

# The impact of light pollution and mitigation actions to protect seabirds in Macaronesia

GOUVEIA, CÁTIA<sup>1</sup>, T. DIAS<sup>1</sup>, A. T. PEREIRA<sup>1</sup>, A. CRUZ<sup>2</sup>, Y. ACOSTA<sup>3</sup>, D. MENEZES<sup>4</sup>, G. CARREIRA<sup>5</sup>, P. BRAZÃO<sup>6</sup>, M. SERRA-RICART<sup>7</sup>, C. BUENO<sup>8</sup>, E. ASCENSÃO<sup>9</sup>, R. FRANCO<sup>10</sup>, N. COELHO<sup>11</sup>, M. SILVA<sup>12</sup>, L. SILVA<sup>13</sup>, A. REIS<sup>14</sup> & D. LEITÃO<sup>1</sup>

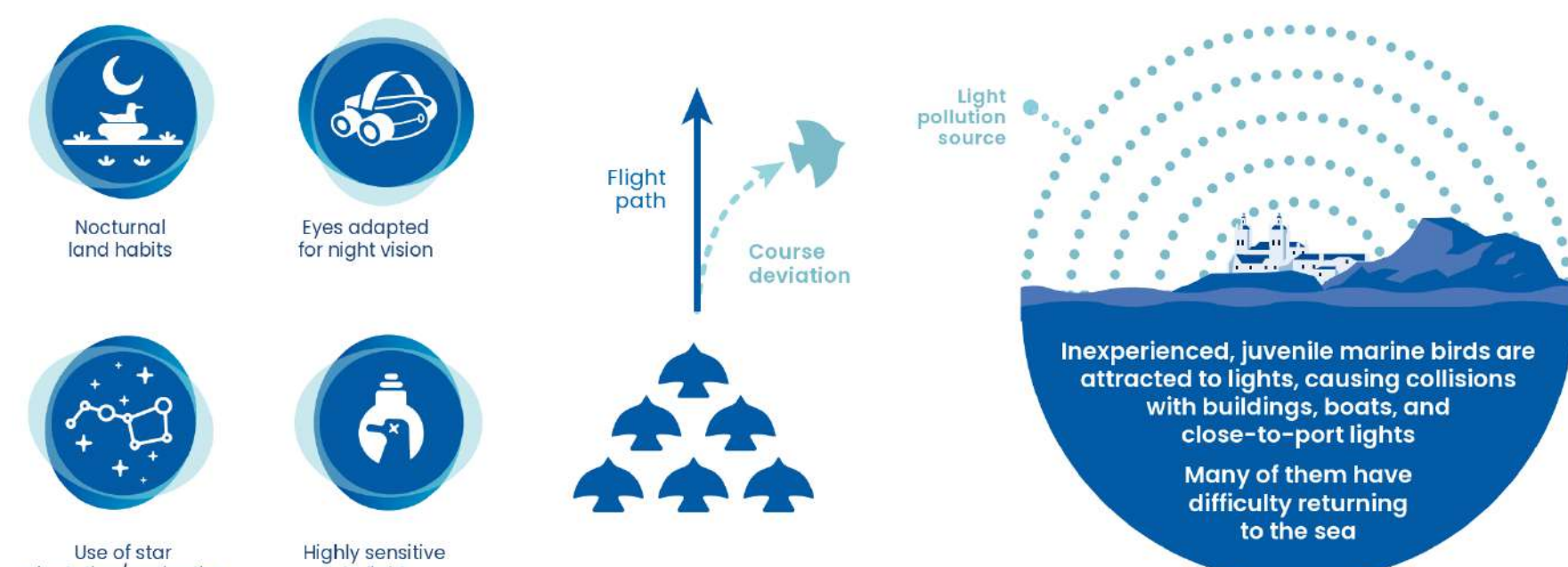
<sup>1</sup> Sociedade Portuguesa para o Estudo das Aves, Rua da Mouraria nº9, 4ºB, 9000-047 Funchal, Madeira, Portugal, [www.spea.pt](http://www.spea.pt)  
<sup>2</sup> Sociedade Portuguesa para o Estudo das Aves, Rua António Alves de Oliveira nº1 R/C, 9630-147 Nordeste, Açores, Portugal, [www.spea.pt](http://www.spea.pt)  
<sup>3</sup> Sociedad Española de Ornitología, Ilhas Canárias, Espanha, <https://seo.org/>  
<sup>4</sup> Instituto das Florestas e Conservação da Natureza Madeira, Portugal, <https://ifcn.madeira.gov.pt>  
<sup>5</sup> Direção Regional de Políticas Marítimas, Açores, Portugal, <https://portal.azores.gov.pt/web/dm>  
<sup>6</sup> Fluxo de Luz, Madeira, Portugal, <http://www.fluxodeluz.com>  
<sup>7</sup> Instituto de Astrofísica de Canarias, Ilhas Canárias, Espanha, <https://www.iac.es>  
<sup>8</sup> Instituto Tecnológico de Canarias, Ilhas Canárias, Espanha, <https://www.itccanarias.org/web/es>  
<sup>9</sup> Câmara Municipal de Santa Cruz, Madeira, Portugal, <http://www.cm-santacruz.pt>  
<sup>10</sup> Câmara Municipal de Machico, Madeira, Portugal, <https://www.cm-machico.pt>  
<sup>11</sup> Câmara Municipal do Funchal, Madeira, Portugal, <https://www.funchal.gov.pt>  
<sup>12</sup> Câmara Municipal de Santana, Madeira, Portugal, <http://www.cm-santana.com>  
<sup>13</sup> Câmara Municipal de Câmara de Lobos, Madeira, Portugal, <http://cm-camaradelobos.pt>  
<sup>14</sup> Câmara Municipal de Santa Cruz da Graciosa, Açores, Portugal, <http://www.cm-graciosa.pt>

