

Participatory Dark Sky Quality Monitoring from Italy: interactions between awareness raising and research

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National Research Council of Italy

The Buiometria Partecipativa (BMP) project was started in 2008 in Italy with the aim of encouraging non-professionals to collect data on light pollution as a strategy for environmental awareness raising. The BMP project conjugates this component with a scientific approach, making a combined use of various technologies, and allowing the collection of valuable quantitative environmental data, using a low-cost device, called Sky Quality Meter (SQM). Measurements can be produced borrowing an SQM from the BMP instrument pool, if the users do not own one. The measurements are loaded to a database on the project web site, and are published in a variety of formats (maps, reports, charts).

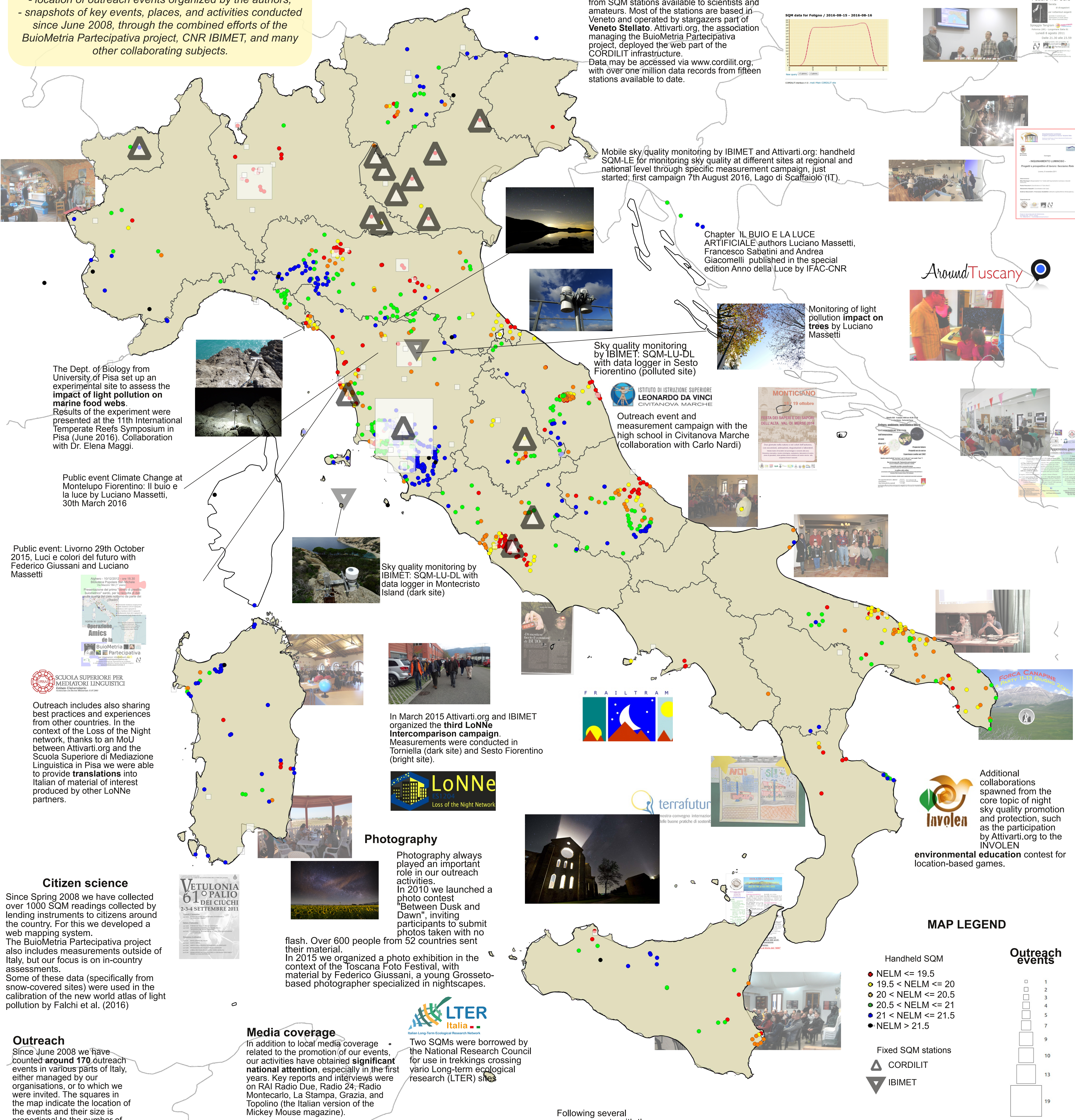
When it started, the BMP project was one out of two worldwide (and the first in the Western hemisphere) configured as a citizen science initiative involving sensors for night sky quality. In 2011 the system was extended to collect data from fixed SQM stations for continuous monitoring of night sky brightness, with the development of data harvesting procedure and leading to complement the citizen science measures with more high-quality time series of light pollution.

