

Experience the darkness



Working together
on Dark Sky in the
Wadden Region

APRIL 2021

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1. Introduction



Nocturnal darkness is one of the core characteristics in the Dutch, German and Danish Wadden Region. The Netherlands has therefore already created two recognised Dark Sky Parks (East Terschelling and Lauwersmeer National Park), while the Danish island Mandø and the German islands Spiekeroog and Pellworm are also on their way to achieving this status.

Since 2009, the Wadden Sea has been designated as a UNESCO natural World Heritage Site where natural processes proceed largely undisturbed. Especially in relation to biodiversity and ecology, darkness can contribute to the Protection of the UNESCO Outstanding Universal Value.

During the 13th Trilateral Governmental Conference on the Protection of the Wadden Sea in Leeuwarden in 2018, darkness was one of the issues under consideration and the following was recorded in the Ministerial Statement: “We, the ministers, are aware of the potential impact of light emissions on the Wadden Region and its unique core quality, and of the importance of darkness for both the ecosystem and people.”

The trilateral Wadden Sea Region still experiences truly dark nights. In this region it is possible to see a bright starry sky and sometimes even to admire the Milky Way. The three Wadden Sea countries are working together to preserve darkness in the region and to develop a trilateral Dark Sky programme. The goal is to consistently emphasise the importance of nocturnal darkness in the Wadden Region and to take physical measures together to reduce light emissions and to facilitate the experience of dark nights.

In this document we share the knowledge that we hold trilaterally, while also highlighting possibilities for various target groups to take action through concrete measures to enhance the experience.



2. The importance of darkness for people and nature



There are huge contrasts in the Wadden Sea region between brightly illuminated harbours and the darkest regions in Europe. In large parts of Europe it no longer gets really dark at night. The difference between day and night, and thus also the experience of dusk and dawn, is disappearing. This has an effect on people, animals and plants.

2.1. People

Aspects such as temperature and the quantity and composition of light. Artificial light strongly affects the predictability of the quantity and composition of light, and hence there is less difference between day and night. This in turn leads to disruption of sleep rhythms, causing disorders such as reduced alertness and memory, depression and can lead to overweight. Thus light influences not only individual health and productivity, but also society as a whole. More and more knowledge is coming available about how the use of different light spectra can influence things like alertness, perception and biorhythms. In Chapter 1.1. of the [Austrian Guidelines for Outdoor Lighting](#) you can read how light affects issues such as sleep disorders, susceptibility to glare and the perception of safety.

2.2. Fauna and flora

Research has shown that lighting can also have a major effect on various animal species. Light can be hugely disruptive for some species, while others actually seem to benefit from it. The effects of light on birds, bats and insects has been most intensively researched and determined. Much of this research has been carried out on land. Little or no such research has been conducted in the Wadden Region or comparable regions elsewhere in the world, however, so the effects of light on local organisms in such areas is generally unknown. It already seems that what is good for one species is not necessarily good for another species.

The best-documented information about birds' reactions to artificial light is probably their attraction to light during migration at night. Highly illuminated areas in dark environments, such as onshore plants or offshore platforms and larger cities on land, disrupt the orientation of night-migrating birds that are normally active at day. This form of disorientation often leads to death due to exhaustion, caused by a dramatic increase in flight time, but also to direct collision with illuminated structures.

Light at night can also increase the nocturnal activity of birds living in areas with light pollution as it affects the 'timing' of the daily activity. For example, an often-observed effect of artificial light is that some birds start their morning song earlier in the day. Many bird species migrate or hunt at night. This dependence on darkness makes these species very sensitive to bright light in areas that would naturally be dark.

Many plants are sensitive to day length: when plants come into leaf or flower and when they shed leaves are influenced by the length of the day. Various species respond differently to this: each species has its own optimum.

In Chapter 1.2. of the [Austrian Guidelines for Outdoor Lighting](#) you can read how light affects fauna, flora and ecosystems. Appendix 2 gives several linkages towards websites where you can find more information.



3. Growing awareness



Almost everyone in Europe and the US lives in a place that can be described as 'light polluted', that is places where artificial light is always stronger than the light of the moon and the stars. Every year this area increases by two per cent, while the places that are already bright become brighter.

Light gives us a sense of safety. Research sometimes points to the opposite: more lighting can lead to more burglaries and more vandalism. Public lighting is also a major source of energy consumption. Transitioning to more sustainable LED lighting does indeed make lighting more economical, but in practice this transition leads to even more light. Moreover, some of the luminaires shine with no purpose, such as in empty office buildings and parking areas, and along unused paths or roads that are illuminated all night.

