Innovative policies for improving citizens' health and wellbeing addressing indoor and outdoor lighting

Deliverable D5.2
Ethical analysis

Contractual delivery date:
M13: 31.03.2022

Actual delivery date:
MX: 28.03.2022

Lead beneficiary:
PB11-UU

The ENLIGHTENme project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 945238.

Grant agreement no.	H2020 - 945238
Project full title	ENLIGHTENme - Innovative policies for improving citizens' health and wellbeing addressing indoor and outdoor lighting

Deliverable number	D5.2
Deliverable title	Ethical analysis
Type / Nature	☐ R - Document, report (excluding the periodic and final reports) ☐ DEM - *Demonstrator, pilot, prototype, plan designs* ☐ DEC - *Websites, patents filing, press & media actions, videos, etc.* ☒ ETHICS ☐ OTHER - *Software, technical diagram, etc.*
Dissemination level	☒ Public (PU) ☐ Confidential, only for members of the consortium and the Commission Services (CO)
Work package number	5
Work package leader	UU
Primary Author(s) *(in alphabetical order)* **& ORCID if available**	Deborah Mascalzoni (UU). ORCID: 0000-0003-4156-1464
Other authors *(in alphabetical order)* **& ORCID if available**	Mirko Ancillotti (UU). ORCID: 0000-0001-5748-0672
Reviewers *(in alphabetical order)*	Elisa Conticelli, Luigi Pilolli (UNIBO)
Language	English
Keywords	Human health, urban lighting, public health, environmental justice, One Health

The research leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 945238.

ENLIGHTENme Ethical analysis report

Version 1, 24 March 2022

1 Executive summary

The present deliverable reports about the work performed and the main results obtained in relation to one of the main objectives pursued within the work package (WP) 5, namely to identify and assess ethical issues of urban lighting policies with regard to human health (broadly defined), society, and the environment through a theoretical analysis.
A stepwise process of cumulative actions is described in detail in the 'Activities' section. A preliminary mapping of the ethical, legal, and social landscape of lighting-related issues was followed by a review based on the ethics literature. Past and current scientific participation and diffusion activities are also reported.
The main findings, as described in the 'Results' section, show that in the last few years there has been some ethical reflection about urban lighting, which comprised analysis of the effects of lighting on human health on different levels: physical (circadian rhythm, sleeping patterns) emotional (mood alteration, relationship between darkness and safety) and existential level (nocturnal sublime, value of darkness). On the other side, artificial lighting has also been looked at as positive social value (community security light and aesthetic value - lighting as art installations). Ethical concerns with regard to lighting (portrayed mostly as pollution) includes heavy risks and impact to the environment and the wildlife (migration patterns, sleeping patterns, reproductive patterns).
Although the ethical analysis is necessary to provide a theoretical foundation, a gap was identified in the literature, which emerged also during peers' discussion during the 2021 'International Conference - Shaping light for health and wellbeing in cities': there is a need to provide an ethical framework or guiding ethical principle(s) easily applicable to practice and in lighting policy/decision making. To this end, the environmental justice principle and the One Health approach have been identified as promising notions. 'Environmental justice' is the principle according to which all people are entitled to equal protection of environmental and public health laws and regulations. One Health entails recognizing that optimal human health is achievable recognizing the interconnection between people, animals, plants, and their shared environment. There is a need to emphasize that domestic and urban lighting are central public health issues and, as such, they require an ethical reflection on the moral justification of current and potential lighting practices, initiatives, and policies. Then, it needs to be pointed out the limits and risks, including for humans, of considering the public health dimension of lighting in isolation from the other known consequences of lighting for animals and the environment.

2 Introduction

WP5 combines empirical and analytical approaches with the aim to identify, assess and suggest ways to respond to normative and societal challenges of urban lighting. The overall objectives of this WP can be summarized as follow:

A. To identify and assess ethical issues of urban lighting policies with regard to human health (broadly defined), society, and the environment through a theoretical analysis. The present report primarily focuses on this objective.
B. To provide legal and ethical guidance for the recruitment of participants in the ENLIGHTENme biomedical trials (WP3).

C. To develop legal guidelines and recommendations for the data management of datasets from retrospective and perspective collections taking into considerations at the same time the strive for open data and GDPR compliance.

