



ORIGINAL ARTICLE

Review and Offering Solutions to Deal with Light Pollution in Iran in Terms of Technical Reports over the World

Payam Dalaliyan Miandoab¹, Hamed Sanaei¹, Mehrdad Tarafdar Hagh², Mohsen Azadi³, Farzad Vandakbar Miandoab¹

¹Department of Electrical, Faculty of Engineering, Miandoab Branch, Islamic Azad University, Miandoab, Iran.

²Department of Electrical, Faculty of Electrical and Computer, Tabriz University, Tabriz, Iran.

³Department of IT, Agri Jahad, Tehran, Iran

ABSTRACT

Today, the light pollution is one of the most important research areas in lighting engineering. Due to the growing areas of residential, commercial and industrial centres and in proportion to the need to provide their lighting, the investigation of environmental effects of light pollution have attracted the attention of many researchers around the world so that in this regard, countries such as England, Italy, Spain, Japan and other industrialized countries have enacted laws in this area. In this paper, we review technical reports available in the world to deal with light pollution and some ways is proposed to reduce the harmful effects of these parameters in Iran.

Keywords: Light Pollution, Light Brightness, Good Lighting, Artificial Lighting.

Received 09.08.2014

Revised 01.09.2014

Accepted 02.10.2014

INTRODUCTION

In this paper, the existing standards and technical reports about requirements, values and limitations of the amount of light pollution is examined. In CIE-1 version that was released in 1980, consequences and impacts of light pollution on the night sky and how to reduce it to improve astronomers' visibility was studied. This study was completed in technical report CIE-126 and CIE-150 that were published in 1997 and 2003, respectively. Due to the many different aspects of the topic of light pollution, it covers the standards and technical reports related to the light that each kind can be related directly or indirectly to lighting pollution [1]. In this section of the report, it attempts to review standards that directly related to the light pollution and its restriction. Because new regulations under the title of "General technical and administrative specifications of lighting in urban and suburban roads" with abbreviation title of 195 publication will be implemented jointly by the energy ministry and transportation ministry, light pollution will be as a separate chapter in this publication and CIE technical report that was mentioned at first, will be the magazine's main sources, so the three technical report CIE-1, CIE-126 and CIE-150 will be studied in this report.

Interruption caused by artificial lighting systems for people, astronomy, plants or animals generally is known as light pollution. The pollution arises from poorly designed lighting system or improper selection and installation of equipment so that makes up a large part of light shine where it should not have the radiation. In this case, people were resentful of the boldness with light or this annoying light causes the loss darkness in time and space that they need to relax. The plants and animals may have been abused of additional light at night or that light is a disturbing trend in work of astronomers. The first scientific studies about the topic of light pollution were done about 35 years ago about the increase of the brightness of the night sky so that the stars were not seen by astronomers.

Because before the increased brightness sensed by others, astronomy equipment was found this conditions. Countries such as Italy, the Czech Republic and America are the leader of the legislature about light pollution [2]. But it is interesting to know before astronomers, poets and writers have impaired vision on the topic of light pollution and the night sky from their view points. In many internal papers and seminars, the gifted Iranian poet Sohrab Sepehri has been introduced as the first person who mentioned

the issue of lighting pollution. Sepehri's poems 46 years ago in the water footsteps book notes to "Moon is killed by Neon command".

First International Symposium on light pollution was held in 1995 in Italy with the theme of "light pollution, its size and probability" and in less than two years, the local law of the country was adopted and this law was considered as a model for other countries in this field.

The purpose of this paper is to examine and provide solutions to deal with light pollution in Iran in accordance with the technical reports available in the world.

Survey methodology is applicative and its nature is analytical, descriptive, and comparative and data collection is documental.