3.1. Better light

Light can still be visible at long distances. The openness of the landscape is an important factor in this regard: in an open area one can see light sources many kilometres away, while in a secluded area this is sometimes limited to just metres. We can reduce light pollution by making different choices. The amount of (stray) light can easily be reduced by applying a simple principle: the illuminated surface needs to be visible, not the light source itself!

Read more about the technical possibilities in:

- the report [Austrian Guidelines for Outdoor Lighting](#) from Chapter 3 onwards
- this [brochure with simple tips and recommendations](#), as a supplement to the Austrian Guidelines for Outdoor Lighting.

3.2. Making your own contribution

More darkness begins with the question of how much light you need. This depends on the purpose of the illumination, and also on your own wishes. Sometimes there are legal requirements that need to be considered, too.

- How to ensure less light [at home and in the garden](#)
- Read how you, as a government body, entrepreneur or citizen can help to reduce light pollution in the Wadden Region in the report [Austrian Guidelines for Outdoor Lighting](#) vanaf hoofdstuk 5.
- A lot of (German language) brochures have been published by the [International Dark Sky Reserve UNESCO Biosphere reserve Rhön](#)

3.3. Working together for darkness

In order to take steps to consistently reduce light pollution and create more darkness, we will need to work together, with various stakeholders forming a community to support Dark Sky, based on a sense of community, in dialogue with each other, sharing knowledge, learning from experience and building relationships.

Besides this bottom up approach you also need a top down process. In this respect we can learn from the project Night Light (2016-2019) in which regional authorities in the Netherlands, Hungary, Spain, Luxembourg, Denmark, Slovenia and Italy joined forces improving regional policies to reduce light pollution and protect and valorise dark night skies.



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Various lessons have been learned from this project:

- Commitment by stakeholders at various levels is a precondition: policymakers and practitioners, citizens and conservation experts, politicians and tourism actors. It is crucial to strengthen and expand the stakeholder network.
- It is also necessary to involve the lighting industry, architects and installation companies.
- Each target group has its own motivation for participating in Dark Sky. Government bodies often focus on the issue of energy savings, conservationists want to protect biodiversity and entrepreneurs are interested in the economic opportunities offered by darkness. It is essential to achieve a common understanding in order to work together successfully.
- The issue must be addressed both by bodies from the area itself (bottom-up) and by (regional) government (top-down).
- Without a clear institutional framework and policy environment, it is almost impossible to achieve results on a larger scale; this in terms of both reducing light pollution and using the potential of darkness and of bright starry skies.
- Consistent long-term policy with dedicated political and administrative actors can provide strong support for efforts and initiatives.
- Education and awareness-raising is absolutely essential! It is vital to increase understanding and general awareness of the negative effects of light pollution. The same goes for knowledge of newly developing opportunities for local economies. In order to achieve this, education and marketing experts must also be involved.

Read more in the report project Night Light “[Lessons and Recommendations Guide – December 2019](#).”



4. The experience



On a clear night in the Wadden Region you can see around 3500 stars. Seeing a starry sky like this, including the Milky Way, is a special experience for many people. It can even be a life-changing experience for children who live in places where almost no stars can be seen at night.

Enabling people to experience darkness and a bright starry sky induces a sense of wonder among both residents and visitors. This promotes involvement and also raises awareness about the need to protect this core value and to contribute to its further development. Hence experience and a sense of wonder are crucial for strengthening Dark Sky in the Wadden Region. Experiencing darkness and a bright starry sky creates opportunities for new sustainable tourism products. This provides a unique selling point and can contribute to further development of the local economy.

The weather forecasts have no timetable or agenda. It is almost impossible to predict when a clear starry sky can be seen. The phase of the moon is relevant and predictable, but clouds and precipitation strongly influence the experience, too. This makes it difficult to schedule public activities. Communicating dates at the last moment is one option for preventing the experience from becoming a disappointment.

Relating public activities to all aspects of the night presents a better option. Besides darkness and starry skies, one can also hear night sounds, smell different things than during the day and also experience that once your eyes have become used to the dark, you can actually see quite a lot. So each night experience is different, but this is exactly what creates a sense of wonder and hence also awareness.

Read more about this in Appendix 1, in which we provide practical advice for organising a darkness event. This section also includes recommendations from the Night Light project for promoting experience of the dark and strengthening tourism.



5. Policy



It is harder to achieve more darkness in a region than it is to increase the lighting in an area. Although we know more and more about the impact of light pollution worldwide, it still remains difficult to actually create more darkness. This requires a joint approach in which individual citizens, as well as entrepreneurs and businesses, authorities, site managers, the lighting industry and communication and consultancy agencies can all make a contribution. Besides experience and awareness, this also requires good policy.

