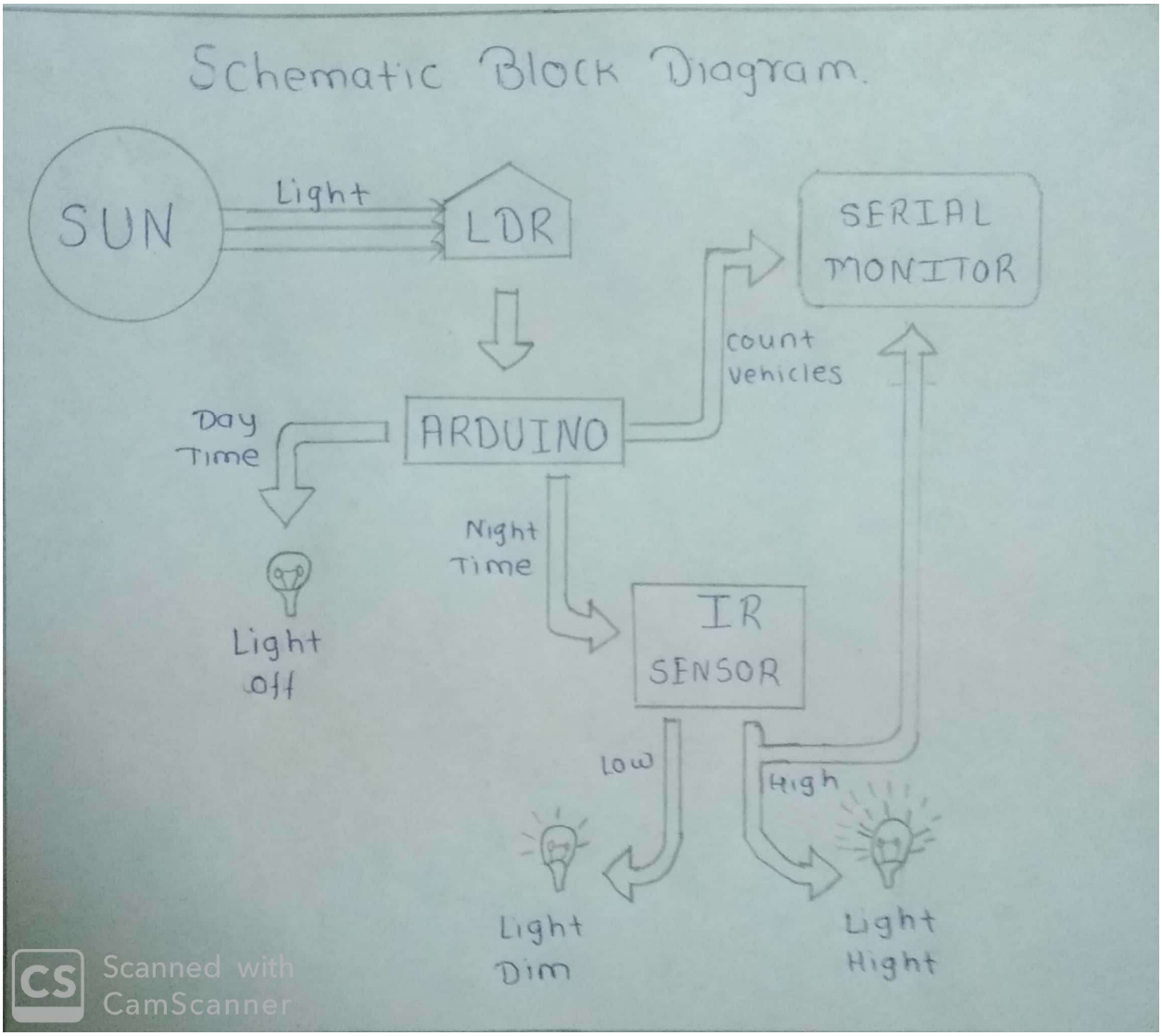
1. Fast response time
2. Precise and accurate work
3. LDR is used to detect the light,
4. Arduino is used to on/off the Light.
5. IR sensor calculate distance
6. Serial monitor counts the number of vehicles passes through road

## DESIGN SYNTHESIS

1. The circuit design of automatic street light control system based on vehicle detection
2. Using Arduino Uno having feature of Dim light capability. In this task, 01 LDR sensor, 12 LEDs,
3. 13 resistors, 03 IR obstacle detector sensors and 01 Arduino UNO have been used


LDR
ARDUINO
UNO
IR 1
IR 2
IR 3
ROAD
LED 11
LED 12
LED 9
LED 10
LED 7
LED 8
LED 5
LED 6
LED 3
LED 4
LED 1
LED 2
R1
5%
220 Ω
GND

## SCHEMATIC BLOCK DIAGRAM



# REFERENCE


- https://coreglow.ca/news/5-ways-to-reduce-light-pollution-core-glow-with-the-international-darksky-association/
- https://www.eartheclipse.com/pollution/serious-effects-of-light-pollution.html
- https://en.wikipedia.org/wiki/Light_pollution
- https://therevelator.org/tag/light-pollution/


# CONCLUSION

The proposed streetlight automation systhttps://therevelator.org/tag/light-pollution/em is a cost effective and the safest way to reduce power Consumption. It helps us to get rid of today's world problems of manual switching and most importantly, primary cost and maintenance can be decreased easily. The LED consumes less Energy with cool-white light emission and has a better life than high energy consuming lamps.
Moving to the new & renewable energy sources, this system can be upgraded by replacing conventional LED modules with the solar-based LED modules