## Introduction

Light pollution (also known as Artificial Light At Night, ALAN) is a little-known type of pollution, but with significant impacts both on biodiversity and on humans themselves and their health. Although the origin of this pollution is more linked to urban spaces, its effects affect both protected areas and species that are not restricted to the borders of classified areas. The project LIFE Natura@night, in a consortium of 13 Macaronesian partners (municipalities, regional governments, I&D institutions and NGOs), aims to reduce light pollution affecting the Natura 2000 Network in Madeira, Azores and the Canary archipelagos and to mitigate its impacts on species protected at EU level (seabirds, bats and moths).

**The darker side of light:** electric light has revolutionized human society but has also brought us health risks, endangering species and natural ecosystems, even far from big cities.

## Why marine birds are considered highly impacted by light pollution?



Amongst the most endangered animals, seabirds are severely affected by anthropogenic light sources: with high numbers of grounding fledglings reported in the last 30 years and disruptions in adult colony attendance. They have long suffered from collisions with light sources at-sea (e.g., cruise ships, fishing boats) and inland (e.g., touristic resorts, streetlights), especially in islands where they breed – many of these collisions are fatal.

Seabirds are not only impacted by direct light but also by reflections and glare of light from faraway sources, this being the cause for disruption of ecosystems through ecological light pollution. The consequences of ALAN can be detected at places located tens (or even hundreds) of kms away from the source and it is essential that light pollution in urban areas is controlled to reduce its effects on protected areas.



## Methods & Results

Using seabirds as flagship species and integrating other groups such as bats and nocturnal insects, LIFE Natura@night guarantees an ecosystem-based approach and provides the best available knowledge which is essential to mitigate ALAN impact on endangered fauna in Macaronesia.