At the national level, the project has obtained considerable recognition, in terms of actual citizen participation, media coverage, and has received a national award for innovation and environmental awareness raising. Internationally, the BMP project represents one of the longest-running experiences of participatory monitoring of night sky quality, and has developed a significant network of relationships with other institutions engaged in research, awareness raising, and policy support. In 2013 the Buiometria Partecipativa project entered the Loss of the Night Network.

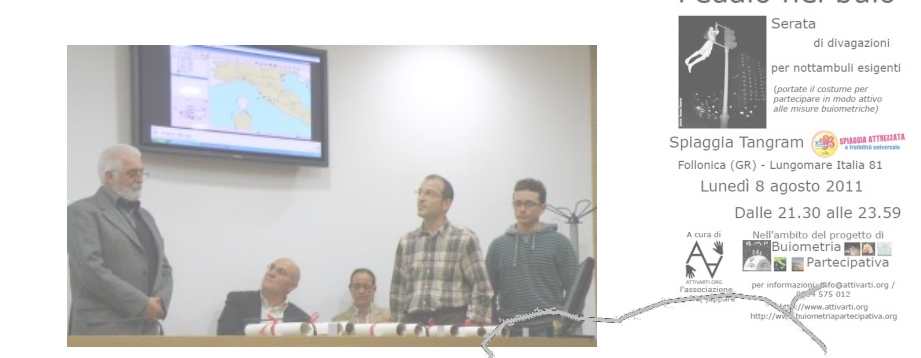
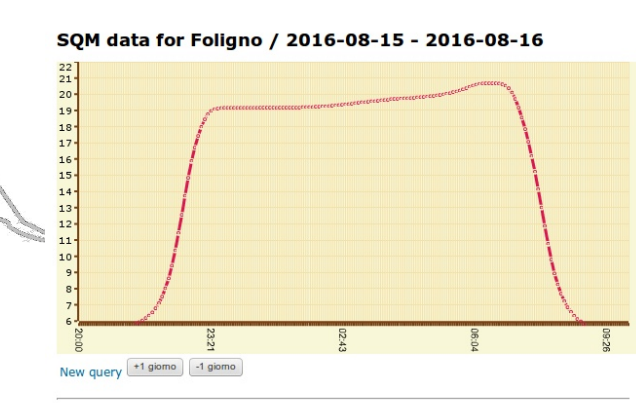
In 2014, the Institute of Biometeorology of the Italian National Research Council was also invited to join the Loss of the Night Network. On one side, the collaboration led the institute to investigate further the issue of artificial light at night, deploying sensors and conducting additional outreach activities. On the other side, Attivarti.org -the organization running the Buiometria Partecipativa project- was exposed to other cases of outreach and environmental education.

Our sites:
<http://www.buiometriapartecipativa.org> : main project site
<http://tinyurl.com/buiometria> : the full trail of events and initiatives since May 2008.
<http://www.cordilit.org> : SQM network
<http://www.fi.ibimet.cnr.it/the-institute> : IBIMET's main site

Below is a combined view of
 - locations of SQM measurements;
 - locations of the fixed SQM stations federated by the CORDILIT network;
 - location of outreach events organized by the authors;
 - snapshots of key events, places, and activities conducted since June 2008, through the combined efforts of the Buiometria Partecipativa project, CNR IBIMET, and many other collaborating subjects.



The CORDILIT network federates the effort of several organisations across Italy, making data from SQM stations available to scientists and amateurs. Most of the stations are based in Veneto and operated by stargazers part of Veneto Stellato. Attivarti.org, the association managing the Buiometria Partecipativa project, deployed the web part of the CORDILIT infrastructure. Data may be accessed via www.cordilit.org with over one million data records from fifteen stations available to date.



