"The road to infinity" on the island of Anholt, Denmark. Long-exposure night view, taken in "the Desert". The glow is from passing ships in the Kattegat strait. The point of light at center is Anholt Lighthouse. Photo credit: Jakob Andersen, Clearskyastro.dk.

Application to

DarkSky International

to designate

the island of Anholt, Denmark

as a

Dark Sky Park

(Name: Dark Sky Park Anholt)

norddjurs kommune

DARK SKY ANHOLT FOR EN SYNLIG NATTEHIMMEL

The European Agricultural Fund for Rural Development
Europe investing in rural areas

Contents

1. Endorsement of the Dark Sky Anholt project from Mayor K. J. Bjerregaard, the Municipality of Norddjurs, Denmark

[Danish original, with English translation on next page]

Til DarkSky International Grenaa, 5.12.2024

Som borgmester vil jeg på vegne af Norddjurs Kommune gerne indstille Anholt til at blive certificeret som en Dark Sky Park. Anholt er med sin helt unikke natur og øens lokalsamfund og historie en meget særlig del af vores kommune. Anholt er kendt for sin uspolerede natur, stilheden og mørket, der giver helt specielle muligheder for at opleve stjernehimlen.

I disse tider med højt tempo, allestedsnærværende digitale tilbud og fokus på udfordringer omkring mental trivsel er sådanne naturområder med plads til fordybelse og refleksion særligt værdifulde. Norddjurs Kommune giver derfor fuld opbakning til at værne om mørket på Anholt til glæde for øens og kommunens borgere samt de mange turister, der hvert år besøger øen midt i Kattegat.

En anerkendelse og certificering af mørket på Anholt er på en række områder vigtig for Norddjurs Kommune. En Dark Sky Park-anerkendelse vil give nye muligheder for at tiltrække besøgende hele året, hvilket vil understøtte et bæredygtigt helårsliv på Anholt med gode jobmuligheder året rundt.

Norddjurs Kommune har desuden fokus på at understøtte børn og unges interesse i naturvidenskabelige fag. I tæt samarbejde med Foreningen Dark Sky Anholt får børn og unge fra både Anholt og fra skoler og ungdomsuddannelser på fastlandet gennem stjerneobservation og introduktion til astronomi pirret og fodret deres naturvidenskabelige nysgerrighed. At have en Dark Sky Park at tage på feltstudie i er en uvurderlig mulighed. I forhold til uddannelse er Dark Sky Anholt endvidere en del af kommunens partnerskab med Aarhus Universitet.

Naturbeskyttelse og bevarelse af biodiversitet står højt på Norddjurs Kommunes dagsorden. Dark Sky Anholt er et vigtigt eksempel på, hvor bredt naturbeskyttelse skal tænkes. Med det store fokus på, hvordan brugen af kunstig belysning bedst kan etableres, er Dark Sky Anholt-projektet en vigtig inspirationskilde i kommunens arbejde generelt med belysning – hvor intelligent, fokuseret belysning, energi og bæredygtighed får stadig større opmærksomhed.

Et Dark Sky Park-certifikat til Anholt vil være en stor anerkendelse, først og fremmest til Foreningen Dark Sky Anholts utrættelige arbejde med at bevare mørket og formidle mulighederne for at opleve stjernehimlen på Anholt. Samtidig vil det være en anerkendelse til Anholts borgere, der har valgt livet på øen og Norddjurs Kommune til, i et af de mange yderområder, der tilbyder helt unikke naturoplevelser – herunder et storslået, natmørkt himmelhvælv.

På Norddjurs Kommunes vegne

Borgmester Kasper Juncher Bjerregaard

[Translated from the preceding original Danish letter of support. Certified translator Heidi Flegal.]

To DarkSky International Grenaa, Denmark, December 5, 2024

In my capacity as Mayor of the Municipality of Norddjurs, I hereby nominate the island of Anholt as a candidate for certification as a Dark Sky Park. With its unique nature, local community and history, Anholt is a very special part of our municipal area, known for its unspoiled landscapes, stillness and a darkness providing outstanding opportunities to view starry skies.

In this fast-paced day and age, with ever-present digital distractions and publicized challenges to mental well-being, there is an exceptional value in natural areas such as this, with room for reflection and immersion. Our Municipality therefore gives its full support to safeguarding the darkness on Anholt, for the benefit of the islanders, the other citizens in the municipality, and the many tourists who visit this island in the middle of the Kattegat strait every year.

The recognition and certification of the darkness on Anholt is important for the Municipality of Norddjurs in several ways. Being recognized as a Dark Sky Park will give the island new opportunities to attract visitors all year round, helping to sustain permanent livelihoods on Anholt and giving islanders better year-round job opportunities.

In addition, our Municipality focuses on supporting child and youth engagement in science. In close cooperation with the Dark Sky Anholt association, we work to awaken and satisfy the curiosity of children and young people – not only those living on Anholt, but also those from primary and secondary schools on the mainland, Jutland, through star observations and introductory astronomy classes. In this context, having a Dark Sky Park for field trips would be phenomenal. In fact, in terms of teaching and outreach, the Dark Sky Anholt association is already part of our municipal partnership with Aarhus University in Jutland.

Protecting nature and biodiversity are also high on the municipal agenda. Dark Sky Anholt is a key example of the broad approach to conservation our efforts must take. With its passionate focus on how best to install artificial lighting, Dark Sky Anholt's project is an important source of inspiration to the municipal work with lighting in general – where attention to and awareness of intelligent, focused lighting, energy issues and sustainability is continuously growing.

A Dark Sky Park certificate for the island of Anholt will be an important acknowledgement, first and foremost of the tireless work of the association, Dark Sky Anholt, to preserve the island's darkness, and to teach and reach people to tell them about the starry night skies on Anholt. It will also recognize the citizens of Anholt, who have actively chosen island life and chosen to live in our Municipality: one of the many peripheral areas in Denmark that offers exquisite encounters with nature – including magnificently dark nightscapes.

On behalf of the Municipality of Norddjurs, sincerely,

Mayor Kasper Juncher Bjerregaard

2. Executive Summary

"Anholt, the darkest place in Denmark." This is an ever-more popular way of referring to this small jewel of an island, well known to Danes and located in the Kattegat strait, almost exactly midway between the Danish and Swedish mainlands. The island of Anholt is something of a diamond in the rough, known for its relative remoteness, rare flora, stunning land- and seascapes, and – not least – its exceptional opportunities to experience truly dark night skies. Therefore, the Dark Sky Anholt association (DSA) and the Municipality of Norddjurs hereby jointly propose that Anholt be granted the designation of Dark Sky Park.