The results of the theoretical study (A) and of the legal analysis within aims B and C will be discussed within the communities in collaboration with WP2. Interviews and focus groups will investigate the perception of the ethical challenges among the stakeholders. The objective is to identify preferences and fears thorough qualitative and quantitative work that coupled with the theoretical study will be conceptually analysed within the framework of a so-called wide reflective equilibrium and inform the work of WP4 in the co-development of recommendation for urban lighting policies.
WP5 work novelty is the integrated process that merges the theoretical analysis on the ethics of lighting policies and their effects with stakeholders' perceptions. The aim is to produce an integrated approach to be immediately tested within the co-creation policy process. This leads to add an ethical and legal element to the process of stakeholders' involvement to make it ethically informed.

The aim of the present deliverable is to provide the theoretical ethical foundation for the successive empirical investigation and final contribution to recommendations for urban lighting policies.

3 Description of Activities

The achievement of the deliverable is a stepwise process, which has been primarily pursued through the activities described in the following.

1) **Synopsis of the field** – The first step consisted in preliminary mapping the themes of ethical, legal, and social relevance for the project through a series of peers' meetings and a snowball literature review.

2) **Review** – It was performed a systematic review of the current ethics literature in English language into five databases: Web of Science, Scopus, PhilPapers, PubMed, JSTOR. The search was performed for titles, abstracts, and keywords in the period 1971-2021. The search terms and Boolean operators used were the following: ("moral" OR "ethic*) AND ("night-time light*" OR "urban light*" OR "outdoor light*" OR "indoor light*" OR "domestic light*" OR "light pollution" OR "artificial light*" OR "lighting quality" OR "lighting behav*" OR "light hygiene" OR "lighting poverty" OR "lighting policy" OR "smart lighting"). The search produced 44 results, which after eliminating duplicates and non-pertinent documents, were reduced to 14. The documents were read and relevant contents were organized by topic order, i.e. by main topics or issues.

3) **Conference organization and presentation**. WP5 members contributed to the organization of the 'International Conference - Shaping light for health and wellbeing in cities', 16-17 December 2021. In the specific, WP5 members took care of the promotion and facilitation of Session 6 'Ethical, legal, and social aspects (ELSA) of urban lighting and related health studies, chaired by Dr. Deborah Mascalzoni. Within the session, WP5 members presented and discussed in two talks the main findings of point 1 and 2 (synopsis of the field and review) and of issues connected to the deliverable 5.1.

4) **Extended abstract**. In order to participate to the conference described in the point 3, an extended abstract was submitted and then selected by the principal organizers of the conference (Ancillotti and Mascalzoni 2022). The text 'Light pollution and justice' was then published in the book of proceedings 'Shaping light for health and wellbeing in cities', published by the University of Bologna, Italy.

4 Results

In the following, the main results of the Activities described above are presented.

4.1) Synopsis of the field

The preliminary mapping of the themes of ethical, legal, and social relevance for the project highlighted two major clusters of interest, conceptually labelled as 'Procedures' and 'Contents'.

Under 'Procedures' were identified the ethical, legal, and social issues connected to the correct progress of the project itself. Mainly, they revolve around the themes of 'informed consent' of participants, 'data collection and data management', and the overarching theme of responsibly promoting 'citizenship involvement'. These themes have been addressed for the most part within the deliverable 5.1.

The 'Contents' cluster encompasses the ethical and social themes connected to current and new lighting settings. Two main themes are domestic and urban lighting. While in the case of domestic lighting the main issues connect to improving lighting quality and habits so to achieve a more sustainable and healthier use of artificial light, the theme of urban lighting is more complex and characterized by different ethical instances apparently suggesting different, and sometimes divergent practical implications. Urban light pollution, energy waste (Gallaway, Olsen et al. 2010), environment pollution and environment light pollution (Longcore and Rich 2004), as well as astronomical light pollution (Riegel 1973), recommend that first and foremost, there is a need to reduce the amount of light used to illuminate our cities at night. However, phenomena like lighting poverty and concern around social safety (Boomsma and Steg 2014, Pritchard 2017), but also aesthetic consideration of artificial light at night point towards opposite conclusions.

4.2) Review

The review work highlighted something that had already emerged while mapping the field, namely that little has been written about the ethics of lighting. Additionally, the ethical aspects of lighting-related issues were seldom the focus of the documents, but were rather secondary or ancillary issues. In a nutshell, nigh-time lighting has been essentially conceived negatively because deemed excessive and it was often connected to the notion of light pollution (Stone 2017). From the material, the following themes emerged: loss of darkness, energy waste, ecology, and, in a limited manner, animal harm, and human health.

Dark nights are valuable because they hold transformative power in terms of their important intellectual, cultural, aesthetic, and (psycho-physiologically) restorative effects (Dill 2021). The experience of dark nights is part of individuals' development of ecological consciousness (Naess 1989).