Mobile sky quality monitoring by IBIMET and Attivarti.org: handheld SQM-LE for monitoring sky quality at different sites at regional and national level through specific measurement campaign, just started: first campaign 7th August 2016, Lago di Scaffaiolo (IT).

Chapter IL BUIO E LA LUCE ARTIFICIALE authors Luciano Massetti, Francesco Sabatini and Andrea Giacomelli published in the special edition Anno della Luce by IFAC-CNR

AroundTuscany

Monitoring of light pollution impact on trees by Luciano Massetti

Sky quality monitoring by IBIMET: SQM-LU-DL with data logger in Sesto Fiorentino (polluted site)

Outreach event and measurement campaign with the high school in Civitanova Marche (collaboration with Carlo Nardi)

The Dept. of Biology from University of Pisa set up an experimental site to assess the impact of light pollution on marine food webs. Results of the experiment were presented at the 11th International Temperate Reefs Symposium in Pisa (June 2016). Collaboration with Dr. Elena Maggi.

Public event Climate Change at Montelupo Fiorentino: Il buio e la luce by Luciano Massetti, 30th March 2016

Public event: Livorno 29th October 2015. Luci e colori del futuro with Federico Giussani and Luciano Massetti

Sky quality monitoring by IBIMET: SQM-LU-DL with data logger in Montecristo Island (dark site)

In March 2015 Attivarti.org and IBIMET organized the third LoNNe intercomparison campaign. Measurements were conducted in Torriella (dark site) and Sesto Fiorentino (bright site).



Additional collaborations spawned from the core topic of night sky quality promotion and protection, such as the participation by Attivarti.org to the INVOLN environmental education contest for location-based games.



Outreach includes also sharing best practices and experiences from other countries. In the context of the Loss of the Night network, thanks to an MoU between Attivarti.org and the Scuola Superiore di Mediazione Linguistica in Pisa we were able to provide translations into Italian of material of interest produced by other LoNNe partners.

Citizen science
 Since Spring 2008 we have collected over 1000 SQM readings collected by lending instruments to citizens around the country. For this we developed a web mapping system. The Buiometria Partecipativa project also includes measurements outside of Italy, but our focus is on in-country assessments. Some of these data (specifically from snow-covered sites) were used in the calibration of the new world atlas of light pollution by Falchi et al. (2016)

Photography

Photography always played an important role in our outreach activities. In 2010 we launched a photo contest "Between Dusk and Dawn", inviting participants to submit photos taken with no flash. Over 600 people from 52 countries sent their material. In 2015 we organized a photo exhibition in the context of the Toscana Foto Festival, with material by Federico Giussani, a young Grosseto-based photographer specialized in nightscapes.



Media coverage

In addition to local media coverage related to the promotion of our events, our activities have obtained significant national attention, especially in the first years. Key reports and interviews were on RAI Radio Due, Radio 24, Radio Montecarlo, La Stampa, Grazia, and Topolino (the Italian version of the Mickey Mouse magazine).



Two SQMs were borrowed by the National Research Council for use in trekkings crossing vario Long-term ecological research (LTER) sites

Planning

In 2012-2013 the BMP project provided input to the drafting of the new Regional master plan for environment and energy in Tuscany. Several inputs were accepted and the final version of the plan contains references to the value of night sky and literature on impact of light pollution.

Following several measurements with the BMP handheld SQM, Giuseppe Amante and Alessandro Pensato, from Sicily, developed an Arduino-based NELM sensor.

Special acknowledgements go to:
 - Francesco Giubbilini, Luca Delucchi and Stefano Costa
 - The communities of Torriella and Piloni, in Southern Tuscany
 - Leopoldo Dalla Gassa and the Veneto Stellato association
 - The ES-1204 COST Action (Loss of the Night Network)

MAP LEGEND

- Handheld SQM
 - NELM <= 19.5
 - 19.5 < NELM <= 20
 - 20 < NELM <= 20.5
 - 20.5 < NELM <= 21
 - 21 < NELM <= 21.5
 - NELM > 21.5
- Fixed SQM stations
 - CORDILIT
 - IBIMET
- Outreach events
 - 1
 - 2
 - 3
 - 4
 - 5
 - 7
 - 9
 - 10
 - 13
 - 19