One good example of policy is the new enforcement to [the Grenelle law from 2013](#) which came into force in France on 1 January 2019, designed to prevent further light pollution. This was prompted by campaigns conducted by three French environmental organisations. The Decree establishes technical requirements for the design and operation of outdoor lighting installations and imposes these regulations on both public and private property owners. It contains a number of prescriptions that apply to various lighting situations, from parks and gardens to building exteriors and parking facilities. The second part specifies eleven sites of astronomical observatories throughout France that receive special consideration for the highest level of protection.

Importantly, the Decree fully sets forth, for the first time, a clear intent in establishing meaningful national regulations “designed to prevent, limit and reduce light pollution, including excessive disturbance to persons, fauna, flora or ecosystems, causing energy wastage or preventing observation of the night sky.” Its applicability extends to all lighting in France, taking aim at even cherished traditional applications such as the lighting of the exteriors of monuments and churches. However, it does so in a way that, is sensible and realistic, allowing for such applications while minimizing their impact through limits on the intensity and duration of use.

In general the policy follows the main guidance that has been promoted by the International Dark Sky Association:

1. Outdoor lighting curfews: Artificial light may only be switched on when it is needed and must be dimmed (by at least 70%) or switched off outside the period of use.
2. Limits on the allowed emission of light directly into the night sky.
3. Reduced influence of glare
4. Restrictions on the emission of blue light; only light sources with low ultraviolet and blue components may be used; lighting should instead tend towards amber to warm white light, with colour temperatures to a maximum of 3000 Kelvin.
5. Allowable illumination levels: In order to prevent use of excessive lighting that can compromise public safety, light uses should never be more than 35 lumens per square meter of illuminated target surface.
6. Light trespass into dwellings should be prohibited like the use of sky beams, lasers and similar high-intensity light as well as the night-time lighting of waterways.

See for the actual law [France Adopts National Light Pollution Policy Among Most Progressive In The World](#) | International Dark-Sky Association. To ensure that the Dutch, German and Danish Wadden Region does indeed stay dark, we will need to persuade governments to create corresponding policy together.

The inclusion of a legal regulation on light pollution in the Federal Nature Conservation Act in Germany is currently being discussed, but this should not be submitted to the Federal Council until December 31, 2022 (according to the draft).



6. Dark Sky worldwide



The [International Dark Sky Association \(IDA\)](#) is working to protect the night sky for current and future generations. There are now 79 Dark Sky Parks worldwide, many of which are in the United States.

There are two Dark Sky Parks in the Netherlands, both in the Wadden Region: the Boschplaat location on the island Terschelling (since 2015) and Lauwersmeer National Park (since 2016). In contrast to the Netherlands, Germany has a relatively high number of nature conservation areas (large scale protected areas: National Parks, Biosphere Reserves and Nature Parks) in some of which true darkness can still be experienced. Engaged nature protectors and astronomers collaborate to protect darkness. They proposed to install, till now, five locations in Germany officially designated by the IDA as Dark Sky locations as best practice examples for reducing light pollution. Two of these are Dark Sky Parks: Eifel National Park and Winklmoosalm, two Dark Sky Reserves, Nature Park Westhavelland and UNESCO Biosphere reserve Rhön and one Dark Sky Community Fulda (with about 70 000 inhabitants). Denmark has a Dark Sky Park and a Dark Sky Community: the islands Møn and Nyord.

Every year the IDA organises the international Dark Sky Week. You can find interesting information and short films on the [organisation's website](#).

Under the umbrella of the International Union for Conservation of Nature (IUCN) operates the [Dark Skies Advisory Group](#) (IUCN-DSAG).

The United Nations Office for Outer Space Affairs (UNOOSA) with the International Astronomical Union (IAU) recently held a workshop during which they discussed [the creation of Dark Sky Oases](#) in order to protect areas from light pollution.

Even if "Dark Sky" as such can not be included in the World Heritage list [as it can not be considered in the scope of the WH Convention](#), it is recognized that the dark sky qualities directly or indirectly support the OUV in both natural and cultural sites. In the case of the Wadden Sea World Heritage site, the conservation of dark sky qualities can be important to maintain or improve the quality of the night-and-day cycle for the conservation of natural living species.

