

## Japanese Government Official Guideline for Reduction of Light Pollution

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**Abstract.** After 3-year discussions within a working group of the Japanese CIE and then 2-year discussion under a committee of the Environmental Agency in Japan, "Guideline for Light Pollution - Aiming for Good Lighting Environments" was published by the Environmental Agency. This is the first governmental guideline in the world and therefore a good example to be discussed in the other countries.

### 1. Introduction

The governmental environmental agency of Japan published "Guidelines for Light Pollution - Aiming for Good Lighting Environments" in March 1998. This is the first governmental guideline in the world which deals with reduction of light pollution. Here, I will describe the processes by which this guideline was set up and some important points considered within the guideline.

The IAU (International Astronomical Union) has been discussing light pollution and has been in contact with the CIE (Commission Internationale de l'Éclairage, International Commission on Illumination) from just after the creation of IAU Commission 50, "Protection and Identification of Existing and Potential Observatory Sites". A CIE document "Guidelines For Minimizing Urban Sky Glow Near Astronomical Observatories" was published in 1984. After IAU Colloquium No.112 "Light Pollution, Radio Interference and Space Debris" held in Washington D. C. in August 1988, CIE set-up a technical committee within Division 4, TC4-21 "Interference of Light with Astronomical Observations", with Chairman Dr. Duco A. Schreuder, in 1989. I was appointed to be one of the members of TC4-21 because I was the Vice President of IAU Commission 50. I then contacted the CIE in Japan and the Lighting Society of Japan and succeeded in establishing a Working Group within the Society.

Following a request by some astronomers, the Bureau of Atmospheric Preservation of Japan, under the Environmental Agency, have adopted a star-watching programme from 1986, as one measure of *air* pollution (Isobe & Kosai 1998). This is a simple method to determine night-time sky brightness by taking a photograph of a known bright star within the frame pointing near the zenith. Over all of Japan there were 100 groups who participated in this programme at the beginning and 300 groups in the latest year. Through this connection, officers at the Bureau learned of the CIE activities and then joined the Working Group in the Lighting Society of Japan. They were very keen on the possibility that the

CIE resolution would become an ISO standard which might not be applicable to the current Japanese systems and regulations.

After 3 years' study within CIE Japan, they understood what problems existed and set up a Committee within the Environmental Association, which is totally controlled by the Environmental Agency. In contrast with the Working Group, the Committee had members from different fields, officers of local government, physicists dealing with atmospheric phenomena, and so on. Therefore, the Committee covered most fields relating to light pollution.

To have an idea of this guideline, it is good for the reader to ask for a copy of the Guideline either from the Environmental Agency or from the present author. An essential point of this Guideline is to give a check list to use when outdoor lighting fixtures are prepared. This is a perfect list: therefore if one follows this list, we may minimize light pollution. However, it is usually the case that when one builds a house or a building, one does not seriously take care over the lighting design. Therefore, the Guideline recommends that higher status be given to lighting engineers, who can manage good outdoor lighting to minimize light pollution.

The guideline reviews the problems relating to bad lighting and defines good lighting systems. It also requests good monitoring systems. However, it gives only three lines of the text for monitoring of night-time brightness by satellite measurement. Certainly, ground-based observation of sky glow is able to give a direct measure of light pollution, but the star watching programme needs many collaborating people all over the area to be measured. This is good to educate people for light pollution, but it cannot cover all the land area and also its accuracy is rather worse (0.2 magnitude for faint sky brightness to 1.0 magnitude for bright sky brightness).

Since there are so many parameters to be considered in order to have a good measure, the other ground-based observation does not give an accurate sky brightness as expected. Satellite measurements (Isobe & Hamamura 1998, 2001) detect light escaping to space, which is energy loss. This cannot be a direct measure of light pollution, since the density of reflecting materials varies from time to time, but it can provide a better measure than a star-watching programme. Satellites are obtaining digital data on the night-time brightness all over the world every day and therefore we can obtain its daily variation. The Guideline could not unfortunately stress this point.

It is hoped that readers of this article will study the Guideline and will set up similar Guidelines or regulations in each country; then those well-studied Guidelines will push the Japanese Guideline to be better.

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Table 1. Contents of the Guideline for Light Pollution

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### *Appendix*

Technical terms, abbreviations and symbols used in the guidelines

## References

- Isobe, S. and Kosai, H. 1998, Star Watching Observations to measure night sky brightness, ASP Conference Series, Vol. 139, pp 175-184
- Isobe, S. and Hamamura, S. 1998, Ejected city light of Japan observed by a defense meteorological satellite program, in ASP Conference Series, Vol.139, pp 191-199
- Isobe, S., Hamamura, S. and Elvidge, C. 2001, Educating the public about light pollution, in this volume