DARKER SKY | Interreg North Sea | Co-funded by the European Union

CO-DESIGN APPROACHES TO REDUCE LIGHT POLLUTION

Hamburg, Germany

In the Borough of Altona, City of Hamburg, DARKER SKY served as a catalyst both for technical renewal of lighting installations at two demonstrator sites (Elbewanderweg/ Sandweg and Sülldorfer Knick/Bullnwisch) and for initiating broader dialogue on light pollution with local and regional stakeholders.

The project combined infrastructure change with awareness-raising and participatory planning formats. In particular, collaboration with the Hamburg University of Applied Sciences (HAW) enabled the integration of Extended Reality (XR) tools into planning and discussion processes, while the district administration worked to strengthen cooperation with the municipal lighting operator Hamburg Verkehrsanlagen (HHVA).

CO-DESIGN APPROACH

Hamburg–Altona applied a **hybrid co-design** model that combines top-down administrative structures with bottom-up and co-creative participation formats.

Top-Down approach

A predominantly top-down structure framed the formal planning and implementation of lighting renewal. The district is responsible for implementation, while overarching strategies and thematic leadership lie with higher city-level authorities.

Within this framework, the district worked closely with HHVA, the public company responsible for most road lighting, to replace old luminaires with new LED systems and test options for reducing light pollution while maintaining safety for pedestrians and cyclists.

Co-creative approach

At the same time, participatory and co-creative elements were introduced. Together with HAW Hamburg, the district organised a **workshop series** using XR-based 3D modelling tools. These workshops brought together regional authorities, infrastructure providers, planners, and experts to jointly explore environmentally friendly lighting strategies for the pilot areas.

Whereas the first workshop (30 May 2024) focused on sustainable lighting strategies and introduced the XR planning tools (VR, interactive touch table), the second workshop (12 September 2024) emphasised the perspectives of cyclists and pedestrians.

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Bottom-Up approach

In parallel, two public **Night Walks** (February and March 2025) were organised as a citizen-focused participation format. The aim was to raise awareness of light pollution, demonstrate the qualities of darkness, and discuss environmentally and people-friendly lighting.
This format explicitly targeted behavioural change and perception, complementing the more technical and institutional workshops.

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Governance Context

Hamburg's governance structure is divided between higher authorities at city-state level and seven district authorities, including Altona. **Higher authorities** set strategic directions on overarching topics such as biodiversity and environmental protection. **District authorities** are mainly responsible for implementation in public space, including local coordination of lighting projects.

This fragmented structure poses challenges for co-design. For lighting specifically, the district must work closely with HHVA as the technical operator. DARKER SKY functioned as an entry point to intensify and improve this collaboration, leading to a more equal and constructive working relationship over time.

Stakeholder Involvement

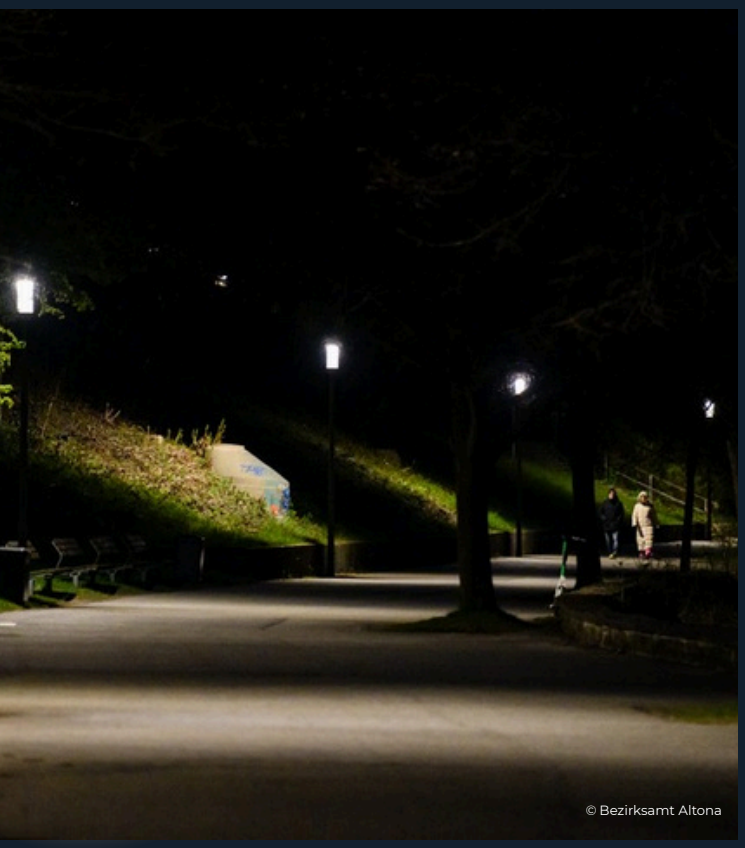
Stakeholder involvement took place at several levels and through different formats. The XR-based 3D modelling workshops primarily addressed institutional stakeholders involved in lighting planning and regulation. Participants included representatives from environmental authorities (BUKEA), HHVA, regional planning bodies, infrastructure agencies, and lighting professionals.
Citizens were mainly involved through the Night Walks. These events were deliberately designed as low-threshold, experience-based formats.