Our aspiration to achieve Dark Sky Park certification is based on **three main goals**:

1) to continue an already strong and necessary focus on protecting the island's vunerable flora and fauna – which prominently involves protecting the night sky
2) to raise public awareness and dialougue, through our dark-sky initiatives, about the use of artificial ligthing – which includes initiating dark-sky-friendly light solutions that can inspire others and, quite literally, serve as a shining example; and
3) to strengthen astro-tourism to Anholt – which includes active outreach initiatives and dark-sky events held there, thereby welcoming visitors throughout the year and helping to support the local year-round community on Anholt.

The technical framework is also in place. To comply with application requirements and DarkSky guidelines, one stationary measuring station has already been providing sky quality data continuously since 2019, and in December 2023 another station was installed and began transmitting data. The overall darkness on Anholt, based on SQM data from from the first measuring station – just over 9,900 measurement for 2021-2023 – has demonstrated an impressive mean value of 21.43. Supplementary measurements have been made at various locations and times on the island, and more recently astro-photograhps have been taken, all of which document the island's dark sky quality.

In terms of documentation, we have an Outdoor Lighting Inventory and a Light Management Plan to reach 100% DarkSky-compliant lighting. Both are divided into two parts: public lighting and private lighting. For public (including harbor lighting), DSA has direct access to public bodies working with us towards full DarkSky compliance. For private lighting, our successful dialogue with private year-round and holiday-home owners will continue to share information, knowledge and inspiration. In short, we are confident that fully dark-sky friendly outdoor lighting is achievable within a few years.

We have seen an overwhelming interest in and support for DSA's work. Our education and outreach actitivities will continue and develop as we move forward. So will our astro-tourism activities, which support, and are supported by, the island's year-round residents.

A Dark Sky Park certification for the island of Anholt will make a tremendous difference to DSA's and the Municipality of Norddjurs's combined efforts to maintain and increase public focus on the dialogue of light pollution – a dialogue which, only now, is slowly beginning to take shape in Denmark.

3. Letters of Nomination, Recommendation and Support

Section 1 of this document – Endorsement by the Mayor of the Municipality of Norddjurs, Kasper J. Bjerregaard – officially confirms the **current local government's support** for this application (in Danish, with an English translation).

Further, according to DarkSky requirements, the following two pages are the official **Letter of Nomination** from members of DarkSky International: Ms. Anne Dixgaard and Mr. Morten Abildstrøm, who are both co-founders of the Dark Sky Anholt association (in Danish, with an English translation).

Appendix A contains **additional Letters of Support and Recommendation** from various key stakeholders, organizations and bodies.

Please note that several of these letters, which all assert continuing support and therefore have not been renewed during our work with the application, use the designation "Dark Sky Sanctuary", even though the present application is for the **designation of Anholt as a "Dark Sky Park"**. Also, some letters are in Danish only.

I. The landowner of the island of Anholt
   Mr. Jens Christian Rostgaard von der Maase (Danish attorney at law)
II. The local government authority, signed by the mayor incumbent at that time, April 2020:
   Mayor Jan Pedersen, for the Municipality of Norddjurs
III. The association of residents on the island of Anholt
   Ms. Liselotte Arentz Sørensen, for Anholt Borgerforening (Anholt Citizens Association)
IV. The association of homeowners (including holiday homes) on the island of Anholt
   Chairman Ms. Trine Heidemann Jensen, for Anholt Grundejerforening
V. Educational network – youth education programs the Norddjurs area
   Mr. Morten Bang Sørensen, for Viden Djurs (in Grenaa, Denmark)
VI. Business network in the Djursland region (in Danish only)
   Mr. Ole Sørensen, for Business Djursland (in Kolind, Denmark)
VII. Tourism organization, depart for coastal tourism in the Aarhus area
   Mr. Flemming Rasmussen, for VisitAarhus, Kyst- og naturturisme (in Kolind, Denmark)
VIII. Denmark's largest nature conservation organization, local committee for Norddjurs
   Mr. Morten Abildstrøm, for Danmarks Naturfrednings Forening, lokalafd. Norddjurs
IX. The regional authority, which is also responsible for regional development in Djurland
   Mr. Kim Kofod Hansen, for Region Midtjylland (the Central Denmark Region)
X. Hans Kjeldsen, Professor at the Department of Physics and Astronomy,
   Aarhus University, Denmark
XI. Anholt Harbor, Ms. Kirsten Hvid Schmidt, Managing Director

Official Letter of Nomination from Members of DarkSky International

[Danish original, with English translation on next page]

Aarhus og Anholt, 30. april 2024

Til foreningen DarkSky International

Anholt er et sommersted. Tusindvis af glade turister kommer hvert år til øen for at slikke sol på de flotte hvide strande, bade i det klare blå vand, gå ture i den enestående natur, spise is og friskfanget fisk, og hver aften finde det perfekte sted at nyde de langstrakte, smukke solnedgange. Det er et unikt sted for uforglemmelige sommerferier – men øen er meget mere end sommer, sol og lyse nætter.

I 2017 fik to yngre mænd på Anholt den idé at lave gin af øens mange enebær, og de inviterede venner og familie til øen i efteråret for at hjælpe med at plukke enebær i Ørkenen. Det blev en helt ny oplevelse af, hvad Anholt har at byde på. På aftenens vandreture fra Anholt by og ud til sommerhusene blev vi, der deltog, slået over den overvældende klare stjernehimmel: Der var Mælkevejen lige over os og myriader af stjerner. Som én sagde, kunne man næsten ikke se Karlsvognen for bare stjerner.

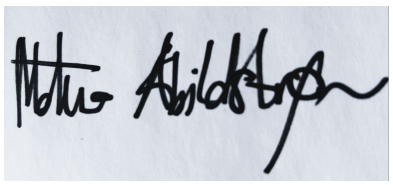
Det var et syn, som nogle af os aldrig havde set før. Andre havde ikke set noget lignende, siden de var børn. Det blev til den helt store fortælling efter efterårsturen, og med den nye opmærksomhed på, at det faktisk er muligt at se sådan en himmel i Danmark, dukkede International Dark Sky Association op – som inspiration og som en metode til at beskytte den.

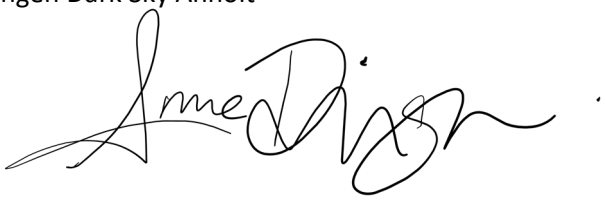
Anholt har et enestående og naturligt mørke, og af samme grund er der på øen et meget klart udsyn til himmelrummet. Det arbejder vi nu, på femte år, konkret og praktisk på at sikre. Vi er nu en forening, der allerede har inddraget og engageret mange i tankerne og i selve projektet: øens private ejer og størstedelen af de fastboende anholtere og sommerhusejere. Øens nye og smukke mørkevenlige belysning – der også er kommet på plads ved kommunens opbakning og økonomiske støtte – er et stort skridt på vejen til bedre forhold på Anholt for nattemørket og dermed stjernelyset. Desuden håber vi på, at belysningen kan inspirere øens besøgende, så de tager Dark Sky-oplevelser og tanker med sig hjem og kan være med til at fremme bedre mørkevenlig belysning i hele landet.

