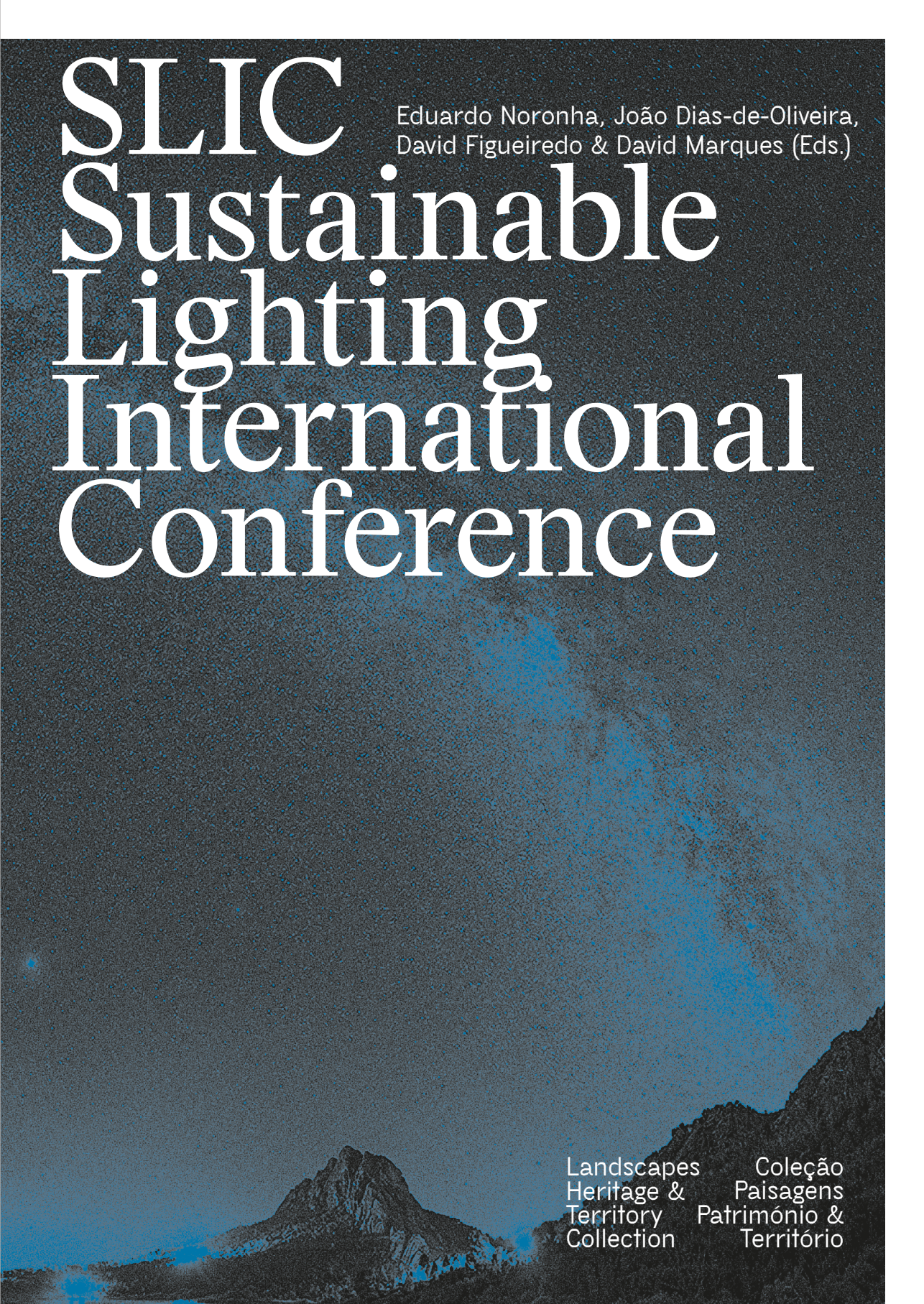
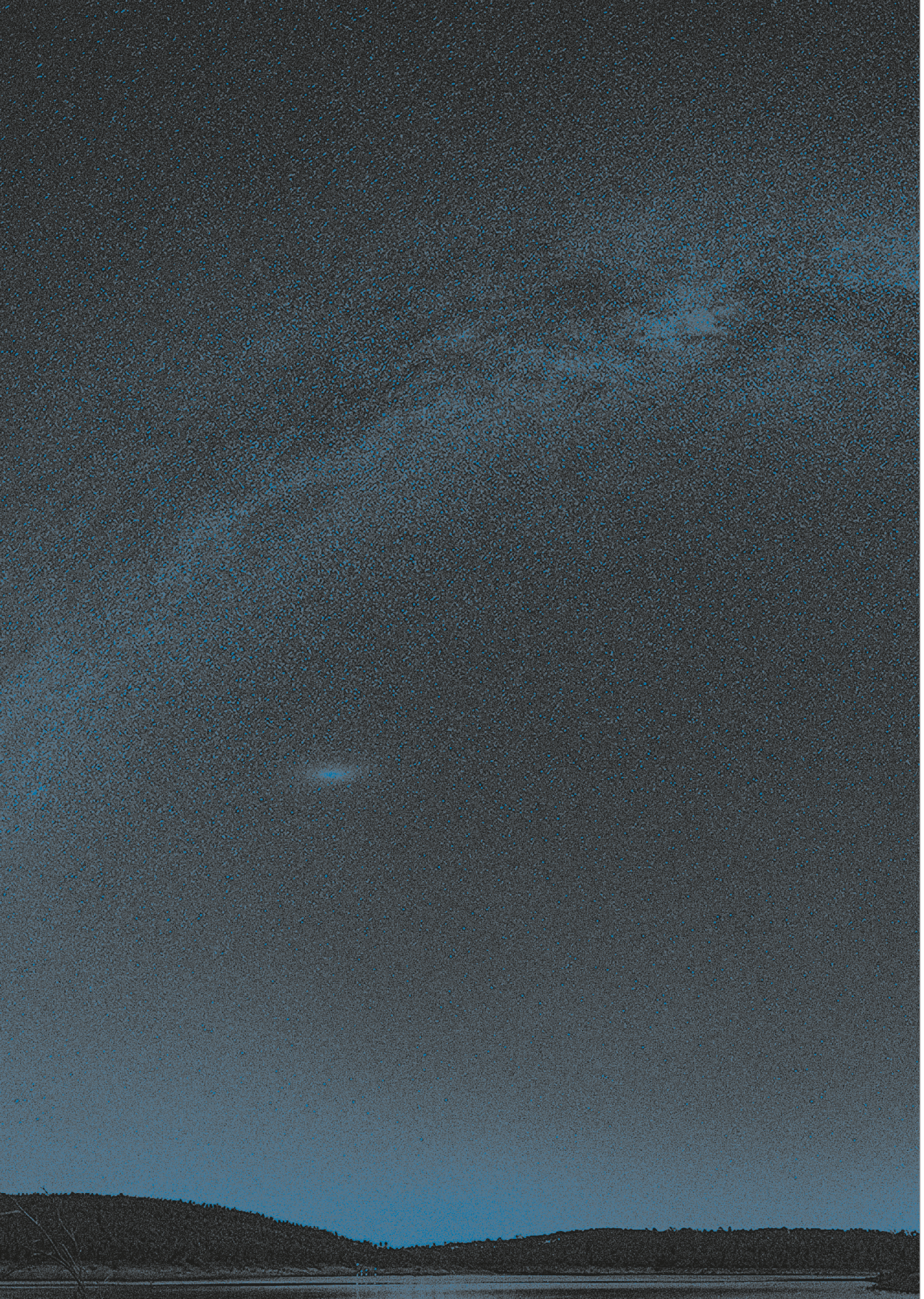
SLIC Sustainable Lighting International Conference

Eduardo Noronha, João Dias-de-Oliveira,
David Figueiredo & David Marques (Eds.)



Landscapes Heritage & Territory Collection

Coleção Paisagens Património & Território



SLIC
Sustainable Lighting
International Conference

Eduardo Noronha
João Dias-de-Oliveira
David Figueiredo
David Marques
(Eds.)

