

Causes and Impact of Light Pollution

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Abstract

In Indian culture we talk about "Tamso Ma Jyotirgamay..." Present article presents the importance of night. We illuminate our buildings, streets, parking fields, shopping malls, markets for the feeling of security and better visibility but this can be fulfilled only when the lighting are well designed and properly placed. Nowadays our life style has been changed and glamour has become the part of our life so we use more lights than we require. Abundant use of lights and spill out of light in nearby places and skyward it alters the natural light of night stars this new threat is known as light pollution. Thus, in urban areas natural beauty of light has been forgotten and light is too effective that the stars become invisible. It is the new focus of urban studies, which is dealt in current article. Jaipur is taken as the study area. The causes, types and probable measures have been studied in the paper.

Keywords: Natural Light, Light Pollution, Urban Sprawl, Awareness

Introduction

Urbanization is growing rapidly. Urban sprawl engulfs the surrounding rural area at the faster pace. Urbanization is a challenge for planners. It is difficult to fulfill the needs of the urban population. Limited resources are there and unlimited population is depending on them in the vertical manner. Pollution is the biggest threat for the urban areas on another hand. Air, noise, soil pollution is well versed whereas the light pollution is the new emerging phenomenon. We know the importance of sunlight so as the light of stars is equally important. The increasing number of vehicles and traffic interrupt the stars light it affects the biological cycle of human beings as well as other creatures. Because of these effects, not only does light pollution warrant our attention, it deserves to be thoroughly examined and studied in the attempt to bring about/enforce reasonable solutions to the problem. Current paper presents

the study of new threat of light pollution with special reference of Jaipur city, its types and its impacts.

Study Area

The study area is Jaipur city located at the heart of Jaipur district in between 26°46'N and 27°01' N and 75°37'E and 76°57' E. Jaipur is the capital and largest city of Rajasthan. It was founded on 18 Nov.1727 by Maharaja Sawai Jai Singh after whom the city is named. Total area of the city is approximately 111.8 sq. Km. Jaipur is known as pink city of India because of the colour used exclusively in the walled city. The city was built on the principles of Shilpa Shastra. The city was divided into nine blocks. Initially city was in walled area, but with the growth of population city is rapidly sprawling in outer walled area. Jaipur is grooming rapidly. The city is centre of attraction for researchers.

As per provisional reports of Census, India (2011) population of the city is 3,073,350 out of which 1,619,280 are females and 1,454,070 are males. Average literacy rate of the city is 84.34% . Female literacy rate is 77.41% and sex ratio is 898 females on per 1000 males. As the data is taken from Census 2011, so the base of the study area is the expansion of the city as per Nagar Nigam 2009 . At the time the city had 77 wards which are 91 now. (Fig 1)

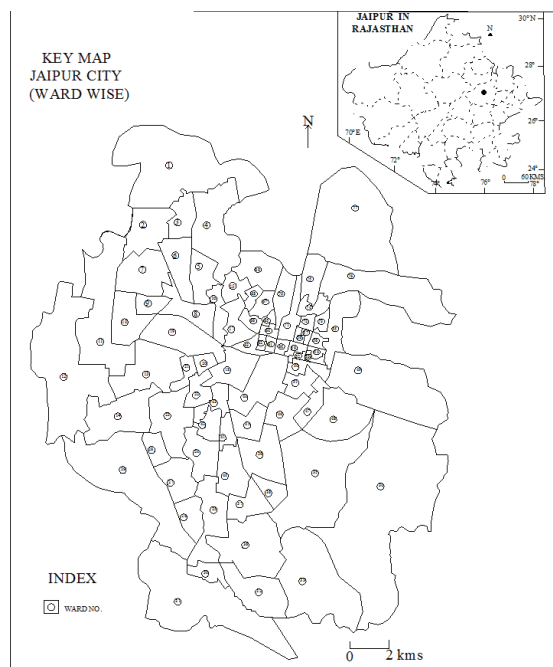


Fig. 1

Causes of Light Pollution

Jaipur city is witnessing light pollution due to various causes. Since the city has dense population and the urbanized life style is being adopted which leads to wastage of lights. So the various causes are as follows-

1. Misdirected Lighting: Jaipur city is illuminated by Streetlights, security lights and billboard lights. They are often the main culprits. Although these lights do light up their intended targets, they also spill out, up, down and around them too. Light pollution in this case is caused by the light being directed above and beyond the target and up into the night sky. According to the

Physically the city has the obstacles in northern and eastern ends in the form of hills which affects the sprawl of the city as well. This physical feature affects the light pollution as well. As urban growth found so the level of light pollution increase. Dense population is another reason for the light pollution. Jaipur city is center of migration. Besides the natural growth people migrate to Jaipur and thus the population is increasing rapidly.