Vores fremmeste mål er at bevare mørket på Anholt, så fremtidige generationer konkret og fysisk kan opleve, at vi bor på en planet midt i Mælkevejen, frit svævende i et gigantisk univers.

Derfor nominerer vi, medlemmer af DarkSky International – Morten Abildstrøm og Anne Dixgaard, næstformand og formand af Foreningen Dark Sky Anholt – øen Anholt som kandidat til at opnå status som Dark Sky Park.

Med venlig hilsen
Morten Abildstrøm og Anne Dixgaard, Foreningen Dark Sky Anholt





[Translated from the preceding original Danish letter of support, by certified translator Heidi Flegal)

Aarhus and Anholt, Denmark, April 30, 2024

To the association
DarkSky International

The island of Anholt is a delight in summer. Thousands of happy tourists visit Anholt each year to lie in the sun on the beautiful white-sand beaches, swim in clear blue waters, walk in exceptional natural surroundings, and eat ice cream and freshly caught fish – each evening seeking the perfect spot to enjoy the long, exquisite sunset. Anholt is a unique location for unforgettable summer holidays, but the island is much more than summer fun and Nordic white nights.

In 2017, two young men on Anholt came up with a plan to make gin using the island's many juniper berries, and they invited friends and family to come that autumn and help pick juniper in the island's "Desert". This proved to be a whole new experience of what Anholt has to offer. Walking in the evening from Anholt village, out past the summer cottages, we were overwhelmed by the clear night sky: the Milky Way right above us, and countless stars. As one participant said, you could hardly see the Big Dipper for all the stars.

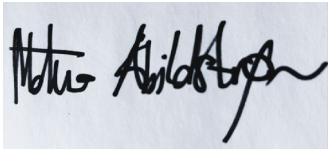
This was a sight that some of us had never seen before. Others had seen nothing like it since childhood. After this autumn get-together, the night sky became an epic narrative – and with a new awareness that it was actually possible to see such a sky in Denmark, we also became aware of the International Dark Sky Association [now DarkSky International] as a source of inspiration and a way to protect the night sky.

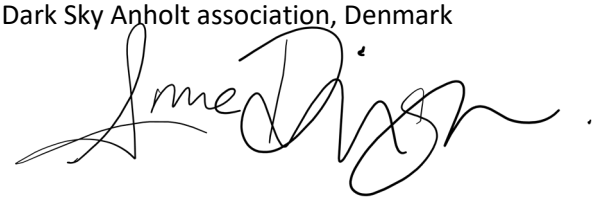
Anholt has exceptional natural darkness, giving a very clear view of heavenly bodies in the night sky. Now well into our fifth year, this is what we are working, specifically and practically, to ensure. As an association, we have already involved and engaged many people in the thoughts and the project itself: the island's private owner, and most of the island's permanent residents and summer-cottage owners. The island's new and beautifully designed dark-friendly lighting – now in place, thanks in no small part to the backing and financial support of the Municipality of Norddjurs – is a big step on the way to improving conditions on Anholt for dark nights and hence for starlight. We also hope this lighting inspires visitors to the island, who will return home with dark-sky experiences and thoughts and promote better dark-friendly lighting across the country.

Our main goal is to preserve darkness on Anholt, giving future generations a tangible experience of living on a planet at the center of the Milky Way, suspended in an immense universe.

That is why, as members of DarkSky International, we – Mr. Morten Abildstrøm and Ms. Anne Dixgaard, Vice-Chair and Chairwoman of the Dark Sky Anholt association – hereby nominate Anholt as a candidate to achieve status as a Dark Sky Park.

Kind regards,
Morten Abildstrøm and Anne Dixgaard of the Dark Sky Anholt association, Denmark





4. Dark Sky Anholt and its partners, network, and funding contributors

4.1. Introducing the Dark Sky Anholt association (DSA), Denmark

The association submitting this application, Dark Sky Anholt (DSA), was **founded** at a meeting held on the island of Anholt, Denmark, on August 31, 2019 (see founding documents, Appendix B).

The **DSA board** has seven members. Some are islanders and some are mainlanders (one of whom lives in Copenhagen). All mainlanders have close ties to Anholt. Four members are from the original founding board (denoted F), and three have been elected by a later Annual Assembly.

The DSA board currently consists of:

Ms. Anne Dixgaard (Chairwoman, F), Aarhus
Mr. Morten Abildstrøm (Vice-chair), Anholt
Mr. Kay Verner Nielsen (Treasurer, F), Nørreballe
Ms. Lisbeth Kristiansen, Aarhus
Mr. Peter Stolt, Rungsted
Mr. Simon Døssing (F), Anholt
Mr. Laurits Fokke Mølbjerg (F), Anholt

There are two types of **DSA memberships**: personal membership and family membership. At the most recent annual general meeting, held in April 2023, DSA had 96 members, about half of each type. DSA is continuously seeking to increase its membership, especially among the many who already support DarkSky's ideas and our specific DSA project.

The **DSA website** has just been relaunched (at www.darkskyanholt.dk) with much new material, and our work to regularly add content – not least photos and SQM data – is ongoing. DSA also has an **open Facebook page** (www.facebook.com/darkskyanholt), where we post news, links, data, and messages to members and visitors alike. As of January 10, 2024 we had more than 1000 followers on FB, and 956 likes – which is about ten times as large as our membership. Considering the population size of Anholt (143 as of Jan. 2023)[1] and of Denmark as a whole (5.96 million as of Dec. 2023),[2] this is a good start, but naturally we continue to seek out a wider audience through these and other channels. Our many outreach activities are outlined in Section 9, as well as cooperating with initiatives to establish a Dark Sky Denmark community.

[1] Source: Statistics Denmark (www.statistikbanken.dk/BEF4), accessed January 18, 2024.
[2] Source: Statistics Denmark (www.dst.dk/da/Statistik/emner/borgere/befolkning/befolkningstal), accessed January 18, 2024.

DSA has no official motto, but we do have several Danish phrases that convey our position and our mission to nature lovers and Danes in general. For instance, on our website (and here in our translation):

> *Jylland har Hærvejen. Anholt har Mælkevejen!* [3]
> Jutland has the Ancient Road. Anholt has the Milky Way!

