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HAMBURG

GERMANY



PROJECT
AREA
STORY LOCATIONS

SETTING

- **Timeframe:** as of February 2025
- Urban public spaces (e.g., neighborhoods, streets, parks) in the city of Hamburg
- Developing a **participatory, immersive tool** (PARTICLE) to support collaborative urban lighting planning and reduce light pollution.

MAIN STAKEHOLDERS

- Lighting planners and municipal authorities
- Local residents and community groups
- Environmental and ecological experts
- Traffic and infrastructure departments
- Children, people with disabilities, visually impaired individuals
- Non-human species affected by artificial light (e.g., birds, insects)

KEY APPROACH

- Use of XR/VR-based PARTICLE tool to visualise space and lighting effects
- **Creating shared visual and experiential understanding among stakeholders**
- Encouraging cooperation across disciplines and municipal departments
- Opening the planning process to the public for feedback and engagement
- Integrating ecological perspectives and potentially species-specific visualizations

KEY TOPICS

- Light as a social, ecological and spatial experience
- Lack of public participation in lighting planning
- XR/VR-based co-design and visualisation
- Interdisciplinary and inclusive planning
- Impact of lighting on humans and non-human species
- **Potential for democratization of planning processes**

IMPACT

- Collaborative workshops show improved communication and decision-making
- Reduces barriers between experts and non-experts
- Helps reveal compromises and trade-offs in lighting choices
- **Supports more environmentally sensitive and socially responsive lighting solutions**
- Shows potential for democratizing urban planning and reducing light pollution

*“LIGHT IS A PUBLIC MATTER.
KNOWLEDGE AND DECISIONS ABOUT IT SHOULD BE
TRANSPARENT, INCLUSIVE AND PARTICIPATORY.”*



Opening Up Lighting Planning: A Tool for Co-Designing Urban Light



The way we light our cities affects us all. Yet decisions about lighting are often made far from the streets they're meant to illuminate, guided mainly by minimum lighting norms, maintenance needs and cost-efficiency. **But light is more than a technical figure. It shapes how people and nature experience public spaces and habitats.**

If we want better lighting and reduce light pollution, we need to rethink how we plan it from the very beginning. That means involving not just lighting experts in the process, but also those who experience the light in everyday life and relevant voices from all areas: district authorities, environmental or traffic municipal institutions, ecologists and citizens - and perspectives often overlooked in planning, like children, people with disabilities and the natural world.

Despite great interest of many actors, collaborative lighting planning still remains an exception. **While participatory approaches**

are more common in other areas of urban development, lighting is often treated as a purely technical matter and as a field for experts. This can lead to isolated decisions and missed opportunities.

There is a lack of awareness about light pollution and its effects, which makes it harder to create demand for better solutions. What's missing are platforms and opportunities for exchange, cooperation and, building a shared understanding of the outdoor environment during the night.

Bringing all different perspectives to the table and creating a common basis for collaborative and participatory lighting planning: this is the vision behind the XR (Extended Reality) planning tool developed by the HAW Hamburg University of Applied Sciences as part of the DARKER SKY project. This new tool is called **PARTICLE** – which stands for Participation, AR, Reality, Transparency, Interaction, Co-Design, Lighting Design, Enlightenment.



A new way to talk about light

The PARTICLE tool doesn't replace specialised planning software, it aims to fill a different gap: creating a shared visual and spatial starting point that allows very different people to talk to each other. Lighting planners, traffic engineers, environmental authorities and building departments all have their own priorities, needs and constraints. Often, these don't align easily. However, the tool aims to help bridging these gaps. It allows everyone to sit at the same table, literally and figuratively, and start from a common visual understanding.

In this case, PARTICLE combines real-world data of public spaces with digital 3D visualisation to create an immersive experience. The tool aims to make lighting plans and their effects visible and tangible, thereby allowing people to simulate and interact with lighting situations in a realistic virtual environment.

Using VR (Virtual Reality) headsets, touch tables or tablets, stakeholders can explore digital streetscapes and test lighting

options by adjusting placement, height, brightness, colour, shielding and more. The simulation includes animated pedestrians and cyclists, making it easier to judge visibility, safety and atmosphere under different conditions. At the touch table, participants collaborate around a 3D model of the site, with their changes displayed on a large screen for group discussion.

Meanwhile, others can experience the same scenarios immersively through VR headsets, with the effects also visible to observers via a separate screen. Both tools allow for intuitive, direct comparisons between existing and improved lighting strategies in a shared visual space.

This changes the tone of the conversation. The tool brings a sense of play into the process: putting on a headset and walking through a familiar space in a new way is engaging, even fun. But this playfulness is not superficial. It helps to lower thresholds and barriers, between disciplines, between professionals and the public and encourages more open dialogue about what good lighting could be.