THE INTERNATIONAL DARK-SKY ASSOCIATION

The International Dark-Sky Association is organized to preserve the dark sky at night from the artificial lighting. This purpose has established the following perspectives:

- Saving energy and creation of economic benefits.
- Beautiful night and increase quality of life.
- The protection of ecosystems and living organisms.
- Creation of margin of safety for sciences such as astronomy.
- Maintaining and preserving the remains of ancient art.
- Increased night visibility and safety at night by reducing the daze.
- Protection of human health.
- Increase public awareness about light pollution and its solutions.
- Cooperation with other relevant organizations and their training about exterior lighting.
- Improvement of laws, policies, research and standards in a particular academic and professional routine.
- Finding scientific solutions to reduce light pollution that include:
 - Reduce the brightness of the night (the total amount of used lumens).
 - Protection and guidance.
 - The study of the spread spectrum lights.

To achieve the above objectives and prospects, this society accompanies with the other societies, astronomers, zoologists, botanists and lighting specialists through incentive policies.

THE LAWS OF ITALY

The first international scientific conference in conjunction with the light pollution was held in 1995 in Italy with title of "light pollution: the size and probability of occurrence" and after two years the world's first local law of light pollution was adopted in Italy

A few paragraphs from the Lombardi Comprehensive law are as follows:

- Lighting systems should be supported by systems that are able to reduce the amount of light nightly after hours of silence.
- Lighting systems should be equipped with high-tech lamps that maximize efficiency.
- Government officials should promote the principle that the law referred to and be the first one who will control the correct application of the law.
- Installers of lighting fixtures are only allowed to install items that are listed on it: "In accordance with the rules dealing with light pollution with minimum energy consumption in accordance with the law of the lumbar region."
- Mayors must submit the plans to install all new systems accordingly the above law during the three years of implementation of the law.
- Manufacturers, importers and producers must add the certification of their product adaption with lumbar and photometric measurements of their product in their product technical data sheet.

It is considered that the law generally encompasses all of the administrative and groups that deal with the topics and specific tasks of each specified category. It is interesting to note that Venice in Italy has been selected as an example of the lack of light pollution because it is the only city where you can see Milky Way galaxy in the night sky. In fact, this shows that light pollution in this city is negligible.

THE LAWS OF JAPAN

Most of the rules about light pollution in Japan have been enacted and enforced as local regulations. The first code in this field in Japan was applied to deal with light pollution to protect the astronomer in November 1989. Followed by it, 6 other administrative requirements were enacted similar to the previous regulations in Japan. The MOE adjusted and released guidelines for voluntary light pollution control to help local authorities at the national and state levels. In this paper, we only refer to national strategies that are more comprehensive than the other criteria. In Japan, the provisions areas guidelines without pressure and the MOE is the main legal authority to implement the laws. Light pollution laws goals have been categorized into two following targets:

- Provision of guidelines and resources for local authorities to set standards for light pollution.
- Teaching people suitably for power consumption.

In Japan, the rules are classified into the following three categories:

- Light Pollution control strategies related to 1998 - 2006.
- Help local programs for environmental lighting (2000).
- A pamphlet about the preventive criteria of light pollution.

THE LAWS OF THE CZECH REPUBLIC

On February 2002, the House and Senate for the first time in the Czech Republic passed a law against light pollution, and then Czech President Vaclav Havel approved and signed it. This law was called the Law for the protection of the atmosphere.

Light pollution is defined as the following:

Any artificial lighting that propagates the outside of where the light is made for it, especially if the direction of light propagation were above the horizon will be considered as the light pollution.

The law that was adopted in the Czech Republic was the result of several years' work of Czech astronomer who was the fans of the International Dark-Sky Association, with the help of Czech Astronomical Society, for many years he tried to raise awareness of people and the authorities about light pollution and eventually managed to convince the authorities of the country that they should legislate against light pollution for the protection of nature, environment and the protection of humans [3].

The law as is stated approved at 27 February 2002 by both the House and the President of Czech Vaclav Havel and the Czech Republic won the honor in the world as the first foremost in this field, so that all the environmental community and the world of astronomy appreciate the Czech Republic act. But what the law says about the atmosphere protection? According to this law, all public and private organizations and government agencies are required by taking various measures prevent light pollution or nuisance light generation in urban areas, otherwise law dealing with offenders and condemned them to pay fines.

The amount of the fine is from 500 to 150,000 kronor (The currency of the Czech Republic).