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SLIC
sustainable lighting
international conference

The *Sustainable Lighting International Conference* (SLIC) was held on the 10th and 11th of October 2025, bringing together researchers, professionals, and students to discuss the future of sustainable lighting. The first day featured keynote lectures by Kerem Asfuroglu and Jordi Rocasalbas, alongside presentations from authors from various countries and disciplines. Discussions focused on light pollution mitigation, energy efficiency, ecological awareness, and the cultural dimensions of night-time environments. The second day offered a series of social and cultural activities. Participants discovered the city of Aveiro through guided experiences and, later, visited the village of Álvaro, Oleiros, part of the Schist Villages, which is a network that is certified as a “Startlight Tourism Destination”. Here, a night-sky observation activity took place, in collaboration with Dark Sky Alqueva, highlighting the value of preserving natural nightscapes and raising awareness about light pollution.

DAY 1 — FRIDAY, OCTOBER 10, 2025

09h30 Opening Session

10h00 Keynote: KEREM ASFUROGLU

11h00 Coffee Break

11h30 PRESENTATION SESSION I

Going Dark for Resilient Cities: Ten Years of Satellite Monitoring of Nightlight Pollution on Greenery Urban Areas
Constanza Borghi

Eco-physiological Impacts of Light
João Pestana

Access to an Unpolluted Night Sky — The Need for a Dark Skies Treaty
Hannah Dalgleish

From Light Spill to Light Control: The Role of Shielding in Public Lighting Design,
David Marques

Reaching Sustainable Lighting in Urban Marine Areas through the Right Balance of Light: Implications for the Lighting Design of the Built Environment,
Luís Raposo

Star Dome: Fostering Dark Sky Stewardship
Katrina Matejcik

13h00 Lunch Break

14h30 Keynote: JORDI ROCASALBAS

15h30 Coffee Break

16h00 PRESENTATION SESSION II

From Plastic Waste to Urban Streetlights: A New Green Perspective for the Cities of the Future
Giuseppe Vendraim

Liminal Lighting Systems: A 4D Printing Approach for Adaptative and Bio-Inspired Desgin
Victor Neto

Adapting Light-Point Simulations for Assessement of Upward Light Emissions in Urban Light Planning
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Perceptual Illusion as a Lighting Design Tool — The ALDA Method
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Visual Comfort in Modernist Hospitals: Preliminary Comparative Assessment of Human-Centered Lighting in Old and New Inpatient Blocks
Jenifer Daltrozo

Assessing the Predictive Accuracy of Circadian Lighting Simulations in an Office Environment
Georgios Triantafyllidis

18h00 Closing Session

20h00 Dinner Event at Meliá Hotel

DAY 2 — SATURDAY, OCTOBER 11, 2025

MORNING & AFTERNOON:
EXPLORING AVEIRO — ORGANIZED WITH TURISMO IN AVEIRO

10h00 Ovos Moles Workshop at Oficina do Doce (Rua João Mendonça, 23/ Aveiro)

11h15 Moliceiro/Merchant Boat Ride along the city's channels (featuring Art Nouveau façades, salt pans, the Congress Centre, etc.)

12h15 Visit to the Salt Pans (tradicionally produced)

EVENING & NIGHT: TRIP TO ÁLVARO, OLEIROS

17h00 Bus departs from University of Aveiro toward Álvaro, Oleiros

20h00 Dinner at Álvaro Village

22h00 Night-sky observation under dark skies

23h00 Return trip to Aveiro

Forewords

Fátima Pombo

Full Professor of Design, Head ID+ Research Institute for Design, Media and Culture, University of Aveiro, Portugal

One of the major themes today is the construction of a new rationality, with different relationships between humans, technology, material and immaterial culture, artifice and nature and its finite resources; a new rationality that manages to integrate the balance between what belongs to nature and what belongs to invention and innovation. Insightful authors from different areas of research also provide a sharp portrait of our times. Zigmunt Bauman, giving considerable attention to the contradictions of modernity and postmodern ethics, presents a detailed analysis in his trilogy *Liquid Times. Living in an Age of Uncertainty*, (2007); *Liquid Love: On the Frailty of Human Bonds* (2003) and *Liquid Modernity* (2000). Peter Sloterdijk has a complex body of work, being his *magnum opus* the trilogy *Sphären* (1998, 1999, 2004) which, developed from diverse and varied sources of knowledge, encourages reflection on the condition of being in today's world, as it presents itself to us, with humans, animals, plants and machines as the protagonists of this condition. Ezio Manzini, with a recognised research on the role of design in approaching social innovation and in building a sustainable and resilient society, in the work *Abitare la prossimità. Idee per la città dei 15 minuti* (2021), recalls Heidegger's legacy with his interpretation of care and caring as conditions for the new paradigm of inhabiting, living and coexisting in the city. Andrea Branzi, in *Ritratti e Autoritratti di Design* (2010) and *Gli strumenti non esistono. La dimensione antropologica del Design* (2013) argues that environmental and sustainability issues, which are fundamental to safeguarding ecological balance, must be addressed within a creative culture that includes human beings and their environment in the broadest sense, thus encompassing environmental, ergonomic, social, symbolic and aesthetic issues. There are many other authors who remind us of the state of the art in contemporary times. Referring to other texts, such as the United Nations Annual Report of July 2022, the serious dangers facing the 17 SDGs are clear: "According to the Report, cascading and interlinked crises are putting the 2030 Agenda for

Sustainable Development in grave danger, along with humanity's very own survival. The Report highlights the severity and magnitude of the challenges before us. The confluence of crises, dominated by COVID-19, climate change, and conflicts, are creating spin-off impacts on food and nutrition, health, education, the environment, and peace and security, and affecting all the Sustainable Development Goals (SDGs)." (https://unstats.un.org/sdgs/report/2022). In the most recent report, dated July 2025, the United Nations Secretary-General lists in the 'Preface' successful examples of the implementation of the 2030 Agenda for Sustainable Development, but adds that "Despite these important gains, conflicts, climate chaos, geopolitical tensions and economic shocks continue to obstruct progress at the pace and scale needed to meet the 2030 target. This year's Sustainable Development Goals Report finds that only 35 per cent of SDG targets are on track or making moderate progress. Nearly half are moving too slowly and, alarmingly, 18 per cent are in reverse." (In The-Sustainable-Development-Goals--Report-2025.pdf, p. 2)

Design must be at the forefront of the collective and multidisciplinary response to building a better world that we have an obligation to leave to future generations. Design research must be active and creative in contributing to a more sustainable, bluer and greener world. The inspiration to pursue this without giving up or having doubts comes from the planet, from the Earth. It is "bio-inspired", to quote this eloquent expression that has already faded from its author, becoming everyone's. Design research as "earth-centred design" integrates knowledge as a systemic possibility to imagine and create new, fairer, truer and more beautiful futures.

Paula Marques

Coordinator, TEMA — Centre for Mechanical Technology and Automation University of Aveiro, Portugal

At the Centre for Mechanical Technology and Automation (TEMA) we perceive research as a collaborative and proactive effort. TEMA is a cohesive, multidisciplinary community that operates at the intersection of engineering, materials science, product development, and sustainability, fostering exchange across academic borders.

While our involvement in SLIC25 primarily stemmed from individual organisational contributions, we were pleased to support and participate in a forum that reflects ideals we profoundly support — sustainability, technology responsibility, and transdisciplinary collaboration. The issues addressed at the conference align with TEMA's aim of meaningful science, societal significance, and impact.

We are committed to cooperation with various research units and communities in many modalities, including collaborative events, shared research, and communication, as demonstrated by this project. We believe that meaningful and sustained innovation is achievable through such collaborations.

Congratulations to all participants in SLIC25.