Energy waste entails an unjustified overproduction of energy for lighting purposes with consequent detrimental effects on the environment and on the allocation of public economic resources. The threshold between proper use and waste of energy changes according to the criteria used in the evaluation. However, as this dimension of the problem does not exist in isolation, it is unlikely that a technological innovation could solve it — for instance LEDs reduce energy consumption but potentially increase skyglow (Stone 2017).

Ecological concerns encompass both the issue of the harm provoked to fauna and flora by the intrinsic negative effects of night-time lighting but also the environmental issues connected to pollution caused by the energy required for night-time lighting. Considering animal harm, usually this issue is encapsulated in the broader dimension of ecological concerns. However, this holds true only insofar the value of animals is recognized according to a holistic view — what matters are not the individuals but the ecosystems, the species that include the individuals. The reflection on the ethics of light pollution affecting animals' wellbeing is minimal (Hampton, Hyndman et al. 2021).

Although the threat that light pollution poses to human health is so compelling that night shift work has been classified as a carcinogen (Stevens, Hansen et al. 2011), the ethical reflection on the issue is limited also in this case. At best, as for animal harm, there are mentions to the problem, often in connection to the already mentioned restorative effects of darkness, thus with reference to the intrinsic negative effects of light pollution (Stone 2018). However, taking into due consideration the undesirable effects to which light pollution is instrumental, it is clear that this is detrimental to human health not only because light impacts circadian rhythm but because it also contributes to the environmental crisis.

4.3) Conference organization and presentation

Presenting and discussing the results of the first two points (synopsis of the field and review) and from issues connected to the deliverable 5.1 gave the opportunity to receive a feedback from other members of the consortium as well as from an external, international expert audience. The discussion of the legal and ethical aspects of the project was interesting and proficuous and it also highlighted the potential utility of providing an ethical framework or guiding ethical principle(s) easily applicable to practice and in lighting policy/decision making.

4.4) Extended abstract

The text 'Light pollution and justice' described in further detail the themes described in the point 2 (Review), and drew an outline of the future ethical original work that was planned within the WP5 (Ancillotti and Mascalzoni 2022). Artificial light at night is essentially framed as an environmental problem, i.e. light pollution. Typically, the core of environmental problems is that they cause inequalities between people (living and future). Therefore, to the core, they raise justice problems. 'Environmental justice' is the principle according to which all people are entitled to equal protection of environmental and public health laws and regulations (Bullard 1996). With some adjustments to properly reflect the reality of lighting issues, it can be used to analyse light pollution as a public health problem. However, the principle could be extended to all living entities such that the entities whose interests should be considered when planning lighting policies would include also animals, species, plants and ecosystems. The environmental justice principle could be extended to other entities within the One Health approach to global challenges (AVMA 2008). This would entail recognizing that optimal human health is achievable recognizing the interconnection between people, animals, plants, and their shared environment.

5 Deviations

There were no deviations to date.

6 Conclusions

Building on the progress of the ethical analysis of the field performed hitherto and connected to the previously mentioned text 'Light pollution and justice' (4.4), two articles are currently under preparation. From the review of the ethics literature emerged that urban lighting and connected issues have received rather little attention, in spite of the huge impact that different lighting habits and policies have and will have on public health and on other life forms. One of the ethics articles focuses on the public health dimension of urban and domestic lighting. The other article focuses on the aforementioned environmental justice principle and One Health approach applied to lighting issues. Therefore, firstly we claim that domestic and urban lighting are central public health issues and, as such, they requires an ethical reflection on the moral justification of current and potential lighting practices, initiatives, and policies (Childress, Faden et al. 2002). Secondly, we point out the limits and risks, including for humans, of considering the public health dimension of lighting in isolation from the other known consequences of lighting for animals and the environment. The One Health approach offers opportunities for synergistic collaboration to address complex threats to health and wellbeing. While One Health approaches are increasingly recognized for national and international programmes in relation to zoonotic diseases, food safety, antimicrobial resistance, and climate change, its application to clinical practice and public policies impacting human health are lacking (Machalaba, Raufman et al. 2021). Potential journals where the article could be submitted are Public Health Ethics (Oxford University Press, Impact Factor 1,9) and One Health (Elsevier, Impact Factor 3,8).