XR-based Workshops

- These workshops **enabled direct exchange** between actors who had previously not worked together in such a format.
- Participants **developed** initial lighting scenarios and **provided** feedback for further tool development.
- **Key discussion points** included the need for holistic, cross-sector lighting strategies and the challenge of balancing biodiversity protection with perceived personal safety.

Night Walks

- These events combined a short **expert lecture** with a **guided walk** in a dark natural area and a **feedback round**.
- **Public interest** was very high, with both walks fully booked shortly after announcement and positive feedback afterwards.
- Participants expressed **strong interest** in learning more about **light pollution**, its **impacts** on people and nature, and **alternatives** to conventional lighting.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SCIENTIFIC MONITORING

Environmental monitoring of lighting conditions and light pollution has already been implemented, and the results are currently awaited from partner universities, while **technical** monitoring is ongoing and is scheduled for completion in winter 2025/26 as part of the demonstrator activities. Measurements of light (pollution) levels are foreseen in connection with the testing of new luminaires at the pilot sites.

In addition to physical measurements, the participatory formats (especially Night Walks and workshops) function as a qualitative **feedback mechanism**, capturing perceptions, concerns, and experiential knowledge from both professionals and citizens.

SWOT ANALYSIS

STRENGHTS

- Strong engagement formats combining technical XR tools with experiential public participation.
- Improved cooperation between the district and the municipal lighting operator HHVA.
- High public interest and positive perception of the district administration through the Night Walks.
- XR modelling supports shared understanding among diverse professional stakeholders.

WEAKNESSES

- High demand on staff time and organisational capacity, especially for workshop preparation and coordination across authorities.
- Complex governance structure can slow down decision-making and dilute responsibilities.
- XR-based processes require technical expertise and preparation effort.

HAMBURG HYBRID CO-DESIGN APPROACH

OPPORTUNITIES

- Potential to institutionalise Night Walks as a regular participation format within the district.
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- Use of XR tools to support political decision-makers' understanding of light pollution and lighting design.
- Strengthening cross-authority cooperation on biodiversity-friendly lighting beyond the pilot sites.

THREATS

- Risk of limited implementation if higher-level authorities or operators do not align with district-level ambitions.
- Hierarchical mismatches between district initiatives and city-level structures may hinder innovation.
- Resource constraints could limit continuation of intensive participation formats.

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RECOMMENDATIONS

- Night Walks are a **low-cost, high-impact** participation format that can be adapted easily in other municipalities.
- A **combination** of short **expert input** and direct **sensory experience** **in a dark environment** is particularly effective.
- Events should be **time-limited** (around two hours), carefully moderated, and **supported by communication** through municipal press channels.
- XR-based workshops are **valuable for complex urban contexts** where many actors share responsibilities. However, they require substantial preparation and **should be embedded** in existing planning and decision-making processes **to have lasting impact.**

Next Steps for Hamburg

Upcoming **milestones** include **completing the testing** of the new luminaires and **finalizing** the associated light pollution **measurements at the pilot sites.**

- Internally, the district plans further **workshops and meetings with higher authorities** to **consolidate lessons learned** and explore how biodiversity-friendly lighting can be more firmly embedded in standard procedures.
- Efforts will also be made to **involve political decision-makers more closely,** potentially through formal resolutions supporting improved expertise on lighting and light pollution at district level.
- Regarding public participation, the district aims to **establish Night Walks as a permanent format** within its administrative practice and to involve local politicians in order to **secure long-term support and continuity**.

CONTACT

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