Democratising lighting planning

To date, the PARTICLE tool is still being developed and has mostly been tested in workshops with professional stakeholders in Hamburg. These workshops have already shown what's possible: authorities and environmental departments - who often don't work in collaboration - could test and improve ideas together, instead of working separately. However, the potential goes far beyond professional planners.

What if local residents could use the tool to explore different lighting scenarios before decisions are made? What if children could walk through their route to school and share their feedback? What if people with visual impairments could show how flickering LEDs affect their experience of space?

This is about democratising lighting planning - making it open and accessible to everyone affected by it. Light is a public matter. Knowledge and decisions about it should be transparent, inclusive and participatory. The tool could help people not only understand what lighting does, but also what it means to them, others and nature. It allows for shared insight into the compromises involved in planning decisions.

This also raises the question of how to include a seat for nature at the table. Many species rely on darkness and are disrupted by artificial light. In the future, the PARTICLE

tool could include species-specific data to simulate how different creatures experience light. Imagine seeing through the eyes of a migrating bird or a nocturnal insect. Every organism has its own wavelength sensitivities, which differ greatly from human vision.

For example, humans are most sensitive to green light and can't see ultraviolet light at all, whereas many insects are highly sensitive in the UV range. If we had this kind of data, we could integrate it into the tool and visualise the lighting impact through the "eyes" of different species.

That would open up entirely new possibilities. It might reveal, for instance, that dimming a light doesn't actually reduce the impact on a particular species, because that species is most sensitive in a spectral range that we haven't touched. Being able to switch the scene and ask, "What does this look like for a migratory bird?" or "Is this still glaring for a bat?" would be a powerful step. But we are only at the beginning.

Giving nature a seat at the planning table could mean building their needs directly into the scenario. This could take many forms: maybe an avatar that represents non-human perspectives or built-in prompts that remind users to consider ecological impacts. How exactly this can be done is still open, but this is the direction for further development of the tool.





A tool in progress

The PARTICLE tool is still in development and is not yet mobile or ready for use in public spaces. But even now, it shows great promise as a more inclusive and forward-thinking approach to lighting planning: one that can help reduce light pollution and bring in voices that are often left out.

In the future, it could be made available in public libraries, co-working spaces or community centres, allowing decision-makers and lighting planners to come together and citizens to explore local planning projects and give feedback.

In Hamburg, interested municipalities, planners and other stakeholders are already invited to use the tool at the FTZ Digital Reality centre from the HAW Hamburg. Even where the tool itself is not available, the principles behind it can already inspire new ways of planning: bringing different departments and disciplines together early, using visual and interactive materials to support dialogue, and involving local communities and nature, including groups that are usually underrepresented.

Much like in other areas of urban planning, lighting strategies can also benefit from co-creation, transparency and empathy. Good practices might include setting up exchange platforms, cross-departmental working groups, involving ecologists in lighting decisions, or inviting citizens to walk-throughs or night-time site visits.

In the long run, the PARTICLE tool points to a broader shift in lighting planning: **away from expert-only planning and towards planning that is collaborative, interdisciplinary and sensitive to both people and nature.**

This tool offers a glimpse into a more democratic and responsive way of shaping public environments.



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ABOUT

Interview took place in **February 2025** with Carolin Liedtke (Hamburg University of Applied Science)

Main project partners

- Hamburg University of Applied Science, Carolin Liedtke, i.a. Roland Greule & Anna-Carena Mosler
- District Authority of Hamburg-Altona, Phoebe Schütz & Heike Bunte

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about Hamburg and current progress

- ▶ [Introducing Our Pilot Sites: Hamburg.](#)
- 🌐 [DARKER SKY News](#)
- 🌐 [DARKER Pilot Sites Hamburg.](#)
- 🌐 [FTZ Digital Reality \(German\).](#)

REDUCING LIGHT POLLUTION IN THE NORTH SEA REGION

GOOD PRACTICE STORY COLLECTION

This story is part of the Good Practice Story Collection of the Interreg North Sea DARKER SKY Project. The stories are gathered by our project partners and connected stakeholders, based on their work and experiences in different regions. They were collected during the first two years of the project (2024–2025). **Some reflect earlier stages and in many places further progress has been made since then.** For updates, please visit the project website and LinkedIn.

The collection aims to inspire and share practical insights into how different places reduce light pollution. **The stories come from diverse settings but are connected by a common approach:** bringing people together, balancing safety, everyday use and nature and learning through practice.

Enjoy reading! We hope the stories offer ideas and perspectives you can take with you.

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