This work will enrich the ethical discussion around artificial lighting. Until now, this has not only been rather scarce, as already mentioned, but it has been characterized by generalist claims typical of the normative ethics tradition. The gap that our work aims to fill is the lack of applied ethics contents. In practical action and decision-making, the

question seldom is a generic 'What I ought to do', but it often sounds like 'What I ought to do in these specific circumstances'. This is the difference between normative and applied ethics. While normative ethics studies what makes a course of action right or wrong, applied ethics focuses on actual cases, trying to ascertain whether or not certain actions and their consequences are right or wrong (DeMarco and Fox 2020). The latter is more suited to guide action in practice and indeed it needs real life cases to exist and inform it. As all possible real-life instances cannot be predicted, WP5 objective is to provide ethical tools, such a framework or a hierarchical set of principles, that can be used in actual lighting instances, even by non-ethicists.

In conclusion, the work done so far provides theoretically grounded and justified notions, i.e. lays the groundwork for 1) the successive WP5 empirical studies and for the interpretation of findings from other work packages, primarily WP2, and 2) informing ethically sound lighting practice and policy making in collaboration with the other members of the consortium.

7 References

Ancillotti, M. and D. Mascalzoni (2022). Light Pollution and Justice. Forthcoming in AlmaDL – University of Bologna.

AVMA (2008). One health: A new professional imperative. One Health Initiative Task Force Final Report. Schaumburg, IL, American Veterinary Medical Association.

Boomsma, C. and L. Steg (2014). "Feeling Safe in the Dark:Examining the Effect of Entrapment, Lighting Levels, and Gender on Feelings of Safety and Lighting Policy Acceptability." Environment and Behavior 46(2): 193-212.

Bullard, R. D. (1996). "Environmental Justice: It's More Than Waste Facility Siting." Social Science Quarterly 77(3): 493-499.

Childress, J. F., R. R. Faden, R. D. Gaare, L. O. Gostin, J. Kahn, R. J. Bonnie, N. E. Kass, A. C. Mastroianni, J. D. Moreno and P. Nieburg (2002). "Public Health Ethics: Mapping the Terrain." Journal of Law, Medicine & Ethics 30(2): 170-178.

DeMarco, J. P. and R. M. Fox (2020). New Directions in Ethics: The Challenges in Applied Ethics, Routledge.

Dill, K. M. (2021). "In Defense of Wild Night." ETHICS POLICY & ENVIRONMENT.

Gallaway, T., R. N. Olsen and D. M. Mitchell (2010). "The economics of global light pollution." Ecological Economics 69(3): 658-665.

Hampton, J. O., T. H. Hyndman, B. L. Allen and B. Fischer (2021). "Animal Harms and Food Production: Informing Ethical Choices." ANIMALS 11(5).

Longcore, T. and C. Rich (2004). "Ecological light pollution." Frontiers in Ecology and the Environment 2(4): 191-198.

Machalaba, C., J. Raufman, A. Anyamba, A. M. Berrian, F. C. J. Berthe, G. C. Gray, O. Jonas, W. B. Karesh, M. H. Larsen, R. Laxminarayan, L. C. Madoff, K. Martin, J. A. K. Mazet, E. Mumford, T. Parker, L. Pintea, M. K. Rostal, R. R. de Castañeda, N. M. Vora, C. Wannous and L. M. Weiss (2021). "Applying a One Health Approach in Global Health and Medicine: Enhancing Involvement of Medical Schools and Global Health Centers." Ann Glob Health 87(1): 30.

Naess, A. (1989). Ecology, Community and Lifestyle: Outline of an Ecosophy. Cambridge, Cambridge University Press.

Pritchard, S. B. (2017). "The Trouble with Darkness: NASA's Suomi Satellite Images of Earth at Night." Environmental History 22(2): 312-330.

Riegel, K. W. (1973). "Light Pollution." Science 179(4080): 1285-1291.

Stevens, R. G., J. Hansen, G. Costa, E. Haus, T. Kauppinen, K. J. Aronson, G. Castaño-Vinyals, S. Davis, M. H. W. Frings-Dresen, L. Fritschi, M. Kogevinas, K. Kogi, J.-A. Lie, A. Lowden, B. Peplonska, B. Pesch, E. Pukkala, E. Schernhammer, R. C. Travis, R. Vermeulen, T. Zheng, V. Cogliano and K. Straif (2011). "Considerations of circadian impact for defining 'shift work' in cancer studies: IARC Working Group Report." Occupational and Environmental Medicine 68(2): 154.

Stone, T. (2017). "Light Pollution: A Case Study in Framing an Environmental Problem." ETHICS POLICY & ENVIRONMENT 20(3): 279-293.

Stone, T. (2018). "The Value of Darkness: A Moral Framework for Urban Nighttime Lighting." Science and engineering ethics 24(2): 607-628.