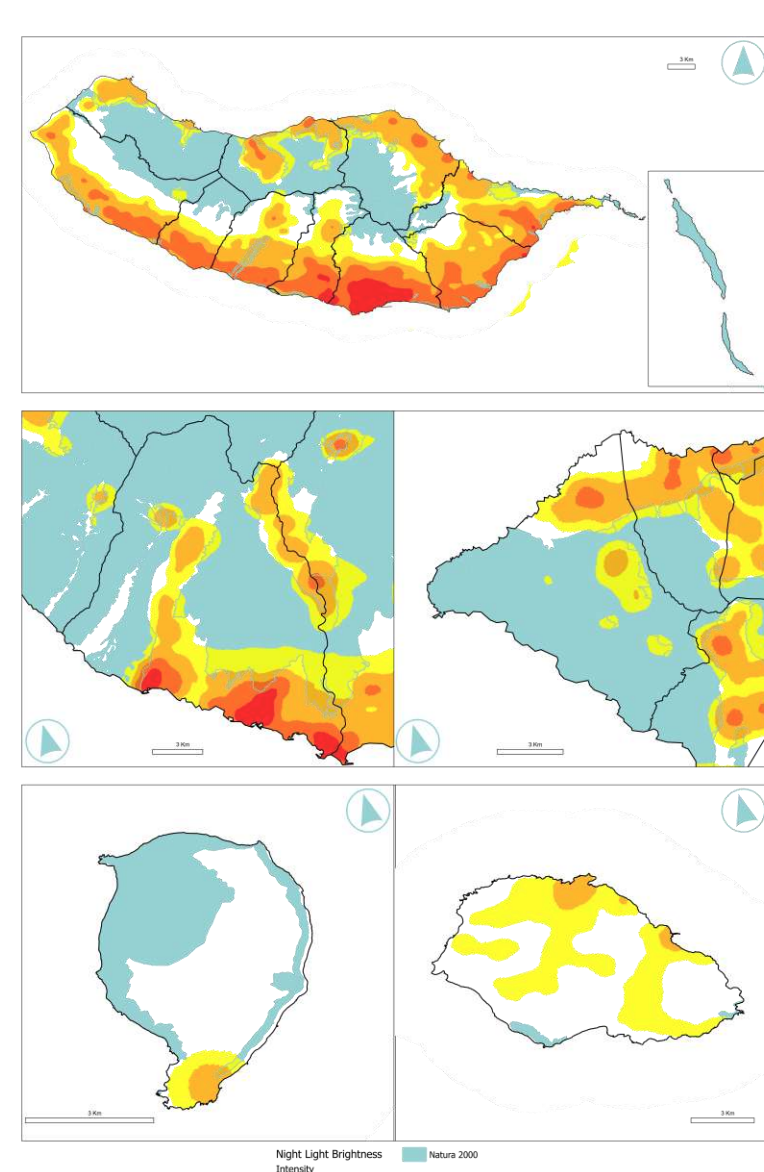
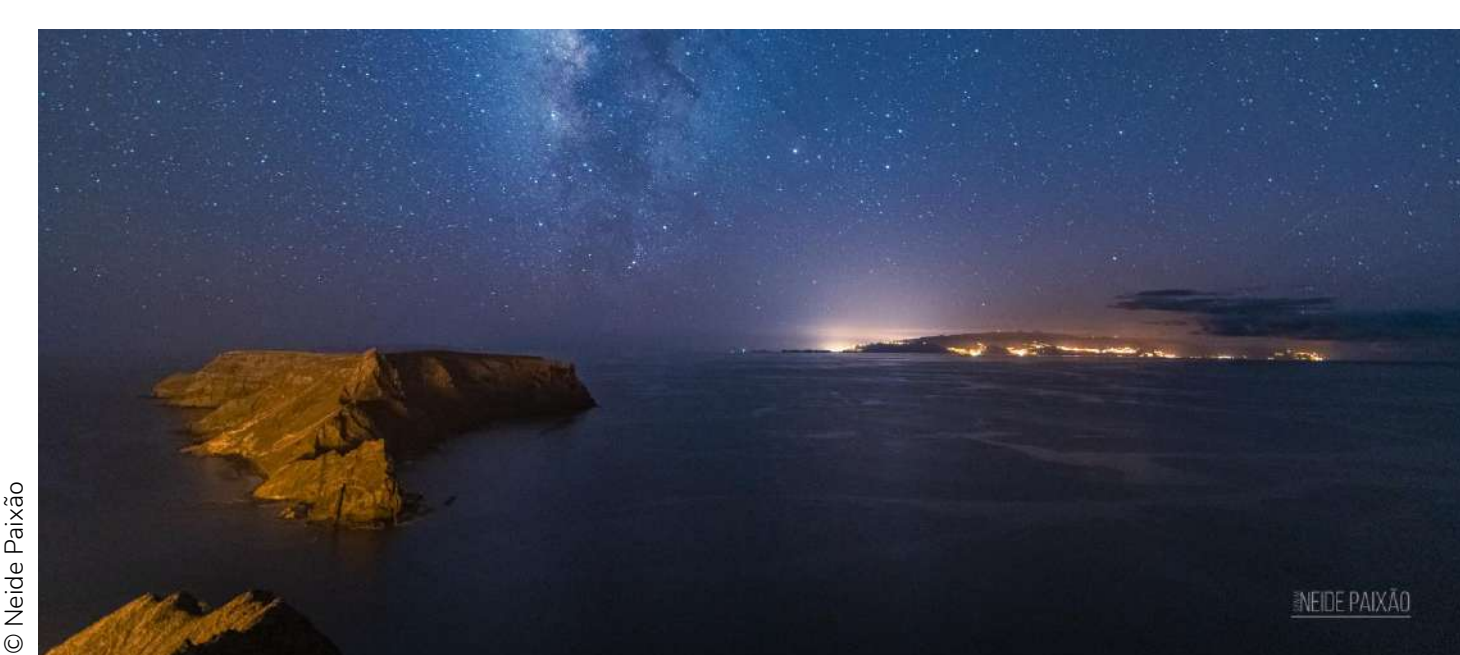
### REDUCING IMPACTS OF LIGHT POLLUTION ON BIODIVERSITY