Paulo J. S. Cruz

President of the School of Architecture, Art and Design, University of Minho, Portugal

The Celeste project and the Sustainable Lighting International Conference (SLIC) illustrate how technological innovation and ecological responsibility can coexist within a shared vision of sustainable design. In recent years, light has become both a symbol of progress and a source of growing concern. While artificial lighting has extended human activity and comfort, it has also obscured the night sky and disturbed fragile ecosystems. To design light today is, therefore, not only a technical challenge but an ethical one — about how to reconcile safety, efficiency, and beauty with the preservation of darkness.

From this perspective, Celeste stands as a paradigm of how design can mediate between science and society. By transforming research into tangible prototypes, it bridges the laboratory and the landscape, the experimental and the real. It embodies an approach to design that is not limited to form or function but guided by responsibility and awareness. Through the collaboration between Lab2PT, ID+, TEMA, and local authorities, the project demonstrates that interdisciplinarity is not an abstract principle but a condition for innovation with social and environmental relevance.

The partnership between designers, engineers, researchers, and industries shows that technology, when infused with human sensitivity, becomes a tool for reconnection rather than alienation. Projects like Celeste do more than mitigate light pollution; they restore the poetic and cultural value of the night, reminding us that darkness too is a vital part of our environment. By bringing back the visibility of the stars, they recover an intangible heritage of orientation, contemplation, and imagination — a heritage shared by all humankind.

At a time when the ecological and digital transitions are reshaping our cities, design must reaffirm its role as a discipline of synthesis — capable of integrating technical expertise, cultural meaning, and environmental care. Sustainable lighting is not solely about energy efficiency; it is about balance — between innovation and memory, progress and belonging.

The journey of Celeste and the dialogues fostered by SLIC 2025 embody this balance. They remind us that when science, design, and engineering converge, they not only solve problems but also ‘illuminate’ new possibilities.

Opening remarks /Preface

The Organizing Committee

The *Sustainable Lighting International Conference* (SLIC) took place at the University of Aveiro on the 10th and 11th of October 2025, bringing together researchers, professionals, and students to discuss the future of sustainable lighting.

The conference aimed to foster dialogue across different disciplines from design and architecture to engineering and environmental sciences, addressing the need for more sustainable and human-centred approaches to artificial lighting. SLIC served as a platform for the exchange of knowledge and practices related to light pollution mitigation, energy efficiency, ecological awareness, and the cultural dimensions of night-time environments. The event featured keynote presentations by *Kerem Asfuroglu* and *Jordi Rocasalbas*, alongside contributions from national and international researchers whose work explored the social, ecological, and technological implications of the use of artificial light.

By integrating technical innovation with ecological and cultural sensitivity, SLIC reaffirmed the importance of light as both a design material and an environmental responsibility. We are pleased to present the conference proceedings of the first edition of the SLIC — Sustainable Lighting International Conference. Welcome to SLIC.

Eduardo Noronha

Conference Chair, University of Minho

The 1st edition of SLIC — Sustainable Lighting International Conference, held at the University of Aveiro on October 10–11, 2025, brought together researchers, industry professionals, and policymakers to discuss the latest advances in sustainable lighting technologies, light pollution mitigation, and their impacts on urban and natural environments.

Over two days, participants reflected on strategies for mitigating light pollution — a phenomenon that particularly affects urban and metropolitan areas, where the excessive use of public, commercial, and residential lighting creates a constant glow in the night sky, preventing nearly 80% of the world's population from observing the Milky Way with the naked eye.

The conference was integrated into the Celeste research project — Public lighting luminaire for light pollution prevention, which is currently reaching its final phase. Funded by the "la Caixa" Foundation under the 4th edition of the Promove Programme: The Future of the Interior, the project has, over the past three years, focused on the study, design, development, and production of public lighting luminaires that ensure comfort and safety standards without compromising night-sky visibility.

Throughout this process, the project deepened understanding of the light pollution phenomenon — which has worsened with technological evolution — and enabled the design, prototyping, and validation of a technical solution with effective light pollution control and low environmental impact. The installation of a pre-series of luminaires in the village of Álvaro, in the municipality of Oleiros, further strengthened the symbolic value and international recognition of these territories for their environmental, landscape, and heritage qualities, contributing to the attraction of tourists and new residents to low-density areas.

This experience also fostered collaborative networks among numerous individuals and institutions that, in different ways, contributed to a shared goal. At the origin



Figure 1
Celeste Team with DFA and Exporlux.

of the project, a consortium led by the University of Aveiro was established, comprising the Municipality of Pampilhosa da Serra, ADXTUR — Schist Villages Tourism Development Agency, the Municipality of Oleiros, and the Institute of Telecommunications.

The SLIC Organizing Committee expresses its sincere recognition and gratitude to all entities and partners involved, namely UNAVE, ID+, TEMA, Lab2PT, Design Factory Aveiro, Prolite, Exporlux, Metalogalva, JMJ, IDSANS, and to all individuals who personally contributed to achieving the goals defined for this event.

Finally, a special word of appreciation and gratitude goes to the research team from the University of Aveiro and dear friends — João Oliveira, David Figueiredo, and David Marques — for their exemplary dedication over the past three years, reflected in the product design, knowledge dissemination, and rigorous project supervision.

To all those who shared this journey with us, we extend our most sincere thanks and friendship.

João Dias-de-Oliveira

Conference co-Chair, University of Aveiro, Portugal

The first edition of the *Sustainable Lighting International Conference* (SLIC) marked a remarkable milestone for Project Celeste, not only as a dissemination platform but also as a living demonstration of what happens when disciplines truly converge. Over two days, the University of Aveiro became a meeting ground for designers, engineers, architects, researchers, and students, all united by a shared purpose: to rethink how we illuminate our world sustainably and responsibly.

From the very beginning, Celeste has been a project about integration, between technology and humanity, between scientific precision and design sensitivity. To me, true design has always been made of both disciplines of engineering and industrial design, two complementary dimensions of the same creative process. This conference reminded us that when these perspectives work together, they solve problems and also reveal new possibilities.

Lighting, in particular, is one of those areas where technology and perception coexist in a delicate balance. While artificial light extends human activity, it also reshapes our environment, our ecosystems, and even our biological rhythms. The growing awareness of light pollution reveals that our progress has often come with unintended consequences, such as the loss of the night sky, ecological disruption, and energy waste. To design better lighting is therefore not only a technical challenge but also an ethical one, on how to preserve darkness while ensuring safety, comfort, and beauty. This balance lies at the heart of Celeste and of the discussions that animated SLIC 2025.

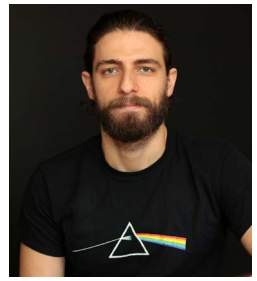
My own journey within Celeste began with some luck, when I was invited by Eduardo Noronha to co-supervise the Master's dissertation of David Figueiredo, titled "Light pollution prevention: design of a public streetlight fixture". That collaboration opened the door to a broader exploration that continues today in his doctoral research on human-centred lighting solutions for light pollution.

These projects also embody what SLIC stands for, research that is both technically rigorous and deeply human.

Throughout the development of CELESTE and the preparation of SLIC, I have learned a great deal, namely about lighting, design, and above all about collaboration. Working alongside Eduardo Noronha has been an immense privilege, as well as witnessing the dedication of David Figueiredo and David Marques. Their energy, creativity, and persistence turned ideas into prototypes and prototypes into meaningful results. To them, and to all who contributed to making SLIC a success, I express my sincere gratitude.

Keynote Speakers

SLIC is honoured to welcome two keynote speakers, whose work explore sustainable and human-centred approaches to lighting. Their perspectives bring valuable insights into the relationship between design, technology, and the environment, setting the tone for discussion and exchange throughout the conference.



Kerem Asfuroglu

Founder of Dark Source

Kerem Asfuroglu is the founder of Dark Source, an award-winning, independent lighting design studio driven by environmental values based in Ireland & the UK. Following his graduation from Wismar University — Architectural Lighting Design MA in 2010, Kerem pursued his professional design career in London for nearly a decade before setting up Dark Source in 2019. He has been awarded with the title of Dark Sky Defender by the Dark Sky International for advocating the importance of darkness through design. Some of his environmental lighting projects include the Newport Dark Sky Masterplan, Plas Y Brenin Outdoor Centre, Presteigne Dark Sky Community, Cloughjordan Ecovillage and Cumbria TAN Dark Sky Planning Policy.



