THE FIGHT AGAINST LIGHT POLLUTION IN ITALY

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ABSTRACT. The author outlines the steps of the fight against light pollution in Italy in the last years.

1. Introduction

The problem of light pollution is unfortunately, as diffused in Italy as it is in all industrialized and populated countries. In fact, until some time ago, nothing had really been done, neither to limit the phenomenon nor even to understand it.

In 1990, in the meeting of SAIt in Abano, I proposed to found a committee of study; its purpose was to determine which, technically, are the most polluting light sources, both as form and as spectral emission. Furthermore, after having studied the diffusion of the phenomenon throughout the national territory - especially near the most important Observatories - our goal is to find the best solution. This Organism, composed of three members Prof. Massimo Capaccioli from Padova, Prof. Salvatore Cristaldi from Catania and myself, began its work inviting all the national Observatories to fill in a questionnaire. Ten out of twelve answered: from the results of the questionnaire the following information emerged, and was presented at the meeting of S.A.It in Torino in 1991.

2. The situation in Italian Astronomical Observatories in 1990

The following is a brief statistical and objective analysis of the received data (Di Sora 1993).

- Forty per cent (40%) of the Observatories operate under skies that possibly do reach a magnitude 6 with a pollution index judged to be tolerable; thirty per cent (30%) are capable of reaching values of approximately magnitude 5; the remaining twenty per cent (20%) do not exceed magnitude 3. In each case the source of pollution is both private and public.

- Forty per cent (40%) of the sites are disturbed by mercury lamps and in the remaining cases it was seen that sodium lamps, mostly the high pressure ones, can

also be disruptive.However, the use of sodium lamps is less dangerous than that of mercury ones.

- As far as possible recovery of the quality of the skies is concerned, 20% of the interviewees gave a positive response, 30% responded negatively, while the remaining 50% declared that there exists the possibility.

Regarding the work done by the Observatories, an interesting and significant remark emerges concerning the matter of contacting organisation that are responsible for existing equipment.

- Forty per cent (40%) of the Institutions never contacted the competent authorities, obviously deducing as a result: ". . . Wild street lamp!" The remaining sixty per cent (60%) of the Observatories, when contacting the companies mentioned above, realised that some concern exists regarding the advanced state of the matter.

Therefore, this clearly demonstrates that it is possible to obtain favourable results with a minimum of effort and firmness. However, it has been fully recognised that bringing this problem to the attention of the Public Authorities and of the big companies that produce lighting materials could mean taking one big step forward in resolving the problem.

Concerning the features that should be prevent in a c.d. lamp and in order to conform to an anti-light pollution norm, 60% of the Observatories opted for the use of low-pressure sodium lamps. The remaining half shared the ideas of the Committee, already partially at work, to reduce by fifty per cent (50%) the lighting in normally illuminated areas after a certain hour.

3. The Bill N.751

Nevertheless the situation was such to impose a law making solution. In fact, precise and organic laws do not exist in Italy regarding external lights. Even the manufacturers of illuminating equipment operate in total freedom. Technical offices and engineers do not know the minimum problem regarding the diffusion of light up-wards. For this reason the Committee elaborated, in collaboration with other Observatories, a bill presented at the meeting of S.A.It. in Teramo in 1992 and signed by Honourable Lino Diana and others. The merit of it, compared to similar measures approved in other countries, derives from the fact that:

1. It is not a strictly territorial law but one that operates in all the country.
2. Besides, the protection of the sky in general, and of some Observatories in particular, it established a serious and vigorous term of politics of the lighting engineering apparates and of power saving consumption.

A possible adoption of this bill could bring the following results:

a appreciable reduction of light pollution in the unprotected areas to within ten to fifteen years;

b nearly the total redaction of light pollution in the protected areas (20) within three to five years;

c saving of energy for about three hundred to five hundred billion lira only for the use of external lighting, private and public;
d rationalization on the designing and the use of the light sources;
e limitation of the dazzle phenomenon.

The studies done by the Committee determined, therefore as main responsible factors of light pollution, the following facts

1. street lamps with open optics (spheres, lanterns and similar);
2. traditional street-lamps with protective curve glass, even worse if refractor according to the principle of Fresnel. In fact this type of street-lamp, contrary to assertions of some engineers and manufacturers (really few only in Italy), not only send and waste a large quantity of light and energy above 90 degree - to the thirty times more in comparison with the cut-off one (30-35 cd/klm vs. 0-1 cd/klm) - but even provokes irksome phenomena of dazzling (typical value of G is 4.5). So much so that the UNI rule n. 10439 (passed in 1995) implicitly advises against its use (see the prospect 1 of this). Besides all this is eminently demonstrated by the occurrence that, in the U.S.A. - aside from the presence of astronomical observatories - the new street-lamps are all cut-off type and the old ones with refractor and curved bowl had been modified with simple metallic screens. In fact, just last year, the General Electric (the most important producer of street lamps in the U.S.A.) communicated that by now, the manufacture of cut-off lamps have surpassed that of prismatic bowl one. Besides, in Italy, there is the bad habit (out of ignorance or for evident commercial interests) to mount also the street-lamps with prismatic bowl at the same distance (25-30 metres) of that cut-off one (according to measures collected statistically by the Astronomical Observatory of Campo Catino and other organizations).
3. lights oriented with angles more than 30 degrees if symmetric and 0 degrees if asymmetric and not equipped with eventual shelters;
4. systems that work at full power without the possibility of being reduced after certain hours and with optics not parallel to the road surface;
5. from a spectrographic point of view light sources which are different from sodium ones.