4.2. Acknowledging partners, networks, and funding

DSA was originally conceived by a group of enthusiastic local year-round residents and holiday-home owners in 2019, and it is still run and managed mainly through the unpaid volunteer work done by **the association's board and members**, the backbone of DSA. Volunteer work also drives our web site, with by some professional assistance from external partners, notable a web designer and an astro-photographer.

The **local community network** that supports DSA mainly consists of two groups: residents who live on the island year round ("Anholters") and holiday-home owners who often come to stay and know the island well. Although DSA does not have everyone from these two groups as a member, or have the unreserved support of each and every person on the island, we are pleased to say that our efforts have met with extremely broad support. The local island community network has been invaluable to the process of installing dark-sky-friendly lighting, and registering all outdoor lighting, and we are grateful for all the support we have received.

Regarding outreach and educational efforts, DSA has already earned widespread recognition in Denmark, as detailed in Section 9. We have only been able to achieve this thanks to our collaboration with a variety of **academic and educational partners**, to whom we are extremely grateful. They bring precious knowledge and expertise to Dark Sky events and also to our child and youth education events.

Special thanks are due to several key partners in **our wider network**, some of whom have also provided funding for events (as detailed below), for the web site and for this application seeking Dark Sky Park certification:

- The Municipality of Norddjurs – Vidensakademiet ("The Knowledge Adacemy")
- Aarhus University, physicist and astronomer Ole J. Knudsen, Administrator/Journalist, BSc, Dept. of Physics and Astronomy
- Light designers, university researchers, and others helping the DSA project and process, and this application, with specialist knowledge

[3] Name cf. the English text on the *Hærvejen* website (www.haervej.com/). The historic "Ancient Road" is several hundred miles of hiking/biking nature trails running north–south along the center of the Jutland peninsula. In Danish, the pun is that both compound names end in *vej* = "road". In Danish, our galaxy is literally "the Milky Road", so:
The Ancient Road is epic, but the Milky Road is ultimately awesome, and you can see it on Anholt.

- Musician Aksel Striim (“Viking musician”, performer, instrument-builder, composer and educator
- Lawyer Jens Christian Rostgaard von der Maase, owner of the island of Anholt
- Anholt Borgerforening (the Anholt Citizens’ Association).

In addition, we have benefited from networking in various ways with **other projects in the dark-sky community** in Denmark. We heartily congratulate Dark Sky Park Møn & Nyord, Dark Sky Park Bulbjerg, and Dark Sky Park Mandø on their certifications and are grateful for their help in pursing certification ourselves. DarkSky International has also encouraged and advised us along the way, and we are grateful to our DSI contacts for their extremely valuable assistance.

Last but certainly not least, we sincerely thank our main **funding sources** for supporting DSA, our work, actual fixture upgrades, and this application in various ways:

- The European agricultural fund for rural development (EAFRD – in Danish: ”Den Europæiske Landbrugsfond for Udvikling af Landdistrikterne”), through which the European Union invests in rural districts (under the Danish RDP, Rural Development Programme), along with the Local Action Group for small island communities (in Danish: “LAG Småøerne”).

The European Agricultural Fund for Rural Development
Europe investing in rural areas

- See also https://danske-smaaoer.dk/nyheder/etablering-af-ny-lag-for-smaaoeerne/ .

Sammenslutningen af Danske Småøer

LAG LOKALE AKTIONS GRUPPER

Finansieret af Den Europæiske Union

- Norddjurs Kommune, Denmark (the Municipality of Norddjurs)

norddjurs kommune

5. Motivating the proposal of Anholt as a Dark Sky Park

With its location in the middle of the Kattegat strait, almost precisely mid-way in the body of water separating Denmark and Sweden, the small Danish island of Anholt is the darkest place in Denmark proper. The 22.37 sq km island was shaped during the last Ice Age, more than 12,000 years ago (see Section 5.2). Archeological finds show that people have used the island as a transit point all the way back to the Stone Age, the hypothesis being that they navigated by the stars when they went on trading expeditions between what is now Danish and Swedish territory. They would have seen the same breathtaking starry night sky that we enjoy on Anholt today – and which we are seeking to protect.

Some 85% of the Island of Anholt is a special protected nature area that holds great biodiversity. The distinctive and exceptional quality of the island's starry nights and nocturnal environment, combined with its unique but fragile biodiversity, is a driving force behind our efforts to protect the island's dark sky – and our official proposal to designate the island of Anholt as a Dark Sky Park.

Danish legislation and local regulations already in force for Anholt are, of course, key tools that are crucial to protecting nature. Furthermore, there is a profound understanding among the roughly 150 year-round residents on the island, and also among owners of holiday homes and visitors to the island, that being on Anholt means enjoying and appreciating its unique natural surroundings and muted soundscape. Also, they all recognize that they are jointly and personally responsible for continuously protecting the natural wonders of Anholt.

The collective attention and interest in caring for nature on Anholt has been a remarkably solid basis on which to raise interest and awareness to protect the island's dark sky. Working with partners, and thanks to funding and administrative support notably from the Municipality of Norddjurs, the DSA accociation – locally initiated, and mainly volunteer-driven (see for instance www.darkskyanholt.dk, or www.facebook.com/darkskyanholt) – has made good headway on Dark Sky issues already, now wish to take our efforts to the next level: certification through DarkSky International.

We propose that the Island of Anholt be designated as a Dark Sky Park for three main reasons. First, there is the shared appreciation and eagerness to preserve the island's unique natural landscapes, importantly including its unspoiled dark night sky, and these are the foundation of the dark sky movement on Anholt. Because a major portion of the island is protected as a nature reserve, areas on the island with artificial lighting are limited. However, had it not been for the ongoing dialogue on how to manage lighting, the general tendency to install more outdoor lighting (thereby damaging the quality of the dark sky) might have been seen on Anholt as well. Fortunately, the core of both local government policies (the Municipality of Norddjurs) and the locally initiated Vision for Anholt is this: People live on, or visit, the island to enjoy its silence and natural beauty. The existing dark sky preservation efforts are therefore a basic assumption underlying this application.