Jordi Rocasalbas

Innovation Manager at LedsC4 and Board Member of Carandini

Jordi Rocasalbas is the Innovation Manager at LedsC4 and a board member of Carandini. With over 20 years of experience in the lighting industry, he has built a distinguished career characterized by leadership, innovation, and a strong commitment to quality. Throughout his professional journey, Jordi has contributed to the development of cutting-edge lighting solutions at several renowned companies, earning a solid reputation as a forward-thinking expert in the field. Deeply committed to environmental responsibility, sustainability, and circular design, Jordi continuously explores and develops connected lighting solutions grounded in sustainable materials and practices. His work aims to enhance human well-being while protecting the environment and preserving the beauty of the night sky. Jordi is passionate about promoting the value of high-quality lighting. His mission is to raise awareness and foster a culture that embraces the positive impact of well-designed, sustainable light.

Abstracts

The abstracts present in this section represent the diversity of the research and projects presented at this first edition of SLIC, covering a wide range of topics, from the effects of artificial light at night on aquatic organisms to the use of sustainable materials on luminaire manufacturing to the use of simulations for human-centred lighting, highlighting the multifaceted nature of contemporary lighting research and practice.
Each abstract has been peer-reviewed by the Scientific Committee to ensure scientific rigor, relevance and originality.

COSTANZA BORGHI,* CARLA BALOCCO,** GIACOMO PIERUCCI,**
STEFANIA CUPILLARI,** MICHELE BAIA**, GHERARDO CHIRICI*

Going Dark for Resilient Cities: Ten Years of Satellite Monitoring of Nightlight Pollution on Greenery Urban Areas

*
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Keywords
Remote sensing
Urban environment
Ecosystem Services
Artificial light at night
Urban vegetation

Urban light pollution has grown as a global environmental concern [1], affecting not only human health [2] and wildlife, but also vegetation. Indeed, it significantly impacts light cycle and phenology patterns, influencing vegetation health and growth [3]. By interfering with circadian cycles, vegetation ecosystem services provision can be altered [4, 5] and their vulnerability to stressors increased [6, 7]. Conversely, public illumination supports perceived safety, walkability, and inclusivity of spaces [8], highlighting the complex balance between the ecological and the social perspectives. Recently, a growing number of countries adopted laws and policies against light pollution [9–11]. Among the others, measures include dimming and selective switching off, limiting blue-rich light at night and cutting glare and upward light.

To support such approaches, our research investigates the European trends in night-time radiance on urban vegetation over the last decade. First, European urban clusters through the use of the Global Human Settlement Layer project (Urban Centre Database) for the year 2025 [12] were identified. A vegetation mask from European Space Agency world cover dataset [13] isolated vegetated urban areas within clusters (i.e., tree cover, shrub land and grassland). Finally, for each urban cluster, the mean annual radiance was calculated using the global VIIRS nighttime lights time series [14], available in Google Earth Engine [15] for the years 2013–2024, with 500m of spatial resolution.

Results indicate that, at the country level, France recorded the greatest average annual reduction in radiance (-0.93 nW/cm2/sr), followed by Portugal (-0.91) and Iceland (-0.88). In contrast, Russia and Finland exhibited the highest average annual increases, with average annual radiance over urban vegetation growing by 0.92 and 0.80 nW/cm2/sr, respectively. Based on the income classification provided by the World Bank Group [16] for the year 2022, both high-income and lower-middle-income countries show a decreasing trend (-0.26 nW/cm2/sr, each), while upper income countries show an average annual increase in radiance of 0.75 nW/cm2/sr. The trend also emerged in very

highly densely populated cities (i.e., from 4000 inhabitants per km², in the urban center), with a greater annual average increase in radiance of 0.29 nW/cm2/sr, compared to less densely populated cities (0.12 nW/cm2/sr).

This long-term observation allows the detection of spatial and temporal patterns of artificial lighting and the assessment of mitigation efforts. Indeed, by integrating satellite data with ecological and social perspectives, it may be possible to guide lighting design that balances environmental protection with the needs of urban spaces and cultural heritage. In conclusion, the research supports light pollution reduction by promoting responsive lighting that respects biological and cultural complexity, aiming to protect biodiversity, enhance fragile ecosystems, and improve quality of life.

Acknowledgements

This work was supported by the EU Project, LIFE Energy + LIFE Climate—Project 101157553-LIFE23-CCA-IT-LIFE ESCAPOS "Environmental energy for Strategic CApillary urban POlicieS", funded by the European Union. The research was partially developed within the framework of the project "Advanced models for estimating carbon uptake by urban vegetation to support ecological transition policies", funded by the Tuscany Region under the initiative "Green Transition — Advanced Training Projects with Research Grants" (CUP B53C23002970009), within the European Social Fund Plus (ESF+) 2021–2027 Regional Programme — Priority 4 'Youth Employment. This research was partially developed in the framework of the activities of the Fondazione per il Futuro delle Città (FFC)

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BRUNA SILVA,** MARIA S. COSTA,** ANA L. MACHADO,**
AMADEU M.V.M. SOARES,** MARTA S. MONTEIRO**

Eco-physiological Impacts of Light Pollution on Aquatic Organisms

*
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Keywords
Artificial light at night
Ecotoxicology
Urban aquatic ecosystems
Multiple stressors

Light pollution, resulting from artificial light at night (ALAN), significantly affects the physiology, behaviour and ecology of organisms, being increasingly recognised as a major driver of biodiversity decline (1–3).

ALAN disrupts the natural light patterns, causing dysregulation of biological rhythms that mediate essential processes such as sleep-wake cycles, growth, development, reproduction, hormone secretion, and stress responses of organisms, leading to significant biological and ecological consequences 4–8. The widespread transition from traditional sodium lamps to light-emitting diodes (LEDs) in public lighting has intensified environmental exposure to the blue light spectrum, further increasing the ecological effects associated with ALAN (9, 10).

Despite their growing prevalence, the effects of ALAN on aquatic invertebrates remain understudied, especially in multistressor contexts (11–13).

Here we present the main findings from two FCT-funded projects conducted at CESAM (University of Aveiro, Portugal) investigating the ecological effects of ALAN in different aquatic species. Laboratory assays assessed physiological and life-history responses of aquatic invertebrates (the insect Chironomus riparius, the crustacean Daphnia magna, the planarian Dugesia tigrina) and the fish Danio rerio (zebrafish) exposed to environmentally relevant ALAN levels. The experiments were conducted in isolated light systems. Each light system contained two white LED lights (119 lm/W, colour temperature 6500K), programmed to turn on and off during daytime and nighttime, according to the intended light treatment. Inside the light chambers, temperature and light intensity at the test vials were continuously recorded using the HOBO Pendant® MX Temperature/Light Data Logger (MX2202). Test vials were placed approximately 20–30 cm below the LED lights. Experiments were conducted at a constant temperature of 20 ± 1 °C (for Chironomus, Daphnia and Planaria) and 27 ± 1 °C for Zebrafish. Conductivity and pH were maintained according to the culturing medium of each species. Life history responses to ALN were analysed according to OECD standard guidelines (Chironomus, Daphnia and Zebrafish) or standard protocols developed in our lab (for Planaria). Biochemical markers after homogenization of

organisms were analysed following optimized protocols for the microplate Spectrophotometer (14–17) .

Both short (5 to 10 days) and long-term exposures (21 to 75 days) to ALAN produced adverse effects in all tested species, including oxidative stress and damage (reductions in Glutathione content, increase in lipid peroxidation), induced stress responses (increased levels of heat shock proteins, haemoglobin), altered metabolic rates (respiration rates, electron transport system activity), and reproductive impairments, anticipating a reduction in biological fitness for natural populations under light pollution. Significant effects were mostly observed for the highest ALAN intensity tested (10 lux) with some endpoints showing a clear dose-response pattern. Furthermore, we demonstrate that exposure to ALAN (10 lux) can increase organisms' sensitivity to other environmental and chemical stressors (e.g., salinity, warming, and chemical contaminants), thereby compounding the potential impacts of multiple stressors in urban aquatic ecosystems.

