DARKER SKY | Interreg North Sea

Co-funded by the European Union

CO-DESIGN APPROACHES TO REDUCE LIGHT POLLUTION

Brest, France

Brest Metropole has been working on light pollution through public lighting policy since 2013, with a progressive reduction in overall lighting levels and the systematic adoption of LED technology since 2016 to improve luminous efficiency.

Within the DARKER SKY project, Brest's demonstrator site at Moulin Blanc builds on pre-existing internal studies and technical reflections rather than starting from a blank slate. The city's approach is framed by a broader metropolitan strategy aimed at creating coherent, sober, and context-sensitive nighttime atmospheres across its territory.

CO-DESIGN APPROACH

The approach in Brest is primarily top-down, embedded in a metropolitan-scale strategic framework known as the Nocturnal Ambience Coherence Scheme (NACS, sometimes referred to as SCAN in French). This scheme structures how public lighting is planned, renovated, and operated. NACS follows a three-phase methodology.

Transversal Diagnosis

- The first phase consists of a **transversal diagnosis of existing lighting assets** and public space characteristics, while clarifying political, technical, and social objectives across municipal departments.
- This stage is mainly internal and expert-driven, **relying on collaborative workshops** among planners, engineers, and decision-makers to establish a shared vocabulary and a general lighting strategy oriented toward sobriety.

Territorialisation

- The second phase, **'territorialisation'**, is designed to integrate knowledge about real nighttime uses.
- In the broader NACS logic, this involves **workshops with users and citizens** to identify daily and occasional night activities (professional, recreational, mobility-related).
- This leads to a **territorial strategy** in which lighting atmospheres are adapted to specific uses and rhythms.

Operational Guidance

- The third phase translates these strategies into **operational guidance** for the creation and renovation of lighting infrastructure, supported by an evolving digital cartographic tool.
- This tool **integrates multiple territorial datasets**, including lighting assets, road networks, heritage areas, natural zones, green and blue corridors, and schools.
- **Priorities are balanced** according to different 'rhythms', especially those of nocturnal fauna, flora, and human activities.

For the DARKER SKY demonstrator itself, Brest Metropole did not implement a fully bottom-up co-design process during the design phase. Technical choices regarding equipment and configurations were largely defined through internal expertise and earlier studies.

However, the installation at Moulin Blanc is designed to be highly adaptable:
dimming levels, operating times, detection zones, and cut-off periods are fully configurable and can be modified later based on monitoring results and user feedback.
A sociological study before and especially after implementation was done to capture perceptions and uses.

Governance Context

Brest Metropole is the competent authority for public lighting across its territory; municipalities transferred this responsibility to the metropolitan level in 2000. The Metropole is responsible for the creation, development, management, and maintenance of public space and its associated infrastructure.

Political governance is ensured by elected vice-presidents responsible for services to the population and territorial proximity. The general NACS strategy is validated by a coordination committee composed of elected representatives covering multiple policy domains, including climate and energy, urban planning, mobility, biodiversity, public tranquillity, and citizen participation.

For the Moulin Blanc area specifically, the renovation project was presented to and validated by relevant political coordination bodies, including those responsible for NACS and for the development of the beach surroundings. Operational metropolitan departments were consulted during the design phase.

Stakeholder Involvement

For the DARKER SKY demonstrator at Moulin Blanc, stakeholder involvement during the design phase was limited. Brest Metropole explicitly followed a top-down approach for technical redesign. However, citizen perspectives are not fully excluded: a sociological survey was planned before and especially after implementation of the lighting modifications, in order to assess perceptions and uses. The site has no immediate residential neighbours.

NACS participatory elements

- **consultation** with districts and municipalities
- neighbourhood-level **exchanges** on local uses
- **input from professionals** working at night
- **citizen engagement activities** including exploratory night walks
- Brest Metropole has also used **surveys and questionnaires** in other light-related initiatives.

Public Awareness Events

- first **public round table in April 2024**; presenting light pollution from social, ecological, and technical perspectives and explaining DARKER SKY-related interventions.
- A **second event in October 2025**; presenting the implemented measures and the results of biodiversity and lighting measurements.

SWOT ANALYSIS

BREST TOP-DOWN APPROACH

STRENGHTS

- Strong in-house technical expertise in public lighting within Brest Metropole.
- A long-term strategic framework (NACS) that integrates environmental, urban, and social considerations.
- Use of an evolving digital cartographic tool to align multiple policy domains and territorial datasets.
- Highly adaptable lighting system at Moulin Blanc, allowing post-project adjustments.

WEAKNESSES

- Limited user involvement in the initial redesign of the demonstrator site (primarily top-down).
- Higher costs compared to standard lighting renovations undertaken by Brest Metropole.
- Complexity of the system may create operational and maintenance challenges.