Figure 5.A. *At left, overview: the country of Denmark proper (i.e. not including Greenland or the Faroe Islands: the two northern, independent, self-governing parts of the Joint Kingdom of Denmark). At right: Anholt island in the Kattegat strait. Note: The overview map does not show Norway to the north, Sweden to the east, Germany to the south, or the Danish island of Bornholm, which lies further to the east in the Baltic Sea. Photo credit, right: Private pilot's photo.*

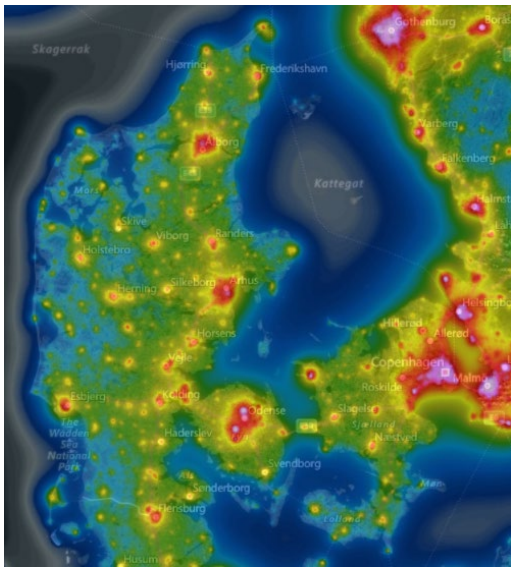


Figure 5.B. *Denmark and the southeastern coast of Sweden, showing light intensity on an increasing scale. Range: dark blue (darkest) through pink (lightest). Source: www.lysforurening.dk ["light pollution dot DK"].*

Secondly, DSA has successfully made astronomy education and communication available to a large number of people in very diverse groups. "Star safaris" in the Desert (see description in section 5.3.), astronomy classes, educational activities, and more have made dark-sky awareness grow, and it has become increasingly popular to participate in the activities offered by the DSA. Partnerships with the local school on Anholt, with youth education programs on the mainland, and with Aarhus University are all valuable platforms for the outreach efforts of DSA. If approved, this proposal motivating Anholt as a Dark Sky Park will reinforce the island's position as a unique location for astronomical experiences. Further, the association's educational efforts also include raising general

awareness about the consequences of artificial lighting on nature, and on human health. Unfortunately, children and young people in Denmark, like their peers in many other countries, are struggling with mental health and well-being issues. For DSA, it is and will continue to be a high priority to give children and youth the opportunity to be introduced to astronomy and, through this, to foster philosophical reflection on being in the world. Finally, also regarding education, Anholt will serve as a "field study" on how to plan and install dark-sky-friendly lighting. With the recent replacement of all streetlights to dark-sky compliant and sustainable lights, the island reached a milestone in showing how solutions can be realized, even while the wish for lighting can be met, thanks to careful outdoor light planning.

Thirdly and finally, the designation of Anholt as a Dark Sky Park will be a landmark in the efforts to develop the island as an astro-tourism destination. Traditionally, most tourists visit Anholt during the 6 to 8 weeks of summer, with July as the busiest month. Efforts to prolong the tourist season have been made, and branding Anholt as a unique place to discover the dark sky is supporting the development of all-season tourism on the island. Like many other island communities around the world, and like many of Denmark's other small, inhabited islands (which number 27 in all – defined as having a population of less than 1,200; having no bridge connection to a large body of land; and not having municipal status; cf. the Association of Danish Small Islands), maintaining a viable residential population is a delicate balance, and functioning year-round community cannot be taken for granted. Many people on Anholt have a work mosaic with several different jobs. Historically and today an innovative, creative approach to creating jobs thrives here, and examples of initiatives that attract visitors in the off-season are many. Even so, learnings from other certified Dark Sky areas are encouraging for those seeking to develop astro-tourism, as this holds the potential to create local jobs – and we believe that the results of Dark Sky Park certification will support the year-round comminity living on Anholt.

5.1 Introducing the Island of Anholt

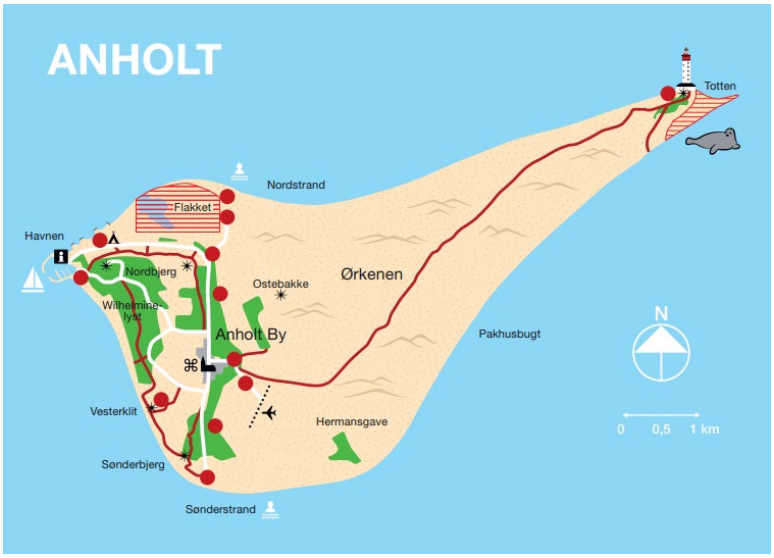


Figure 5.1.A. *Overview map of the Island of Anholt.*

Table 5.1 Key data for Anholt

Geographical coordinates	56°42'N 11°34'E / 56.700°N 11.567°E
Area	22.37 sq km
Population of year-round Anholters	127 (as of 2024)
Highest point	Southern Hill, 48 meters above sea level (location of Anholt 2 measuring station)
Km to mainland	The Danish and Swedish mainland are both approx. 45 km. away (the Jutland peninsula to the west; southeastern Sweden to the west)

The essence of Anholt in the minds of Danes, and to a lesser extent beyond Denmark's borders, is clear from the following profile, published by the official tourism authority of Aarhus [*www.visitaarhus.dk*], which promotes the entire East Jutland region. The following is our translation, in excerpt and based on the original Danish as accessed on February 15, 2024, at this link: *Ø-ferie på Anholt* ("Island holiday on Anholt"):

"An island holiday on Anholt

The sea, the dunes, endless beaches, and spacious skies.

Anholt, one of Nature's rare pearls, is located in the middle of the Kattegat strait, and here, far from the urban oceans of light, the starry night sky on Anholt is quite exceptional. Anholt is also the place to wander in the Desert – the largest low-elevation heath in Northern Europe and one of the most extraordinary natural settings in Denmark.

This island has peace and quiet, and also a lively harbor area with restaurants by the quay and live music on the long, light summer evenings.

The Desert – the largest low-elevation heath in Northern Europe

[… …] the island is one great big bonanza of wildflowers and free-flying birds, and across the island you can get close to the amazing plants and animals that live here.

Dark Sky

The island's dunes and hilly areas offer an absolutely unique opportunity to experience glittering stars and constellations in the sky, without being disturbed by artificial city lighting. As in the old days, the dark nights here are Denmark's darkest.

Life on the island, and the summer season

The village of Anholt Town is the largest and only urban area on Anholt, and besides Anholt Harbor it is also the only area with buildings.

The island's two hills, Northern Hill and Southern Hill, have a view of ocean as far as the eye can see, with more than 60 km to the nearest visible landmarks.

What is more, Anholt has hardly any, or just a few traditional tourist activities. So what is it that makes curious visitors come here the first time – and then make the trip again, and again, year after year?