For example, if you turn on the lights in your home that brightens yard of a neighbor's house you will be fined and if lights are lit in your balcony insofar as the lane becomes bright, you will be fined. The stores are also not allowed to create light pollution in the city to bring attention to their private business. According to this law, all people are required use the lamps that have preservative outside of their homes. The lights should be completely covered up and around, so that the light does not propagate up and around.

In the Czech Republic, shields or cover for all the lights in the city are mandatory. Apart from having coverage, the use of flat glass instead of convex glass for the lights is mandatory because flat glass prevents light propagation to the around. The lights should be limited only to its below area. Distribution of light around and up is against the law and because of inconvenience to others, and energy dissipation will cause the penalty. In fact, according to this law, we have restriction for each light that should not be crossed. Each light should light the same amount of space that has been placed for that reason and no more. In other words, we should not lend the light unless we were close to it. Seeing the light of a lamp from a distance of even a few tens of meters, means that it has created light pollution and its owner should be fined.

LAWS OF SPAIN

In Spain, state law is established separately in independent states. In The Canary Islands from 31 October 1988, industrial building at a height of 1500 meters above sea level is prohibited to increase environmental and electromagnetic pollution. On the island of Tenerife and Lpalma, this law based on the emission wavelength of visible light and ultraviolet radiation has been developed and suggests that low-pressure sodium vapor lamps must be used for outdoor lighting. In this law the most damaging lamp to the environment is metal halide lamp [4].

THE LAWS OF ENGLAND

According to studies conducted in 1990 by the Astronomical Society of Great Britain (BAA), more than ninety percent of the populations are not able to gaze at the stars even in the best case compared to decades ago. Legislation in the UK is behind countries such as the Czech Republic and Italy. In February 2003 a committee appointed by the British Parliament and the auditor were commissioned to investigate light contamination. (CDFS) in following an informal meeting that was held in Greenwich Observatory by astronomers from dark sky Astronomical Society, a statements was provided that was signed by hundreds of active members in the community. In this statement the government was accused of ignoring the problem of pollution and problems in astronomy. Signatories to the statement were seeking legal remedies to address it [5].

In 2005, following the report of the Committee, the British government issued statements as a clean environment. The light pollution was recognized along with other pollutants, such as noise and air

pollution. Some believe this action is not enough, because there are numerous obstacles in the way of resolving this dilemma. But to say this is a positive step in the fight against light pollution. Maybe in the future it would allow lawmakers to go further and take effective measures to reduce or control light pollution.

Some interior lighting is not so that guide light rays can only to the desired range. In this case, light rays are scattered in space. The fact that light pollution is not legally considered as contamination and light pollution does not fall in the category of other forms of pollution in the one hand and this fact that stars does not supported by the legalization and they are totally defenseless against the other ground lights in the other hand, has led to decrease of the ugliness of this type of contamination for the public. Incidentally, this statement states that precisely because the cases cited above, we have to take responsibility for the dark sky of our city and it must start with ourselves and our neighbors.

For example, suppose one of your neighbors use light that adds light pollution. Many people do not know anything about light pollution and there is need to fully explain the problem to them and then ask them for replacement lights and change the lighting (CFS). But if this request is not accepted, you've no choice but to use legal remedies. England is a country that in every city in which there are several officers in different parts of the city. Among their responsibility is that in this case, they must investigate complaints and take necessary action.

PROPOSED MEASURES AND RULES TO REDUCE LIGHT POLLUTION FOR IRAN

As a lighting system with suitable design can have positive effects not only in terms of energy consumption, but many important benefits such as public safety, reduce crime, and generally make good sense in society, conversely, the phenomenon of light pollution can act in contrast and effect on several factors, especially about astronomy and even mental illnesses in humans. An overview of the measures taken in Iran and other countries on the fight against light pollution phenomenon indicated the importance of this issue in global contexts and its ignorance in the country.

Lack of concrete measures taken in Iran and the lack of guidelines and rules for implementation in the field, emphasize on ignoring this issue in this country. Despite failing to keep pace with global developments in previous years, regarding the issue and the steps taken in recent years has increased and it is hoped that with the increasing trend of considering this issue, the more laws will be enacted to eliminate light pollution in our country, especially with the establishment of the National Observatory.