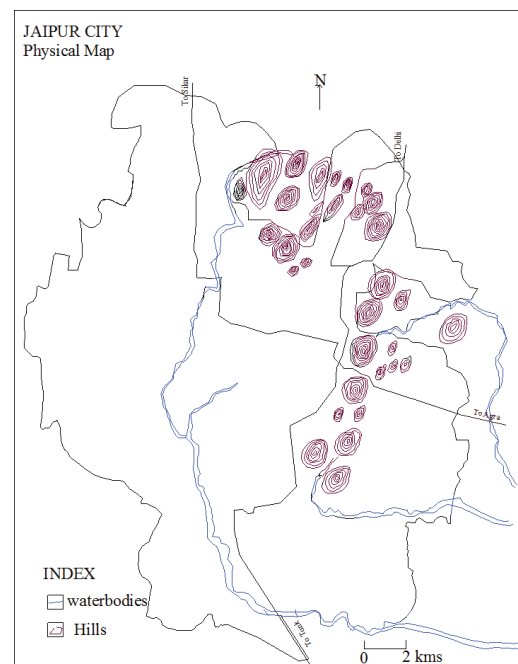


Fig. 2

report of World Bank Group (2022) the Jaipur Municipal Corporation operates and maintains over 1,00,000 public street lights within the city for security point of view. The angle of streetlights is so multidirectional that it spills the lights in wider manner.

2. Unnecessary Lighting: It is found during the study that Some lights are not necessary but still they are used. There are few municipal areas like Malviya Nagar, Mansarovar, where streetlights are fixed very close to each other. This is the wastage of electricity. Thus unnecessary use of closer fitting of lighting is another reason for light pollution.

3. High Voltage Lighting: Some lighting is just too excessive. When you pass by a bright street-light or security light do you say, "Is this high brightness really necessary?" Most individuals who install such fixtures are not thinking about what these lights can do to the night sky. Nevertheless, they are still wasting money on two fronts: spilling a percentage of the lighting into the night sky and using too much electricity to power the excessively high power lighting.

4. Improper Light Designing: Some lighting fixtures are actually designed such that light escapes directly upward and into the night sky. A simple lighting cutoff cap placed over the offending light will not only block the light that would normally head upward into space, but also reflect some of that light back to the intended target, thus minimizing the need for high power lighting!

5. Changing Life Style of Urban Areas: Glamour has been integral part of today's life. Customers are attracted towards glamour and glitter. To encourage the customers' interest, shopkeepers use more and unnecessary lights as well. So far as concerned this is another reason for light pollution. Jaipur city is witnessing the mall culture. New multistoried malls are increasing where lightings are found to glitter and to glamourize the things. This show biz is somehow responsible for the light pollution.

6. Urban Sprawl: Jaipur city is sprawling rapidly. The expansion of the city is found southward and westward due to physical hurdles in northern and eastern area. It results higher level of light pollution in southern and western part of the city. Urban infringement destructs the beauty of night. Basically this problem is totally related to urban and suburb areas. Large development and changing pattern of living enforce more use of street and security lights. This motivates the light pollution.

7. Increasing Number of Vehicles: According to the Govt. of Rajasthan, Transport Department, statistical Year Book 2014-15 Jaipur has 551 cars per 1000 persons. From April 2012 to December 2013 registration of 40810 cars, 2,03,382 two

wheelers, 7199 jeeps, 3618 autos, 4463 tractors, 4482 taxis, 1513 buses, 9060 trucks, 1377 tempos and 675 others was done. This data is increasing day by day. Increasing number of vehicles express the increasing use of headlights which cause the light pollution.

Types of Light Pollution

Jaipur city witness the various types of light pollution:

Over illumination: is the use of light well beyond that required for a specific activity. Many places, both indoors and out, have lights on when no people are present. In many cases, this goes beyond the need for security lighting. Sometimes in office buildings where nobody is present, yet lights got switched on throughout the night. This carelessness is the cause of over illumination.

Light Trespass: is misdirected light that is found in an area where it is unwanted. This occurs due to poor designing of light which causes spill over the light on nearby property.

Sky glow: manifests itself primary in major cities as a hazy glow above the horizon caused by light escaped into the atmosphere from misdirected and badly designed sources. It can be seen over many cities and towns at the time of evening. It is the result of the many electric lighting fixtures that shed light above urban areas. It is caused by light traveling through the atmosphere being refracted or scattered by water droplets or particles (aerosols) such as dust, pollen, bacteria, spores, salt from sea spray, mineral particles lifted from deserts and waste products from industry. It is therefore worse in heavily polluted areas, and will always exist to some extent when the air quality is poor.

Glare: is an overwhelming sensation experienced when the light source itself is brighter than the area it is trying to illuminate and out of the eyes normal adaption range. It is the problem increased due to sports flood lights.

Light Clutter: is over grouping of lighting which are poorly placed. This may generate the problem of confusion and sometimes causes accidents.

Effects of Light Pollution

Various fields have been affected by light pollution in different ways:

Effect on Astronomical Research: Astronomy is the field which is adversely affected by the light pollution. Due to over illumination and sky glow the natural beauty of stars and galaxies has been forgotten. In most cities the sky looks as though it has been emptied of stars, leaving behind a vacant night which fears us of the dark.