Well, come on over and find out for yourself."

In spring 2024 the island launched a new website of its own, beyond the info and tourist site “VisitAarhus”, with strong local anchoring and more detailed information: www.anholt.dk . The stunning photos alone explain why Anholt is so unique.

The introductory phrase (here with our translation) reflects the energy and welcoming spirit of the islanders:

”Velkommen til Anholt. Vores hjemmeside er som Anholt selv – altid i bevægelse og fuld af overraskelser! Vi bygger og forbedrer løbende, så hold øje med nye opdagelser.”

“Welcome to Anholt. Our web site is like Anholt itself – always in motion and full of surprises! We are continuously building and improving this site, so keep an eye out for new things to discover.”

5.2 Cultural History and Significance

Early history and the first people

Stone tools found on the western part of the island show that the first Anholters lived here in the Early Stone Age. At that time the Maglemose Culture (c. 7,500–6,000 BC) was widespread in Denmark, and Anholt had a land bridge to the Jutland peninsula. Presumably, groups of hunter-gatherers came here to fish, hunt deer and boar, and gather provisions. The landscape had fresh-water lakes and light, semi-open woodlands with hazel, birch, and pine.

Later, the sea level rose, and the moraine hills on western Anholt became an island. Until c. 4,000 BC these new living conditions made the inhabitants shift towards a more marine-oriented diet of seal, porpoise and shellfish, as seen in blue-mussel “kitchen middens”.

Rathulen Hollow, located a few hundred meters east of today’s village, contains some finds from this period, including flint cores, flake axes, and transverse arrowheads. More numerous finds have been made in the Desert, including traces of flint-knapping sites from the Late Stone Age. Incidental finds of tanged arrowheads point towards the Pitted Ware Culture, widespread c. 2,850–2,450 BC along coastal Kattegat areas. These suggest small hunting stations with seasonal seal and marine-mammal hunting and shellfish gathering.

Subsequent prehistory on the island is evidenced by Bronze Age, Iron Age, and Viking Age finds – although we still know very little, based on the archaeological evidence. Excavations will probably yield traces of building activity, and we must also assume that shipbuilding was of vital importance here, as for any island population.

Anholt Harbor

After years of political debate, in 1899 construction of Anholt fishing harbor began. The harbor was completed and inaugurated in 1902. It served as a safe harbor for fishing

vessels caught in storms in the Kattegat strait, and was also home port for Anholt's own fishing fleet. Today's harbor has a marina for small private boats and operates the docking facility for the ferry between Anholt and the mainland town of Grenaa.

Historically, since the 1600s some 300 vessels have been recorded as shipwrecked around Anholt. The first SAR (search-and-rescue) facility on the island was set up in 1878, at the lighthouse on island's eastern tip. It was closed in 1926 and remains unmanned. Today, Anholt Harbor has a modern, well-equipped SAR station that is manned around the clock, and a fully operational SAR vessel ready at the jetty at all times.

5.3 Geography and Nature

Early history

For millennia, during the Weichsel Ice Age –about 150,000–12,000 years before the present – glaciers spread south and withdrew several times. In this process sand, stone and gravel material was pushed up and compacted to gradually form the elevated west end of Anholt.

When ice entered the Kattegat, sea levels were dramatically (25–50 meters) lower, whereas meltoff at the end of an ice age would have caused the sea level to rise. As a result, marine currents and waves gradually reshaped the island's elevated areas, transporting gravel material eastwards and forming seabed there.

In the Stone Age the rising seabed eventually broke the surface, forming a beach-like reef. The constant influence of the water formed a number of elongated beach mounds on the eastern part of the island. Later still, more dry land appeared as the land rose, enabling pioneer plants and trees to gain a foothold. Notably, fir trees spread across the island and still stood as late as the 1600s. Then, as the inhabitants cleared the vegetation to make room for sheep, the area we now call "the Desert" was formed: as the vegetation was so sparse, the wind deposited sand from the former seabed into dunes of "flying sand" – still visible in the Desert today.

For creational lore about Anholt island, see Appendix C.

The Desert

Rather than being a description of a landscape, the term "the Desert" (in Danish: *Ørkenen*) denotes a particular part of the island. For centuries this area was covered by pine and fir trees, and well into the 1700s it was still called the Wood (*Skoven*).

Today's landscape is a mix of bogland, birch groves, stone and gravel ridges, dunes, and flat heather-clad areas. Scattered junipers create a contrast to the sand, crowberry, and dry grasses, with occasional patches of heather (various species), and small willow species in the southern Desert. Moist areas may accommodate cotton-grass, wild orchids, and the small, protected, carnivorous plant sundew.

Mainly, however, the Desert is distinguished by its tiny but abundantly growing lichen, and is home to nearly 250 species of lichen, some very rare. They all get their nutrients from the air and thrive on the island, where air pollution is minimal. Technically, the area's habitat designation is "lichen heath" – the most nutrient-poor habitat type in Denmark. The Desert was stripped of trees due to sheep farming and to fulfill the need for fuel (for the lighthouse and private homes).

Much later, the southern part of Anholt once again became partly overgrown by *Pinus Mugo*, a species of small, hardy mountain pine. These trees have been planted over the last century or so by people who began to buy plots and build recreational homes here. By the 1990s, this species fast-spreading species had come to dominate one-fourth of the Desert. To restore the lichen heath, the municipal authority of the City of Aarhus and the EU co-sponsored a major land-clearance project, which is currently maintained by the hand-weeding of small, self-sown pines. The Desert's ecology, with particular focus on various lichen species, was monitored by a team from the University of Copenhagen.

Traffic and getting around
Most of the Desert was preserved by the Danish conservation authorities back in 1939. The aim was to preserve the large and unique natural habitat for the Danish people as heritage, and to permit scientific studies. Later, Southern Hill (*Sønderbjerg*), Northern Hill (*Nordbjerg*), Western Dune (*Vesterklit*) and Lovers' Lane (*Kærlighedsstien*) were also designated as conservation areas. Today, nine-tenths of Anholt is a nature preserve.

The Danish "preservation orders" enable the authorities to do maintenance work in the designated areas. They also regulate public access. People may walk freely all over the lichen heath. Lichen can tolerate wear, but only light and infrequent foot traffic; no bicycles. All motor traffic in the Desert and on the beaches is forbidden. A handful of people have limited permission to drive motor vehicles in the Desert for their work, but they may not carry tourists when driving to the lighthouse area for work. All visitors are asked to respect these rules, to keep the beaches and uninhabited areas undisturbed, and to keep the natural balance as stable as possible.

5.4 Land Ownership and Administration

The total registered number of buildings on Anholt is **482** (see Figure 5.4.A.). Of these, 453 buildings fall into the category "Residental units" (consisting of *73* regular houses and *380* summer cottages/holiday homes), and 29 buildings fall into the category "Business units and public buildings". The latter include restaurants, the grocery store, the ferry building, the school, the fire station, and so on.