The following are a few guidelines and proposed legislation for Iran that was referred as follows:

- Holding Exhibitions.
- Holding Seminars.
- Coordination with global operations.
- Technical Committee of light pollution.
- Determination the overall patterns of light with regard to the colour and sensitivity of its impact on the morale of the citizens and the use of standard equipment without causing light pollution.
- Prevention of the installation of high-wattage light fixtures with high brightness front of supermarkets, grocery stores and etc. that is causing cataracts at least.
- Lighting systems should be equipped lamps with the technology that maximize efficiency.
- Lighting systems should be built up by the brightness of the bright areas is not greater of minimum brightness specified by law of regional security.
- Lighting systems should be supported by systems that are able to reduce the amount of light nightly after hours of silence.
- Installers of lighting fixtures are only allowed to install items that are listed on it: "In accordance with the rules dealing with light pollution with minimum energy consumption in accordance with the law of Iran."
- Manufacturers, importers and producers must add the certification of their product adaption with enacted laws in Iran and photometric measurements of their product in their product technical data sheet.
- Developing standards for street lighting.
- Training and guidance counselors of lighting.
- Training and guidance lighting installation contractors (especially in streets).
- Training and guidance the agents of maintenance of lighting systems.
- Standards exploitation of street lighting systems (especially in streets).
- Standards for street lighting in particular.
- Developing and implementing standards, especially illumination of billboards around the streets and roads.
- The use of lights, with zero light pollution (labeled anti-light pollution).

- Setting standards and rules to deal with the spotlight shining directly into sky (for advertisement).
- Adequate training of managers and building occupants for efficient use of lighting.
- The use of new lighting systems, such as intelligent systems Dali

CONCLUSION

Proposals submitted in reducing light pollution must cover all the issues. According to research methods to reduce light pollution in other countries, it was observed that the successful experiences of other countries can be used as a model to reduce light pollution in Iran.

For codification of Legislation to combat light pollution in Iran, the following trend is suggested:

According to a survey conducted in this paper the results of research and evaluation, a comprehensive legislation should be enacted to Iran in relevant to its geographical location and municipal laws in 1975 in relation to urban lighting and other relevant laws by a technical committee in the fields of lighting, sanitation, health care, urban management, municipal experts and other related professionals.

The following steps should perform and continue in appropriate way:

- Holding seminars related to the need to reduce the light pollution with the IFs, officials and stakeholders.
 - The approval of a simple instruction based on disusing lights with contamination level of high brightness level.
 - Preparation of a full proposal to reduce the light pollution.
 - The adoption and law enforcement in five major cities of the country by Parliament.
- The adoption and enforcement mentioned rule in the case of obtaining favourable results in the preceding paragraph for at least two years after the implementation of Article 5.

REFERENCES

1. Dalalianmiandoab, P, Sanai, H., BorjaliNavesi, R. (2013). new ways of modeling a variety of light pollution, the First National Conference on Electrical and Computer Engineering at north of the Iran.
2. Dalalianmiandoab, P, TaghizadeganKalantari, N, MahmoudiMoghaddam, K, Zabihi, Gh (2013). types and methods of measuring light pollution, the first national conference on new technologies and robotics in the electrical industry.
3. Anon. (2006). Law on regulating ambient lighting for the protection of night environment.pp98
4. Anon. (2006). Pilot programme on the evaluation and reduction of light pollution in Catalunya.pp233
5. Anon. (2006). The Czech law on Protection of the Air, including Light Pollution prevention. Pp342.
6. Anon. (2006). Somerset County (United Kingdom), Local Agenda 21, Noise and Light Pollution. Available.

CITATION OF THIS ARTICLE

Payam D M, Hamed S, Mehrdad T H, Mohsen A, Farzad V M. Review and Offering Solutions to Deal with Light Pollution in Iran in Terms of Technical Reports over the World. Bull. Env. Pharmacol. Life Sci., Vol 3 [11] October 2014: 199-203