Our work adds data and a physiological perspective on the growing body of research on the biological and ecological effects of light pollution. Despite being evaluated under laboratory-controlled conditions, our findings underscore the need for enhanced sustainable lighting strategies that mitigate ALAN impacts and preserve the integrity of dark ecosystems.

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JIMENA PEREIRA PAZ,* HANNAH DALGLEISH**

Access to an Unpolluted Night Sky — the Need for a Dark Skies Treaty

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Keywords
Light pollution
Human rights
Rights of Nature
Indigenous rights
Dark Sky Tourism

Throughout human history, nightscapes have influenced art, culture, science, and indigenous knowledge systems. Escalating light at night is erasing these age-old relationships, and causing environmental and ecological harm. We argue that the loss of dark skies is infringing on rights to enjoy cultural life and heritage, and access to a clean, healthy and sustainable environment (Pereira Paz et al. 2023).

For indigenous peoples, artificial light at night violates the right of indigenous peoples to self-determination and to conserve their relationship with the natural world. Hamacher et al. (2020) establishes that the loss of the night sky is a form of cultural genocide. For example, for Aboriginal and Torres Strait Islander people, "the stars encode and communicate history, law, ethics, and moral values", and Kamilaroi Aboriginal cultural sites are threatened by skyglow and large flares from fracking (Hamacher et al. 2020). Pollution from space satellites produces further negative impacts upon indigenous peoples (Venkatesan et al. 2020).

For nature and the more-than-human species without any voice, the preservation of natural darkness at night could be considered within the Rights of Nature. This framework "asserts that nature has the right (1) to exist in an unaltered state; (2) to continue to exist in that state; and (3) if degraded, to be restored" (Barentine, 2020). Legal personhood has been granted to lagoons (Spain), rivers (New Zealand), mountains (Brazil), or mangroves (Ecuador). Could the night-time environment be a natural entity in need of rights of its own?

Creating legislation to control light pollution requires countries to acknowledge light as a pollutant with serious repercussions for our planet. Nations need to agree upon a threshold whereby a balance between human activity and the protection of culture, indigenous knowledge systems and nature can be found. Safe and just Earth-system boundaries are a possible framework upon which a threshold could begin to be explored and defined (Gupta et al. 2024). Further, the atmosphere is already accepted by nations as a global commons for which air pollution is a major concern — could this be extended to include light pollution? Multilateral treaties

are another avenue to explore. The Antarctic Treaty has been signed by 58 countries which agree to protect the environment, use it only for peaceful purposes and scientific cooperation, and abstain from ownership or militarisation. Could a Dark Skies Treaty be constructed in a similar vein?

Progress is severely hindered by a lack of awareness. People and policymakers alike are unaware of light pollution and its harms, which is a barrier for reform. Regenerative tourism, which takes into account sustainability, resilience, and equity, could provide a means by which dark skies could be protected and maintained, while benefitting local communities, raising awareness, and generating support for future legislation (Auala & Dalgleish 2023).

In summary, addressing light pollution from socioeconomic, environmental or human health perspectives does not go far enough. A pristine night sky should be situated as a human (and indigenous) rights and Rights of Nature concern to ensure the continued existence of a celestial starscape for allkind.

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From Light Spill to Light Control: The Role of Shielding in Public Lighting Design

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Keywords
Light pollution
Lighting design
Dark sky
Shielding strategies
Road lighting

The global adoption of LED technologies has improved energy efficiency in public lighting but has also led to increased light pollution, particularly in environmentally sensitive areas. This challenge is evident in territories certified as Starlight Tourism Destinations, where the preservation of dark skies is a priority for ecological integrity and sustainable tourism. The Celeste project addresses this issue through the design and prototyping of a luminaire specifically developed for the village of Álvaro, Portugal. The case study demonstrates how lighting design can reconcile safety requirements for rural roadways with the need to minimize environmental impact.

A 625-meter unlit road segment was selected for intervention, characterized by sharp curves, forest borders, and proximity to a river. Field assessments and municipal consultations provided essential insights into the site's safety and ecological concerns. Lighting simulations tested multiple LED and lens combinations, aiming for a balance between low-intensity, uniform illumination and compliance with DarkSky and CIE guidelines. The selected configuration combined warm-white LED modules (2700 K) with tailored optics, producing adequate levels of illumination while avoiding overlighting.

To further mitigate light spill beyond the roadway, custom shielding elements were designed, simulated and integrated into the luminaire. While shielding is not a new concept, its application here is highly context-driven: each geometry was adjusted to the road's specific conditions, ensuring that light was restricted to the areas where it was functionally necessary. This strategic use of shielding illustrates the potential of design-driven interventions to adapt standard lighting technology to environmentally constrained contexts.

The results highlight shielding not only as an accessory but as a critical component in a broader framework for low-impact lighting. Beyond this single case, the approach demonstrates how shielding solutions can be part of a toolkit that municipalities may use when planning or retrofitting installations. In areas where full replacement of luminaires is not feasible, shields represent an accessible way of retrofitting to enhance

existing systems, extending product lifecycles and reducing both ecological and financial costs. Although the Celeste luminaire was conceived as a new product, its development exemplifies principles that can be transferred to retrofit strategies in other contexts.

In conclusion, the Álvaro case study shows that integrating shielding with careful LED and lens selection, guided by fieldwork and simulations, provides a replicable model for rural and protected areas. It illustrates how lighting can be planned not only as infrastructure but also as environmental stewardship, reinforcing the identity of certified dark-sky regions. This work contributes to the ongoing discourse on how design and engineering can converge to provide lighting solutions that are both functional and ecologically responsible.

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LUÍS RAPOSO*

Reaching Sustainable Lighting in Urban Marine Areas through the Right Balance of Light: Implications for the Lighting Design of the Built Environment

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Keywords
Artificial light at night
Sustainable lightning
Marine urbanisation
Marine light pollution
Lighting design

From an ecological perspective, the aim of sustainable lighting in urban marine areas, such as city waterfronts, estuaries, bays, and marine built structures, like oil platforms, is to strike a balance between meeting human needs and protecting marine ecosystems from the harmful effects of human disturbance to light regimes. The impact of light pollution on biodiversity and ecosystems is a recurring theme in the literature (Gaston et al., 2013; Katabaro et al., 2022) and an increasing amount of research specifically addresses the impact of human-induced light pollution on coastal (Ferretti et al., 2025) and marine areas (Davies et al., 2014; Marangoni et al., 2022; Tidau et al., 2021). These have examined the various ecological effects of light pollution on marine biodiversity, such as disrupting day/night activity rhythms (Luarte et al., 2016), disturbing nesting choices (Salmon, 2003) and influencing vertical migration of marine organisms along the water column (Navarro-Barranco & Hughes, 2015). While light pollution research predominantly focuses on the influence of artificial light at night on the natural light regime, a smaller proportion of studies also explore artificial shading as a form of impact (Pardal-Souza et al., 2017; Trethewy et al., 2023). Therefore, it is crucial to prevent artificial lighting from impacting light patterns and cycles and to ensure adequate lighting to prevent obstructions to light penetration into the water. The latter may be essential for marine species that depend on light to fulfil their needs, such as the foraging behaviour of juvenile visual predators (Duffy-Anderson & Able, 2001) and may affect species' abundance in relation to the shade cast from maritime infrastructure like piers (Munsch et al., 2014). This research assumes that combatting light pollution and ensuring light penetration are two sides of the same coin of light sustainability, since both can influence the marine environment. While managing the right amount of light is essential for achieving this goal, adjusting the light spectrum is also a key concern in marine areas due to the properties of seawater. This is because seawater allows specific wavelengths of light to pass through deeper, particularly blue wavelengths, which are emitted by modern lighting technologies (Grubisic, 2018). This study uses a narrative review and instrumental cases to review the main

factors affecting the light regime of urban marine areas from four integrated perspectives: light reach, intensity, quality and duration. The cases examine the remedial measures that were implemented to benefit marine species that suffered from alterations in the natural light regime resulting from urbanisation. These are the Elliot Bay seawall renovation in Seattle and Sea Turtle Conservancy Beachfront Lighting Program in Florida. In conclusion, it is acknowledged that reaching sustainable lighting in urban marine areas is a multifaceted challenge, necessitating a comprehensive lighting design for built environment. It is suggested that such a design should be balanced, ensuring, depending on the case, neither excess nor deficiency of light, and, when artificial light is a necessity, it should be correctly managed, preferably avoiding concentration on shorter wavelengths and long periods of time.