Please note that when we estimate the percentage of Dark Sky compliance (Section 7), we include <u>all</u> buildings, even if the vast majority of buildings are summer cottages which, to a very large extent, are not used at all during the off-season (September–April) – which is relevant, at it conveniently coincides with the dark season in Denmark and supports the very core of our mission and purpose.

Buildings on Anholt, grand total	**482**	
Residential units	453	
… of which houses		*73*
… of which summer cottages/holiday homes		*380*
Business units and public buildings	29	

Figure 5.4.A. *List of buildings on Anholt – broken down into houses, summer holiday homes; and businesses and public facilities. NOTE: The vast majority of buildings are summer cottages, most of which are used only in peak season – and so remain unlit during the dark season. Source: Municipality of Norddjurs, as of 2024.*

Besides the ownership outlined above, approximately 85% of Anholt is owned by the Von der Maase family. Most of this 85% is officially protected, and national Danish legislation ensures access to the public. Over the years, the willingness of the Von der Maase family to support developments on the island has been strong and consistent. This once again shows in the family's support for the DSA project (see Appendix A – I).

Anholt is a part of, and therefore administrated by, the Municipality of Norddjurs.

The harbor area is owned by the private limited company Anholt Harbor. This is a subsidiary of Grenaa Harbor, which is 100% owned by the Municipality of Norddjurs.

Land ownership and the Von der Maase family

The island of Anholt has been privately owned since 1668. Anholt's current family of owners came to be proprietors of the island when Hans Rostgaard married his third wife, Dorthea Rohde, in 1674. Dorthea Rohde was the widow of the lighthouse-keeper Peder Jensen Grove, who in 1668 had bought the island from the Danish Crown.

In 1720, Hans Rostgaard's granddaughter, Conradine Sophie Rostgaard, married Frederik von der Maase, thereby creating the ownership link which, up to this day, is associated with the Rostgaard von der Maase bloodline.

Of the island's total areas of 2,237 hectares, about 1,800 hectares are currently owned by the Danish lawyer Jens Christian Rostgaard von der Maase – and of the total 2,237 hectares, 2,067 are protected land. The first protection order was made in 1939, and it declared the entire Desert a totally and unconditionally protected nature preserve. This means, among other things, that driving motor vehicles along the beaches and in the Desert without a special permit is forbidden. Several other protection orders have since followed, most recently in 2019. (Text courtesy of Maria von der Maase Rockwell Bendtsen.)

5.5 Population, Visitors and Public Access

Like other small islands in Denmark (27 in all, according to the Association of Danish Small Islands), Anholt has had a small rise in inhabitants with the status of year-round residents. In 2022, the **total population** (all ages) was 150. Some are related to families with links to the island for centuries, while others have moved to the island in recent decades. When people decide to move to Anholt, they are often motivated by a wish to make a life change, rather than pursuing a certain career. Many Anholters earn their yearly income by holding a patchwork of jobs. Many jobs on the island are very practical in nature, but Anholters are generally well educated – and many have proactively chosen to give up a promising, well-paid career in the city in exchange for island life.

As the next diagram shows, the population has been quite stable for decades. Shifts were seen in the early twentieth century, but the story goes that during the construction of the harbor (in 1901–1902) the "Anholt census" was based on photographs taken at the time – which, besides year-round Anholters, also showed temporary dock workers.

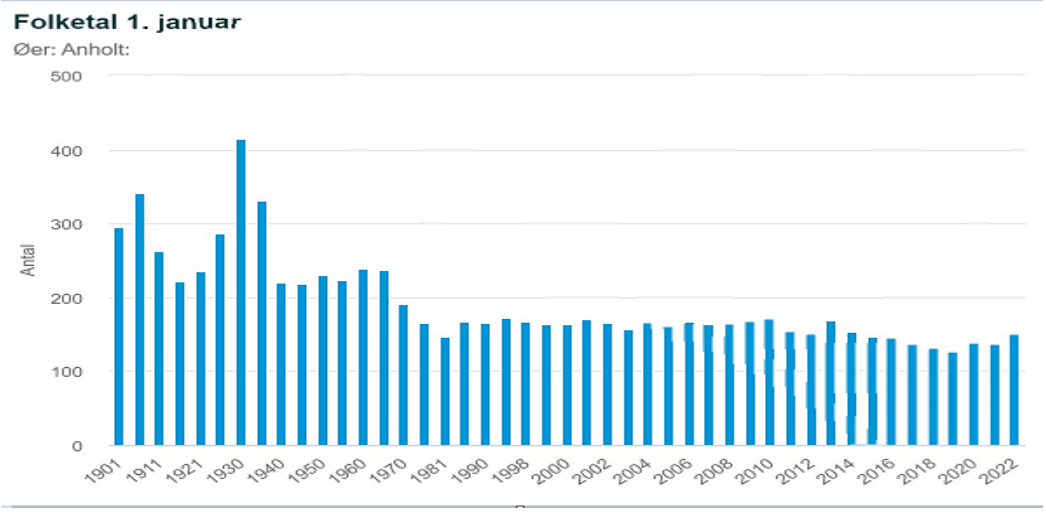


Figure 5.5.A. *Population on Anholt. As of 1 January 2022, there were 150 year-round residents (Anholters). Source: Census information, Statistics Denmark (national body).*

Anholt is widely known to **visitors** as a tourist paradise, recognized for its breathtaking natural landscapes and easy-going lifestyle. Located in the middle of the Kattegat, many boaters and recreational sailboats from Denmark, Sweden, Norway, and Germany plan their routes to stop at Anholt. In the peak season (July), the island may have up to 4,000 people at a time. Only careful preparation and planning allow the island to accommodate so many visitors each year without major problems. Off-peak (outside July) visitor numbers are modest, and continuous efforts are under way to attract visitors in the off season. The DSA project is one example that shows this is possible.

Danish regulations allow **public access** to beaches and coastal areas, even those privately owned (cf. the Danish Nature Agency, background in English at https://eng.naturstyrelsen.dk/, details in Danish at https://naturstyrelsen.dk/om-naturstyrelsen/kontakt/faq/hvor-maa-jeg-faerdes-paa-naturstyrelsens-arealer). The following is our translation of the Danish Outdoor Council's summary of these rules in lay terms (Danish original: https://friluftsraadet.dk/nyheder/maa-du-paa-danske-strande-ogsaa-paa-private):

"This is what you may do at the beach
Here is a selection of the most significant rules, which are important to know for nature experiences and outdoor activities at the beach.