We think that, if we want to reduce dramatically light pollution, it is opportune to do it over all the national territory, specially around the most important Observatories and around ones. For this reason the bill, not therefore a simple local ordinance, has as a final aim the reduction power consumption causing the compulsory use of sheltered street lamps and low consumption everywhere only with regard to installations carried out after the approval of the bill. As for protected areas, a modification of the installations is expected within four or five years. Criteria is also put forward for the realization of installation to be able to reduce considerably the amount of the light sent up-wards. Clearly the bill foresees also that after its approval, light sources not corresponding to such criteria, will neither be sold in Italy.

The main type of street lamp recommended is the "cut-off" one, with light emission, above 90 degree, of 0 candles for 1.000 lumen. With a flat and encased plain of glass and a 0 degree inclination compared to the ground, it totally cuts off the emission of light out-wards and up-wards giving the minimal contribution to light pollution only through the reflection of the road, furthermore not visible beyond certain distances.

Curved, refractor, white and dull protective glass, with diffused effects, are prohibited. Open optics (spheres, lanterns and others) but with transparent glass must be equipped of proper metallic screens to regulate the light flux. Traditional spot-light must be used from up-towards down and not vice versa In any case when this is not possible, the use of upper screens capable of limiting the light flux within the perimeter of illuminated surfaces, is compulsory (for example, the front of a building). Lamps with high efficiency, like the sodium ones, are nearly all foreseen. Flux reductors or line shutters are foreseen too. Sanctions for transgressors, only in protected areas, with variable radius (5-25 km) around the Observatories are applied only after an intimation by local police. Those that are not up-to-date can modify their installations avoiding in this way the sanctions.

The bill finances those town-halls interested in favouring rapidly the conversion of installations in those areas. Among the protected Observatories, there are also amateur observatories. In any case, even the town-halls that are not part of the protected areas, can apply the principles of this bill, through the approval of a special contract prepared by the Astronomical Observatory of Campo Catino (OACC).

Other events and activities in Italy until 1994 are reported in Di Sora (1994) and Cinzano & Di Sora (1994).

4. The last three years

After 1995 the fight against light-pollution has shown a remarkable acceleration. At the side of the SAIt, that has renewed the cited Commission (Salvatore Cristaldi - Catania, Pierantonio Cinzano - Padova, Mario Di Sora - Frosinone and Valentina Zitelli - Bologna), has been the UAI (The Union of Italian Amateur Astronomers) with the same strong resolution it had when its Light Pollution Commission was founded in 1990 by Pierantonio Cinzano, at that time a student. The Commission was directed by Luigi Baldinelli of the AAB (Amateurs Astronomers of Bologna) and, at the moment, by Carlo Rossi of the AAMT (Amateur-Astronomer Association of La Tolfa Mountains). Other institutions have been involved such as AIDI (Italian Lighting Association), ASSIL (The Association of Lighting Manifacturers), ENEL (Italian National Institution for Electrical Energy) and LEGAMBIENTE (ecologists). This has allowed to increase considerably the debate front rending the problem of public dominion.

In the last years the following positive results have been achieved. At central legislative level the presentation of the cited bill (n. 751) and another one by Honourable Daniele Apolloni (presented with the n. 4515 at the House of Deputies). Some districts have moved approving laws as regards. At the moment the Venetian and the Valle D'Aosta region have provided in this way. While it results that there are other bills in Lombardia, Tuscany and Piemonte. The most important experiments, at local level, is that of some towns that have approved real rules such as those that have been in force in Arizona since 1958. This regulation has been elaborated by the Director of OACC Mario Di Sora (also Co-ordinator of SAlt Light–Pollution Commission) and it is at the disposal of all cities that would like to approve it. The right application of the same, guarantees a reduction of the light-pollution of 50% and of power consumption of 30% - 40%. The first town that approved it (1984) was Florence, even if the major concentration of dark cities are situated in the province of Frosinone and just near