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Star Dome: Fostering Dark Sky Stewardship Through Experiential Learning

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Keywords
Education
Community
Indigenous knowledge
Sustainable Lighting

Light pollution is a growing global concern, obscuring our view of the stars, disrupting ecosystems, and impacting human health. The Star Dome is a mobile, experiential teaching tool that directly addresses this critical issue by creating an immersive, participatory learning experience centered on the stars. It educates participants about light pollution's impact on human heritage, ecological systems, and astronomical access while building the foundation for informed lighting decisions and dark sky advocacy.

Born from honoring the Lakota relationship with He Sapa (the Black Hills) and the stars above, the Star Dome bridges Indigenous knowledge systems with sustainable lighting education. The design adapts to reflect diverse cultural cosmologies worldwide, making dark sky education both globally relevant and locally meaningful.

The Star Dome features two circular textile layers: the Guiding Circle, which contains stories, artwork, and cultural knowledge from specific traditions, and the Star Circle, a perforated fabric constellation map of the local night sky. Students gather outdoors, inflate the dome through coordinated movement, and sit inside the illuminated interior to explore a daytime star field. This act creates a moment of awe, connection, and reflection on humanity's relationship to the stars while demonstrating the value of what light pollution obscures and developing a deep, design-driven understanding of environmental responsibility.

Designed for students aged 7–12, the Star Dome moves learning beyond classroom walls into temporary star-filled spaces where students explore astronomy, cultural star knowledge, and environmental responsibility. In light-polluted areas, the dome serves as a proxy for the disappearing night sky, highlighting loss and building advocacy for better lighting practices. The program develops awareness of light pollution sources, understanding of dark sky-friendly lighting principles, and motivation to influence community lighting choices, with potential for school-wide policy changes and home advocacy. The Star Dome becomes a foundation for broader environmental curricula and community-wide lighting practice improvements,

potentially reaching thousands of students annually and inspiring the next generation of dark sky advocates.

Through ongoing collaboration and exchange, the Star Dome grows as communities, educators, and knowledge keepers worldwide co-create Guiding Circles representing their cultural star stories—Lakota, Nahua, Yoruba, Māori, and beyond. Each new layer becomes a textile archive of cultural astronomy and a platform for intergenerational knowledge sharing about sustainable lighting rooted in traditional ecological knowledge.

The Star Dome offers a portable, scalable alternative to expensive planetariums while directly supporting sustainable lighting implementation. It encourages place-based learning, cultural awareness, and night sky stewardship through education that translates to measurable lighting practice changes. As it travels between schools and communities, the Star Dome plants seeds of wonder and responsibility, reminding us that preserving starlight through sustainable lighting preserves our shared human story.

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From Plastic Waste to Urban Streetlights: A New Green Perspective for the Cities of the Future

*
Niteko

Keywords
Circular Economy
Recycled Polyethylene
Life Cycle Assessment (LCA)
Public Lighting
Carbon Footprint Reduction

The evolution of urban lighting systems takes place in a framework where environmental sustainability and circular economy principles have become indispensable. Within this context, the use of innovative materials derived from certified recycling processes represents a strategic opportunity to reduce greenhouse gas emissions and to develop durable, fully regenerable urban infrastructures. This study presents a comparative assessment of PSV-certified recycled polyethylene (≥50% post-consumer) versus recycled aluminum for luminaire housings, evaluating environmental impacts through Life Cycle Assessment (LCA) and assessing technical performance and product circularity.

Our findings demonstrate that recycled polyethylene enables a substantial reduction in carbon footprint: approximately 57 kg CO_2 eq per luminaire compared to 102 kg CO_2 eq for the aluminum counterpart, corresponding to a savings of more than 44%. These results are consistent with recent systematic reviews showing that recycled plastics generally deliver 30–60% lower impacts than alternative materials (Dolci et al., 2024; Meng et al., 2024). From an energy perspective, rotational molding of PE requires only 20–30 kWh/ton, while aluminum production requires ~10 kWh/kg for recycled aluminum and up to 400 kWh/kg for virgin aluminum, highlighting the superior energy efficiency of the polymer-based option.

In addition to environmental benefits, luminaires made from recycled PE exhibit excellent technical properties: IK10 impact resistance, mechanical and dimensional stability across a temperature range of −60 °C to +80 °C, and, crucially, immunity to corrosion—a major drawback of aluminum housings in coastal or polluted environments. Field studies on urban luminaires manufactured from recycled plastics confirm their atmospheric resistance and extended service life (Deodati et al., 2023; Lorelux®, 2023). Furthermore, the inclusion of UV stabilizers and mass pigmentation significantly mitigates photo-oxidative degradation, ensuring long-term mechanical and aesthetic stability, in line with advanced polymer aging models (Najmeddine et al., 2021). These results

directly counter persistent misconceptions of rapid plastic degradation, as systematically debunked in recent literature reviews (DeArmitt, 2025).

Circularity analysis revealed that more than 93% of luminaire components are disassemblable and replaceable, facilitating maintenance and LED module upgrades. The overall circularity output rate achieved 99.74%, with only 0.26% directed to landfill. These findings align with advanced methodologies developed to quantify the circular potential of recycled polymers (Schulte et al., 2023) and demonstrate the feasibility of applying "cradle to cradle" design principles in durable urban infrastructure.

This work contributes to filling a gap in the literature. While most LCA studies have focused on packaging and short-lived consumer products, systematic analyses of recycled plastics in durable urban infrastructure remain scarce. The originality of this contribution lies in providing robust quantitative evidence that recycled polyethylene is not an experimental alternative but a scalable, technically reliable, and environmentally preferable solution. Installations already implemented in various European urban contexts validate the practical and aesthetic feasibility of these solutions. The results demonstrate that it is possible to combine lighting performance, emission reduction, and resource conservation, paving the way for a new generation of more resilient and sustainable cities.

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GONÇALO FERNANDES,* MYLENE CADETE,*
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Liminal Lighting System: A 4D Printing Approach for Adaptive and Bio-inspired Design

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Keywords
Shape Memory Polymers
Bio-Inspired Design
Liminality in Product Design
Adaptive Lighting Systems
Sustainable Manufacturing
User-Product Interaction

This study introduces Liminal, a novel lighting system developed through the convergence of 4D printing technologies [1], bio-inspired design principles [2], and the theoretical concept of liminality, a transitional state between two conditions. The project seeks to transcend traditional static lighting solutions by embedding dynamic material behavior, thereby fostering a heightened emotional and sensory interaction between the product and its user.

The Liminal luminaire utilizes carefully oriented deposited layers, enabling its lampshade to transition from a flat, printed state to a functional three-dimensional form through controlled thermal activation [3]. This design strategy significantly reduces production time, minimizes material waste, and optimizes logistics by decreasing the product's transport volume.

The design draws inspiration from biomimetic phenomena, including natural light diffusion, hydrodynamic wave patterns, and atmospheric light displays such as auroras [4]. The resulting structure integrates a "light path," which enables adaptive structural transformation while generating distinctive optical effects within the environment.

A dimmable LED system with a rechargeable USB-C interface was selected to meet ecological and regulatory standards, emphasizing portability, user interactivity, and energy efficiency. Additionally, the design leverages the IKEA effect, encouraging user participation during the assembly and activation process to strengthen emotional attachment and promote long-term product retention and repairability.