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Appendix 1: Handles for organizing a Dark Sky event



TIPS

1. Find a good place for the event. Research the silence / darkness in the place. Make sure the place is publicly accessible. Or make good agreements with the owner of the place.
2. Ownership and collaboration. Provide an interesting program (see tips below) and see if you can combine with local initiatives or collaborate with local entrepreneurs. This way you can put together packages and strengthen the experience of the participants and the (local) economy.
3. Choose a catchy title for the event. Emphasize the beauty of the night. Make sure your event is a success, even if the (weather) conditions are not optimal, or work with an alternative date from the beginning. Be careful with the word Light Pollution to avoid any negative connotation.
4. Set a correct date. Special dates such as Midsummer Night / Midwinter Night or changing the clock are better remembered. (although during summer nights it might be too bright to see stars properly). Allow for the choice of activities, for example do not go stargazing with a full moon. Be informed about what you'll see in the sky (planets, moon, ISS, meteor showers, ...)
5. Provide an unforgettable experience. Provide a special experience by creating the "right" conditions. Take a nice walk to a dark, clearing place or take a boat trip. Or provide a sheltered spot with good seating furniture and / or blankets if necessary. Arrange the amenities you need.
6. Invest in knowledge exchange. A nature guide who is used to doing day excursions is not automatically a good night guide. With a good star chart and a book about astronomy you can learn a lot about the starry sky. And there is also a lot of information about the importance of darkness for your health and about what you can do yourself to contribute to more darkness.

GET INSPIRED

- The Dutch Nature and Environment Federations have been organizing the Night of the Night for more than 15 years. View the [inspiration guide with great ideas](#).
- See also the [recommendations for experiencing darkness from the project Night Light](#) from page 11 onwards. Some highlights from that:

Organize special events

- Think of a painting / essay / or photo competition for school children.
- Work with local amateur stargazers who can provide practical explanations on the use of a telescope, organize visits to an observatory.

Education and awareness activities for different target groups

- Develop educational activities for the various age groups
- Organize awareness activities with local communities about the importance of darkness and the opportunities to do something about it yourself, combined with enjoying the darkness by looking at the stars.
- Organize technical sessions about the possibilities for Public Lighting in municipalities (in collaboration with regional government, lighting installers and technicians).

Stories of stars, darkness

- Darkness and dark skies are part of our cultural heritage. Every region / local culture has its traditional stories that have to do with darkness or the role of stars and the starry sky. Use these stories to introduce the extraordinary universal values of the starry sky.

The Night light project also made recommendations to improve and strengthen the current Astro-tourism.

There is also a [private initiative](#) to foster international astro tourism.

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Appendix 2: Other references



EFFECTS OF LIGHT POLLUTION

- Book recommendation: [Ecological and Organismic Effects of Light Pollution](#) by Travis Longcore and Catherine Rich, 15 November 2016
- In Germany, within the interdisciplinary research project "[Loss of the Night](#)" (2010-2014), scientists examined for the first time at national level the ecological, health as well as cultural and socio-economic effects, but also the causes for the increasing Artificial Light at Night (ALAN). Based on the research results from the project "Loss of the Night" and other projects, solutions for modern lighting concepts and sustainable technologies were developed.
- Important guidelines (in German) have been published as an outcome of these projects:
 - [Analyse der Auswirkungen künstlichen Lichts auf die Biodiversität](#)
 - [Leitfaden zur Neugestaltung und Umrüstung von Außenbeleuchtungsanlagen](#)
- A study describing the situation of light pollution and possible remedies have been published in a [technical report to the German Bundestag](#), with [English short version](#).
- Between 2010 and 2017 the Netherlands Institute of Ecology (NIOO) carried out a large-scale study entitled '[Licht op de natuur](#)'. A new study has been underway since summer 2019, entitled 'Light on Landscape'. One important aspect of these studies is to measure the effects of experimental lighting on places that were previously dark. Since the colour composition of light can easily be changed nowadays, and since this can mitigate the possibly harmful effects of light, the researchers are examining the effects not only of white light, but also of red and green light on animals (and plants). As many species groups as possible are being researched: moths, bats, mice, the Mustelidae group of mammals as well as other mammals, birds and amphibians.

GUIDELINES FOR LIGHTING

"Loss of the night" initiated the EU network LoNNe (Loss of the Night Network) to join forces for the scientific analysis of light pollution. Today parties from 18 countries participate. They published recommendations to protect areas elaborated by international experts: <http://www.cost-lonne.eu/recommendations/>, especially http://www.cost-lonne.eu/wp-content/uploads/2013/08/LoNNe-Statement-for-NPA's_2016_160722.pdf.

CITIZEN SCIENCE PLATFORMS

Besides the scientific network, the citizen science platform [STARS4ALL](#) offers opportunities to get involved in projects and initiatives around the environmental problem of light pollution.

Another framework, the [EU-platform ACTION](#) offers networking between citizen scientists who engage in issues of environmental pollutions. In addition to light pollution, environmental pollution includes air pollutants, plastics and other substances that disrupt our ecosystems and are released into the environment through poor management of our consumption.

A citizen science project which is just starting with the development of an app (will be available in German and English) about counting light sources in limited areas to compare them with the satellite pictures, is called [Nachtlucht Bühne](#). As it is just starting, there is only [limited information](#) available at the moment, or [a blog](#).



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