This over use of lights is responsible for the interruption in the astronomical research. This is the reason why the astronomical research laboratories are being shifted to remote areas.

Effect on Human Body: A questionnaire prepared for the analysis of the effects of the light pollution on mental and physical health. It reveals the health effects of over-illumination or improper spectral composition of light may include: increased headache incidence, worker fatigue, medically defined stress, decrease in sexual function and increase in anxiety. For those who need to be awake at night, light at night also has an acute effect on alertness and mood.

Common levels of fluorescent lighting in offices are sufficient to elevate blood pressure by about eight points. Stress also affects the working skills. Several published studies also suggest a link between exposure to light at night and risk of breast cancer, due to suppression of the normal nocturnal production of melatonin.

Effect on Animal Ecosystem: Animals are the main victims of light pollution. Light pollution poses a serious threat to wildlife, having negative impacts on plant and animal physiology.

Lights on tall structure can disorient birds. So they collapsed with the tall buildings in the night. The Fatal Light Awareness Programme estimates that in North America at least 100 million birds, mostly low-flying songbirds, die each year in collisions with man-made structures. Glass windows- baffling to birds both day and night- are the biggest contact killers, while disoriented birds may simply sacrifice themselves trying to exit the city maze.

Likewise, sea turtle hatchlings emerging from their nests on beaches gravitate towards brighter sea horizon but due to artificial light they got confused and move towards urban areas. Thus they are sometimes hit by cars or snagged by predators.

Seabirds and songbirds are captured by search-lights on land or by the light from gas flare on marine oil platform circling and circling in the thousand until they drop.

Constant light can destroy crops, trees ecosystem. Plants depend on the cycle of light and dark for proper growth but this light pollution makes the flowering and reproduction crucial.

So as frogs have been found to inhibit their mating call when they are exposed to excessive light at night, reducing their reproductive capacity.

Besides this almost all the small rodents are nocturnal. If we don't protect the night, we'll destroy the habitat of many animals.

Remedies from the Light Pollution

1. Proper Light Design: The lights should be designed in such manner so the wastage of energy be minimized. For the purpose flat lanced lights should be used in public places, sports complex and streets. This can help to stop the spill out of the light.

2. More Effective Lights: The lights must be more effective rather than excessive number. It refers that excessive lights are just responsible for light pollution so required lights in optimum manner should be consumed. It is observed the streetlights were replaced by LED which can curb the light pollution. In the year 2015, an initiative was taken by the state govt. of Rajasthan and Jaipur Nagar Nigam to replace all the existing streetlights with LED lighting.

3. Shielded Fixtures: Each street light should be covered with the fixtures. Light fixtures can be shielded so the light should be directed in targeted area, and its spilling can be controlled to a limit.

4. Proper Location of Lights: Outdoor lighting can be located at the upward part, so the whole

light can enlighten the lower part and minimum energy wastage can be observed.

5. Awareness for Lighting: It is noticed that unwanted lights must be switched off. In the official buildings, where nobody is present, yet the lights found switched on, those lights must be switched off to avoid energy waste as well. There is need to change the habits of routine to save the lights and to curb the light pollution. Earth Hour is a step in this direction. It is organized by the world Wildlife Fund (WWF) annually to encourage everyone to switch off the non-essential electric light for one hour from 8.30 to 9.30 PM. Usually celebrated on the last Saturday of March as a symbol of concern to the planet Earth.

Light pollution is the problem which is easily remediable amongst all pollution. The beauty of stars, planets and galaxies can be witnessed by our coming generation so it is our duty to protect this heritage.

Conclusion

Present study reveals that the Light pollution is a new challenge which has to be taken care at the appropriate time. If not, this problem can be too big to solve. Jaipur city is one of the city

witnessing this problem. Rural areas are safer in the environment. Planners study various types of pollution but light pollution is still untouched. Although economic growth is indispensable yet the environmental conservation is important equally.

References

1. Census of India, 2011
2. Cinzano, P., Falchi, F., Elvidge, C.D. & Baugh, K.E. (2000). *The artificial night sky brightness mapped from DMSP Operational Linescan System measurements*. Monthly Notices of the Royal Astronomical Society.
3. Hollan, J. (2009). *What is light pollution, and how do we quantify it?* Darksky 2008 conference paper, Vienna.
4. Marín, C. & Orlando, G. (eds.) (2009): *Starlight Reserves and World Heritage*. Starlight Initiative, IAC and the UNESCO World Heritage Centre. Fuerteventura, Spain, June 2009.
5. Mizon, B. (2001). *Light Pollution: Responses and Remedies*. Springer
6. Motta a b, Mario (2009). *U.S. Physicians Join Light-Pollution Fight*. American Astronomical society Publishing LLC.
7. Statistical Abstract of Transport Department, Government of Rajasthan.