Experimental validation confirmed the effective integration of 4D printing techniques into consumer product design. The findings demonstrate the potential of combining smart materials, additive manufacturing, and emotional design strategies in the development of functional and sustainable lighting systems, contributing to research in adaptive product innovation, digital fabrication, and sustainable consumer goods [5].

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DAVID FIGUEIREDO,* DAVID MARQUES,**
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Adapting Light-Point Simulations for Anticipation of Upward Light Emissions in Urban Light Planning

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Keywords
Lighting design
Light pollution
Streetlight
Light simulation
ALAN

Artificial lighting remains a major contributor to skyglow, with Portugal among the highest emitters of upward light per capita in Europe, emission per GDP and average light emitted in its territories, leading to the bigger pertinence of mitigation of light pollution at a national level [1–2]. With this work, the aim was to explore how accessible design tools can be adapted to anticipate the environmental consequences of lighting decisions before implementation, informing a more responsible way of planning.

A methodology based on lighting simulation is presented, developed using DIALux and adapting the OSP-framework (outdoor site-lighting performance) [3], for predicting relative levels of light emission upwards under different streetlight configurations during a project implementation stage. The approach utilized simplified light points to explore the influence of key parameters such as luminaire mounting height, inter-pole spacing, luminous flux, optical distribution, and surface reflectance on the emission of light upwards. This emission of light upwards represents a form of light pollution and energy waste, and an estimation of both direct and reflected components of light emitted upwards can be calculated on a horizontal plane at a height above the luminaires [4]. The results allow an efficient comparison between scenarios, rather than absolute prediction of sky brightness, providing a framework that supports lighting decisions.

The obtained simulation results are discussed in relation to international guidelines and compared to the stricter French legislation [5], which introduces limits to illuminance and installed luminous flux density for the preservation of the night sky. There are clear and significant correlations between higher mounting heights and increased flux levels with greater upward emissions, while optimized pole spacing allows for reductions in installed lumens without compromising horizontal illuminance. Reflective surfaces are confirmed as a critical factor in secondary emissions, amplifying the impact of otherwise efficient configurations.

The findings demonstrate that modest changes in the balance between mounting height, pole-spacing and luminous-flux can substantially reduce upward emission without compromising

safety-related illuminance. For example, optimized pole spacing allows reductions in installed luminous output while maintaining recommended horizontal illuminance on road surfaces. Likewise, reflectance of surfaces proves to be a critical factor in secondary upward emissions. Ultimately, the work also aims to demonstrate that more accessible simulation tools such as DIALux can play a central role in guiding dark sky friendly urban lighting strategies. The results show that upward emissions are not completely unavoidable in public lighting but can be mitigated through informed design choices.

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EDUARDO GONÇALVES

Perceptual Illusion as a Lighting Design Tool — The ALDA Method

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Keywords
Adaptive Lighting
Sustainability
User-Centered Design
Perceptual Illusions
ALDA Method

The main objective of this presentation is to promote a more sustainable lighting design practice, with a focus on designing adaptive public lighting solutions for pedestrians. To this end, and in particular, knowledge of the advantages of using the ALDA Method (Adaptive Lighting Design Assisting Method) in the design process, as this can be an effective design tool in the creation of adaptive lighting solutions that improve the quality of the relationship between users, the space they inhabit and energy use. This work is the result of doctoral research, and the method was implemented in a pilot in the village of Arraiolos, Portugal.

Current lighting technologies, especially adaptive LED sources, provide a significant advantage over traditional systems: unparalleled flexibility. However, this adaptability is mainly focused on energy management, particularly in traffic lighting (ESNA RP-08-05; CIE 115:2010). Manufacturers often lack clear methods for adjusting lighting behaviour, which can overlook user comfort and aesthetics (Gonçalves, 2016; Haans & De Kort, 2012; Boyce, 2003; Narboni, 2004). To address this, a framework for adaptive public lighting has been proposed. The Perceived Luminance Continuity (PLC) that defines the adaptive lighting behaviour and supports the ALDA method, which considers the user-environment relationship and perceptions of well-being related to lighting quality (Flynn, 1979; Cuttle, 2009; Pont, 2013). This framework and method were tested in Arraiolos, Portugal, using a mixed-methods approach that included qualitative data from questionnaires and observations, as well as quantitative data from a lighting scenario self-configuration exercise. The data were then analysed through descriptive and inferential statistical methods.

The results suggest several interesting conclusions. When lighting was continuously adjusted using the PLC framework, people often felt as though the space stayed evenly lit, even when the actual illuminated area was smaller than the physical space. With the wider spread (D) (60 m illuminated), almost 90% of participants described the environment as “uniform or continuously lit” across a 120 m area. With the narrower spread (30 m), the space appeared “brighter”, although only about 50% still thought it looked uniform. That seems to indicate that somewhere between 30 and 60 meters, the eye adapts enough to

balance contrast, allowing people to feel comfortable and maintain well-being, with less light. Interestingly, gender didn't appear to influence how people rated lighting quality, with no statistical differences, which runs against some earlier studies. Perhaps because participants had the freedom to adjust settings themselves. Finally, adaptive was strongly accepted: 70.3% preferred it over fixed lighting, rising to 94.3% when energy savings were considered.

The findings suggest that adaptive, user-oriented methods such as ALDA can support more sustainable lighting practices while still addressing well-being. The PLC framework appears useful in describing how people perceive lighting across space, even when much of that perception relies on an illusion rather than actual illuminated space. This indicates that perceptual stability can serve as a design criterion. This approach increases the probability of achieving a balanced solution, in which well-being does not overlay energy sustainability, or the search for energy efficiency undermines well-being.

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Visual Comfort in Modernist Hospitals: Preliminary Comparative Assessment of Human--Centered Lighting in Old and New Inpatient Blocks

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Keywords
Visual comfort
Human-centered lighting
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Modernist hospitals
Healthcare environments
Hospital retrofitting

Human-centered lighting has become increasingly relevant in healthcare architecture, where visual conditions impact comfort, well-being, circadian rhythms, and perceptions of safety. In modernist hospital buildings, designed with a strong emphasis on daylight, new lighting challenges emerge when comparing original facilities to contemporary expansions. This study presents preliminary findings from an integrated assessment of visual comfort in inpatient rooms at the Hospital de Clínicas de Porto Alegre (HCPA), an iconic example of modernist hospital architecture in Brazil. The investigation focused on three inpatient blocks — Block A (1950s modernist design) and Blocks B and C (built in the 2000s) — which differ in architectural layout, lighting strategies, and solar orientation. Block A wards face east and west; Block B wards face north and south; and Block C wards are oriented east–west, with west-facing rooms partially obstructed by an adjacent building, reducing direct solar access. A pilot questionnaire, developed from a systematic literature review on the evaluation of subjective comfort in healthcare environments, was applied to patients, healthcare professionals, and visitors. It addressed perceptions of natural and electric lighting, glare, lighting control, connection to the outdoors, and visual well-being. In parallel, on-site illuminance measurements and simulation--based analyses were carried out to contextualize users' responses. The preliminary findings reveal clear differences in visual comfort perceptions among user groups and between the architectural blocks. Patients emphasized the importance of glare control and access to daylight as critical to their comfort and rest. Healthcare professionals valued consistency and functional adequacy for clinical tasks, while visitors' responses varied based on emotional and relational factors. Block A, despite its age, offered greater daylight access and received more favorable subjective evaluations — though with limitations in luminous control and uniformity. In contrast, Blocks B and C, despite being more recently constructed, demonstrated higher reliance on electric lighting and lower user satisfaction. The integrated analysis of subjective and objective data reveals key mismatches and identifies retrofit opportunities based on human-centered and sustainable lighting strategies. Beyond direct lighting aspects, this study encourages

further investigation into how modernist and contemporary hospital buildings negotiate solar orientation and its relationship to user satisfaction, contributing to broader debates on healthcare design, environmental quality, and architectural heritage.