Started in 2021, the project has already contributed to the increasing knowledge about the impact of light pollution on biodiversity (through the inventory of species, monitoring colonies of Cory's shearwater and Bulwer's petrel and prospecting for new breeding colonies).



### MAPPING ALAN IN PROTECTED AREAS

Natural habitats are not only affected by direct light, but also by reflected light and sky glow that can travel large distances from its origin. Light pollution within Natura 2000 sites was mapped and is being monitored with innovative methodologies, such as remote sensing, photography, sky quality meters and autonomous photometers. The inventory of public lighting have already allowed the identification of sensitive areas in the nine municipalities targeted by the project.



Left: Light pollution in Madeira island coastal area. Right: ALAN intensity in the intervention area (Madeira (top), Mogan and Buenavista del Norte (centre), Corvo and Graciosa (bottom)).

### PROVIDING FRIENDLY LIGHTING SYSTEM AND MITIGATION MEASURES TO REDUCE ALAN IMPACT

In Madeira, Azores and the Canary Islands, we are pioneers in reducing ALAN and mitigating its impacts. By developing Public Lighting Master Plans and other regulations, we implement more efficient, targeted and selective public lighting, improving conservation of local species, with solutions tailored to the needs of citizens.



By studying birds, insects and bats, we have identified sensitive areas where it is urgent to reduce light pollution. These areas are included on municipal regulations. In addition to long term solutions for public lighting, "blackouts" are being performed in priority areas (example above for Câmara de Lobos during Cory's shearwater fledgling season).

### RAISING AWARENESS TO PROTECT BIODIVERSITY

The awareness of coastal communities, stakeholders (fishermen, lighting technicians, architects) and citizens themselves, through training and awareness actions, has already reached hundreds of people and reinforces that the multilevel approach designed to guarantee the success of the project and sustainability in the long term it is already a winning bet.



Left: More than 200 volunteers already joined the rescue campaigns in all three archipelagos, saving hundreds of seabirds affected by ALAN. Around 20 systematic transects are being executed to study the "fallout" events and the public light features that attract birds. Right: Actions like seminars with technicians, enquiries to local citizens and awareness actions guarantee that our solutions enable greater energy efficiency, reduce light pollution and are compatible with people's lives.

## Discussion & Final remarks

Light pollution is a priority threat in Macaronesia and has an important impact on ecosystems. Available data is not reliable and sufficient to apply ALAN conservation measures in priority species and habitats. Since 2021, LIFE Natura@night is undertaking broader mitigation measures to ensure conservation of endangered species of seabirds, bats and insects, in 27 Natura 2000 sites (around 150,000 ha of protected areas).

Overall, turning off the light is simply insufficient. A multilevel approach and building solid alliances between local authorities, I&D community and the civil society has been constructed to undertake measurable changes in light pollution levels, and to achieve long-term sustainability across the areas where light pollution affects biodiversity. This project has also been an exciting opportunity for interdisciplinary research, involving biological and social sciences, with seabirds acting as flagship species for raising awareness and promoting the implementation of mitigation measures for light pollution issues.

While the European Union strategies for 2030 aim the increase of energy efficiency and climate change reduction, it fails to balance it with the protection of biodiversity. In this sense, including existent knowledge on light pollution impacts on biodiversity and health will contribute to the development of a more appropriate and sustainable local, regional, national and international approach to ecosystem-friendly lighting systems that benefit biodiversity and local communities.

By 2025, it is expected that the actions developed within the scope of LIFE Natura@night can inspire other municipalities and regions to adopt measures to fight light pollution, on a joint path between protecting biodiversity, increasing energy efficiency and involving citizens on active environmental changes.