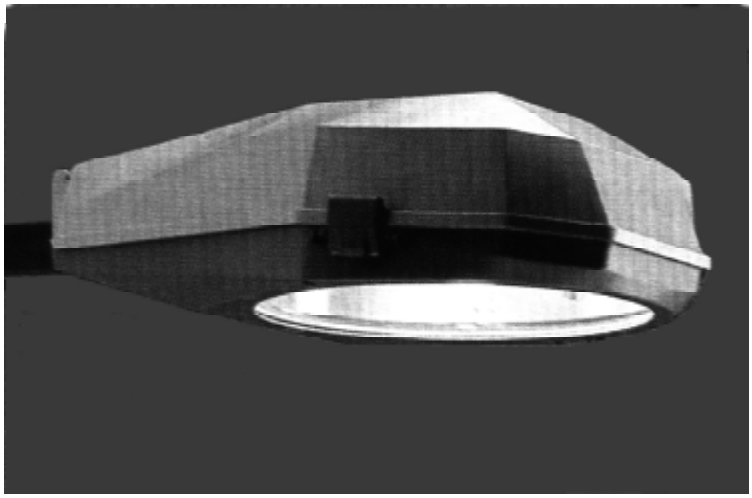

Fig. 1. A fully shielded fixture (courtesy FIVEP).

Fig. 2. A fully shielded fixture for urban design (Courtesy AEC Illuminazione).

Fig. 3. A fully shielded lantern for hystorical settings (Courtesy Domenico Neri Illuminazione).

the Astronomical Observatory of Campo Catino, Frosinone, Alatri, Ferentino, Ceccano, Giuliano di Roma, Guarcino, Fumone, Collepardo, Cassino. Very positive the result that was achieved in Civitavecchia by the amateur astronomers of the AAMT. Thanks to the approval of this rule and to an agreement between the town-hall and the ENEL with this last corporation (an intervention of five billion lira) will provide to the remaking of all installations in accordance with the new standards. In the mean time, in 1997, a Working Group was established at U.N.I. (Italian National Institution for Standardisation) with the contribution of astronomers, amateur astronomers, manufacturers, engineers and managers of lighting installations.

During the early stages there were some misunderstandings, but today also the producers have understood the importance and the gravity of this problem. And so FIVEP, Neri. Mareco, Philips, AEC, Schrèder, Guzzini (only to cite the most important as an example) have modified their products preferring the construction of optics with

Fig. 4. A beautiful example of axymmetric reflector with a shield expressely studied to avoid upward light emission even when installed with non zero inclination.(Courtesy Costruzioni Elettriche Schreder).

Fig. 5. An aximmetric fixture for urban lighting (Courtesy I Guzzini Illuminazione).

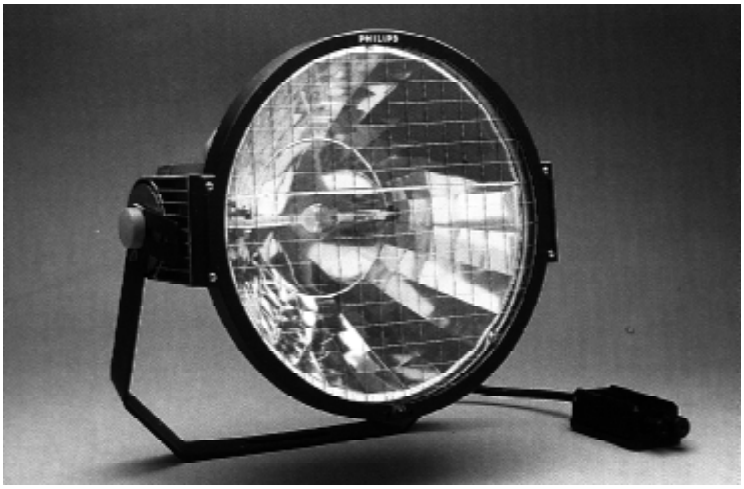

Fig. 6. The optic of this ArenaVision spot-light contains a shield with the purpose of limiting upward flux (Courtesy Philips).

Fig. 7. A less polluting alternative to the globes (Courtesy Mareco).

an emission of light upwards reduced or near 0. Some examples are shown in figures 1-6. An important Italian company, I Guzzini Illuminazione, has set up an original publicity campaign against light pollution on the most important Italian newspapers.

By now it is impossible to count the various meetings that took place in Italy regarding light-pollution. One of the most relevant was organized the 13th October 1998 in Frosinone with the participation of David Crawford, Executive Director of the International Dark-Sky Association. Furthermore every year a national day of light-pollution is organised by many institutions with the sponsorship of the International Dark-Sky Association. In this occasion the amateur-astronomers obtain the turning-off of the street-lamps to show everybody the wonders of the dark-sky. I would also like to stress that in 1997 the first Italian book specially devoted to this problem (225 pages) entitled "Light-pollution and protection of nocturnal sky" (Cinzano 1997) was published, certainly one of the best ever written.

5. Conclusions

In conclusion, I would like to say that, in spite of the fact that this problem was dealt with, with a considerable delay, we have however come a long way in the last five years. We have tried better what has been done by other countries previously. We hope that our experiment goes through with success serving for the best, not only the astronomical community but everyone.

References

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