New road lights, fewer dead insects—insect-friendly lighting successfully tested

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This is one of the new lights in the test field. An insect trap hangs from the lamp. Credit: Aube

In a transdisciplinary study, a research team led by IGB has developed insect-friendly street lighting and tested it in the Dark Sky Reserve

Westhavelland as well as in three German municipalities. Tailored and shielded road lights make the light source almost invisible outside the illuminated area and significantly reduces the lethal attraction for flying insects in different environments. The researchers see this as an important technical solution to reduce insect mortality.

The study was published in the journal *Communications Biology*.

Road lights can become a trap for insects at night: Flying insects such as moths are attracted by the lights and drawn out of their habitats (vacuum cleaner effect). The disoriented insects often circle around the light sources until they die of exhaustion or are eaten.

In order to test insect-friendly road lighting, road lights in a field experiment in the Westhavelland Dark Sky Reserve (AuBe project) and on roads in municipalities in Baden-Württemberg along three selected nature reserves in the Rhine-Neckar, Karlsruhe and Freudenstadt districts (NaturLicht project) were converted in a before-and-after experiment. The four sites were selected to represent a wide range of environmental conditions (urban, peri-urban, rural) and existing light pollution, and to cover a large area of Germany.

Light only where needed is much better than dimming

The new LED luminaires deliver more focused light, reduce spill light, and are shielded above and to the side to minimize light pollution. And they reduce insect mortality: Catches in insect traps on the lights showed researchers that the number of flying insects attracted was significantly lower. As a control, the previous conventional lights were used.
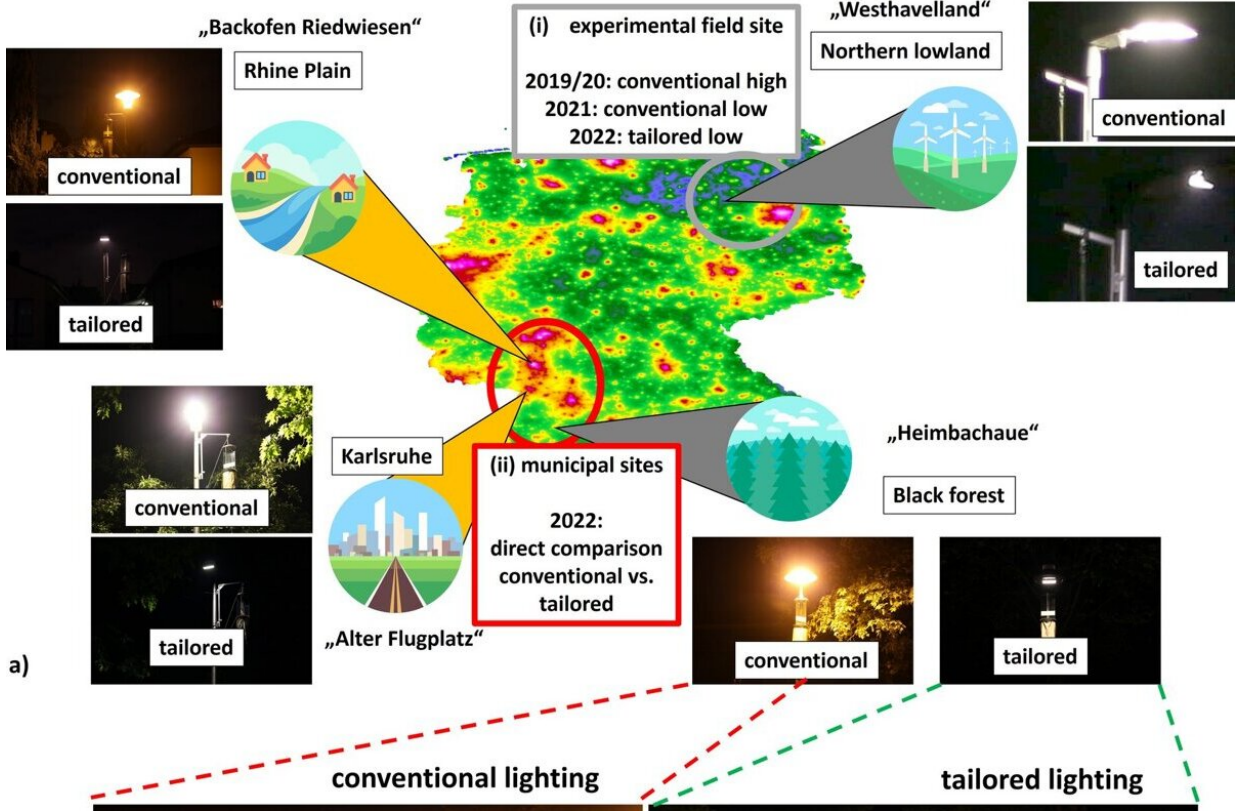
Experimental sites and design. Credit: *Communications Biology* (2024). DOI: 10.1038/s42003-024-06304-4

The conventional lamps emit a lot of light (pollution) in all directions. Credit: Aube

Surprisingly, dimming the conventional lights by a factor of 5 had no significant effect on insect attraction. "We had actually assumed a general dose-response relationship for insect flight behavior in relation to artificial light. However, it turns out that reducing unwanted light emissions by means of spatial confinement and shielding is much more effective than reducing illuminance," explained IGB researcher Manuel Dietenberger, first author of the study.

The exact mechanism of how insects react to street lighting is not yet

fully understood. It is thought that some insect species do not fly directly towards the light at a short range, but instead tilt their backs towards the brighter hemisphere in order to maintain flight control.

"In view of the results, we therefore recommend the use of tailored and shielded luminaires to protect insects," said Prof. Andreas Jechow from the Brandenburg University of Applied Sciences and guest scientist at IGB.

"This should be used especially in sensitive areas such as near nature reserves, freshwater ecosystems or other areas with high biodiversity," added Franz Hölker, head of the IGB Light Pollution and Ecophysiology research group.