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GABRIELE ZOCCHI,* MORTEZA HOSSEINI,*
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Assessing the Predictive Accuracy of Circadian Lighting Simulations in an Office Environment

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Keywords
Circadian Lighting
Melanopic Equivalent Daylight Illuminance
Simulations

Melanopic Equivalent Daylight Illuminance (mEDI) is a critical metric for assessing light's impact on the non-visual human system, including our circadian rhythm. This understanding is vital for how light influences our sleep-wake cycle, alertness, and overall well-being. For professional settings like offices, Brown et al. [1] recommend a minimum vertical mEDI of 250 lux at eye level to promote alertness, productivity, and well-being.

Accurate mEDI simulations are essential for research on the impact of light on human health, to test hypotheses, develop new lighting technologies, and establish guidelines. In general, reliable simulation of mEDI is a powerful tool for designing to improve human health, well-being, and productivity.

ALFA (Adaptive Lighting for Alertness) is a software plugin for Rhinoceros 3D developed by Solemma [2]. It is designed to help architects, lighting designers, and health professionals predict and control the non-visual effects of light on human health and well-being.

In this context, this paper presents a pilot study investigating ALFA's simulation accuracy against mEDI measurements under various conditions, including Day & Time, Daylight/Electric light, Position, and Direction of view.

To investigate ALFA's reliability, a pilot study was conducted, involving both field mEDI measurements and ALFA simulations. For the field experiment, 1600 mEDI measurements were collected over 10 days in a typical Copenhagen office, using a GL SPECTIS 1.0 Touch + Flicker spectrometer. Concurrently, 1600 calculations were performed using ALFA with an accurate 3D office model. ALFA, which utilizes Radiance, was extended with 81-color spectra channels for non-visual light effect simulations, converting EML to mEDI. Luminaire IES files, location, time, and sky conditions were incorporated. Material reflective values, including melanopic reflectivity, were obtained via manual measurements with a Voltcraft MS-200LED SE lux meter. The full dataset is publicly available at https://github.com/Gazo93/mEDI_RE_SIM.

The simulation accurately predicted whether the 250 lux mEDI recommendation was met in approximately 86% of cases when compared against the outcomes from physical

measurements. This predictive accuracy was higher in simulations using only daylight versus those with both daylight and electric lighting. Moreover, accuracy also improved when the simulated direction of view was towards the window.

Regarding the numerical mEDI values from simulations, a moderate degree of reliability was observed compared to field measurements. This is attributed to varying real-world conditions not fully replicated in simulations. Despite a moderate positive correlation ($r = 0.619$), prediction errors and the moderate R-squared value suggest that simulations do not fully capture all the variability of real measurements.

This pilot study found that while ALFA simulations are reasonably accurate (86%) in predicting whether mEDI recommendations are met, particularly with daylight only or views towards windows, the numerical mEDI values themselves show only moderate reliability when compared to measurements. This is likely due to real-world variability not fully captured by simulations.

Further improvement of the simulation model, by understanding influencing factors and reducing errors, will enhance its precision. This will solidify mEDI simulation as an invaluable resource for designing healthy indoor environments, having a more balanced use of light and the avoidance of unnecessary illumination.

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Final message

As we conclude this first edition on SLIC — Sustainable Lighting International Conference, we would like to express our gratitude to all the participants, speakers, and contributors that made this event a success. It is our belief that your engagement, knowledge-sharing, and passion for lighting and its sustainability have enriched the discussions and strengthened our community.

We hope the connections formed during this event will inspire future collaborations and innovations. Thank you for being part of SLIC, and we hope to see you in the future.

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Colophon

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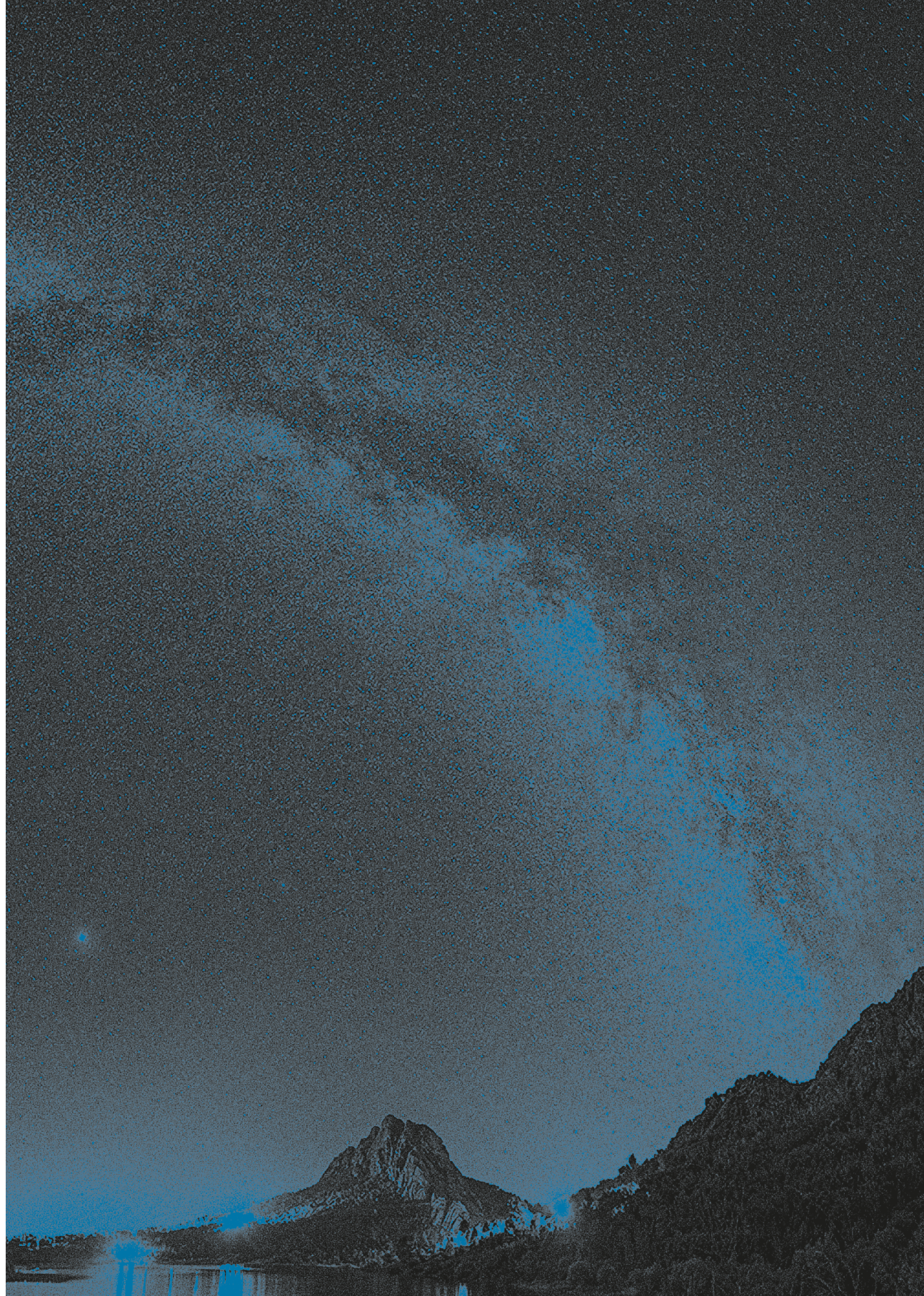
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The *Sustainable Lighting International Conference* (SLIC) took place at the University of Aveiro on the 10th and 11th of October 2025, bringing together researchers, professionals, and students to discuss the future of sustainable lighting.

The event featured keynote presentations by *Kerem Asfuroglu* and *Jordi Rocasalbas*, alongside contributions from national and international researchers.

The Landscapes, Heritage & Territory Collection promotes the publication of texts in the Research, Essay and Catalog lines, under the seal of Lab2PT with the aim of promoting the circulation and dissemination of their scientific production within the main areas of the R&D unit — Archeology, Architecture & Urbanism, Design, Geography, Geology, History and Visual Arts.