OPPORTUNITIES

- Ability to experiment with innovative equipment and control systems under real conditions.
- Development of internal technical expertise and learning-by-doing.
- Communication and public events that raise awareness of light pollution and biodiversity issues.
- Potential to refine lighting settings over time based on ecological and sociological feedback.

THREATS

- Uncertainty regarding long-term obsolescence of chosen technologies and dependence on suppliers.
- Need for staff training to manage advanced control systems.
- Risk that some users perceive the new lighting as uncomfortable or unsafe.

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SCIENTIFIC MONITORING

DARKER SKY provided Brest Metropole with the opportunity to test new lighting technologies and configurations while coupling them with ecological and lighting measurements. Measurements were conducted before implementation and after the lighting modifications, in collaboration with ecologists from the Université de Bretagne Occidentale (UBO).

Beyond simple technical data, the scientific monitoring aims to capture the pulse of the local ecosystem by studying the interactions between light, nature, and people. This holistic approach looks at biodiversity across both land and sea, observing how birds, bats, arthropods and coastal marine life react to a more preserved night environment.

By using non-intrusive acoustic sensors and advanced sky-quality analysis via Sky Quality Cameras and luxmeters, the project seeks to understand the subtle shifts in wildlife behavior and the overall restoration of the night landscape, specifically through vectorscope color analysis.
In parallel, the human dimension is central to this evaluation. A sociological study is being conducted to bridge the gap between ecological needs and urban life, exploring how these changes influence residents' habits and their perception of the nocturnal environment.

Future post-modification phases will focus on measuring the success of these interventions, ensuring that the new lighting configurations are not only environmentally beneficial but also socially embraced.
Ultimately, this monitoring will serve as a roadmap for Brest Metropole to build a sustainable 'Trame Noire' that respects both the biodiversity and the inhabitants.

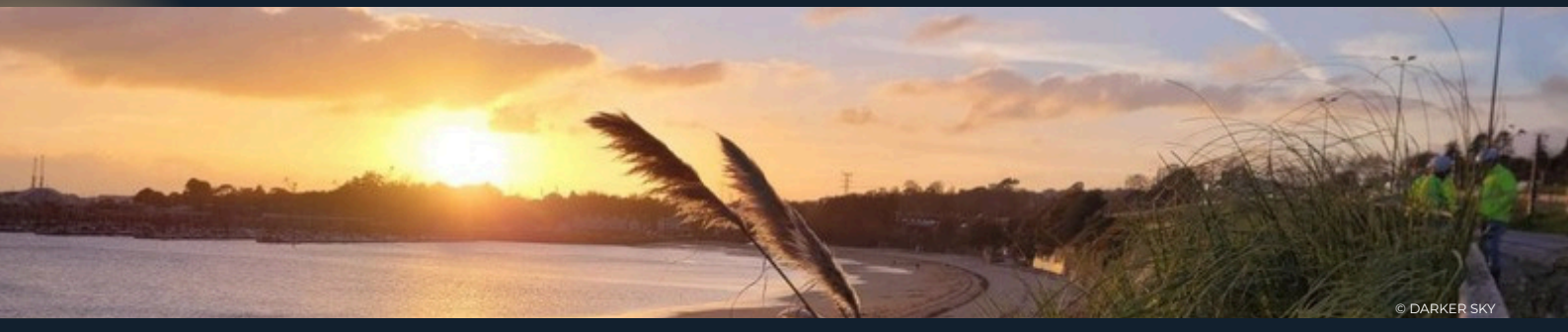
RECOMMENDATIONS

- **Avoid relying solely** on technological solutions;. organisational capacity, maintenance skills, and governance arrangements are **equally critical**.
- Plan for **long-term operation** from the outset, **including** staff training and budgeting for maintenance of advanced control systems.
- Use strategic, cross-departmental **frameworks** (like NACS) **to align** lighting policy with biodiversity, mobility, safety, and urban planning objectives.
- **Ensure** that, even in predominantly top-down processes, **user perception studies** and **post-implementation feedback loops** are built in.

Next Steps for Brest

Upcoming steps include **continued post-installation monitoring** of lighting and biodiversity indicators in cooperation with UBO.

- Electricity meter data collection devices enable **precise monitoring** of the facility's electricity consumption.
- This **energy consumption monitoring** provides information on when lights are switched on and off at the beginning and end of the night, as well as during night-time power cuts.
- The **measurement interval** of the installed equipment **enables verification** of the proper functioning of user detection



CONTACT
Sébastien Gallet, Université de Bretagne Occidentale
DARKER SKY Project Manager for Brest
sebastien.gallet@univ-brest.fr