- *You are allowed to travel on foot along virtually all beaches and dune-conservation areas, around the clock. Even when the beach is privately owned.*
- *You are allowed to stay on or at the beach and in dune-conservation areas for brief periods, i.e. not more than a day, but this can also be at nighttime. On privately owned beaches, you must be at least 50 meters from the owner's residence if you want to stay for a while.*
- *You are allowed to spend the night on or at the beach, but not in a tent or the like. You are allowed to set up a primitive shelter or sleep under the open sky. Remember, you must be at a distance of at least 50 meters from the owner's residence on privately owned beaches. … …"*

5.6 Nature Protection and Conservation

The island of Anholt and a large marine area north of the island (and much of the waters up the the island of Læsø, further north) is designated as a "protected nature area" under the EU directive "Natura 2000". Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and certain rare natural habitat types protected in their own right. It stretches across all 27 EU countries, on land and at sea. The aim of the network is to ensure long-term survival of Europe's most valuable and threatened species and habitats, listed under both the European Union's Birds Directive and the EU's Habitats Directive.

Anholt strategy documents

In 2023, three stakeholder organizations – Anholt Citizens' Association, The Association of Homeowners on Anholt, and Business Anholt – issued a vision and strategy paper for Anholt (*Anholt – Hele året rundt*, "Anholt – all year round"). It emphasizes Anholt's uniqueness with "sustainability" as a keyword in all aspects of island life, including conservation, tourism and business. One passage says (our translation): "Nature on Anholt is, in the main, pristine and should remain so." The document also explicitly states the aim of strengthening ongoing efforts to guide locals and tourists to care for nature, and the importance of this in promoting the island's exceptional darkness (outside the "white nights" of summer), working with DSA on a variety of dark-sky friendly events. (To see the full document – in Danish – visit the island's website at http://www.anholt.dk).

Formally, this vision and strategy document is acknowledged by the Municipality of Norddjurs and will be integrated in the upcoming strategy document for all of Norddjurs.

The Natura 2000 areas on and around Anholt

The Natura 2000 area of Anholt and the sea to the north (with its total area of 48,163 hectares) contains 46,315 hectares of marine habitats. The entire area is delimited as shown on the map. The area is designated as habitat area No. 42 (Anholt, and the sea just north of the island) and bird protection area no. 32 (the waters north of Anholt). The land-based part of area No. 42 is mainly privately owned, but there are also smaller municipal- and state-owned plots. The entire administrative area is part of the Municipality of Norddjurs.

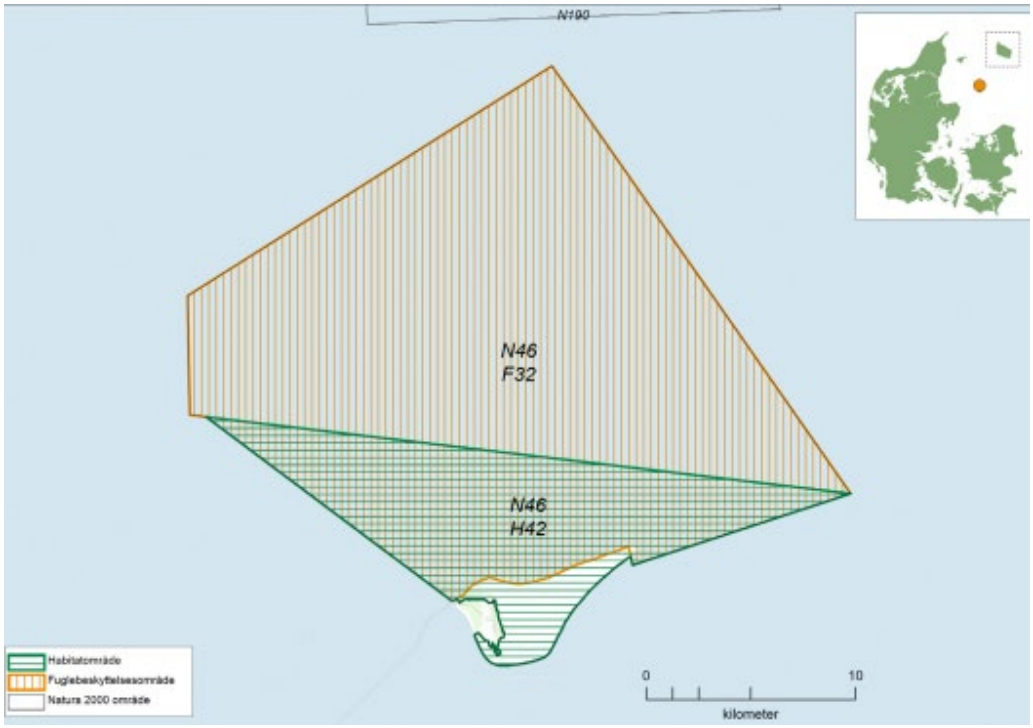


Figure 5.6.A. *Map of the protected Natura 2000 area called "N46". The habitat area "H42" covers Anholt and the marine area north of the island (green-lined), and the bird protection area "F32" covers the marine area north of the island (orange-lined).* Source: European Commission website.

This Natura 2000 area is specially designated to protect the large unbroken dune areas, which, with significant occurrences of dune nature types, make up the Desert, which is a dense mosaic of nature types. Remarkably, this area contains over 5% of the total area (within the Natura 2000 areas) in the continental bio-geographical region of the following natural habitat types: **white dune, dune heath, creeping-willow dune, juniper dune,** foredune, gray/green dune and forest dune. For the four habitat types in bold lettering, Anholt's share of the total area (within Natura 2000) is over 15%.

The marine habitats part contains a large area of sandbar and has been designated because of the presence of several migratory bird species: Eider, Velvet scoter and Common scoter, as well as porpoises in the waters north of Anholt. The Tuft (*Totten*) on the island's eastern tip is a designated seal reserve for breeding gray and harbor seals.

The Natura 2000 area covers most of Anholt (isolated, as noted, in the middle of the Kattegat, over 40 km from the Jutland coast; see maps 5.A and 5.B). However, the largest part – more than 95% of this area – consists of the large sea area north of the island.

Anholt itself is dominated to the east by the Desert, which makes up 85% of the land area. The Desert (consisting of Ice Age deposits, raised seabed and dunes of flying sand from the old seabed) was only formed after the forest was felled in the seventeenth century. The western part of the island is made up of a moraine mound, where the juniper-covered slopes with deposited flying sand to the north and south (Northern Hill and Southern Hill) are part of the Natura 2000 area, along with the large wetland area called the Flats (*Flakket*) to the northwest. This area consists of marine foreland formed by the coastal currents after the construction of Anholt Harbor around the year 1900. The Flats consist of a system of sandy seawalls alternating with wetter depressions and water holes large and small.

Within the Natura 2000 area lie **two protected land areas**: **1)** the Desert conservation area, protected in 1939; and **2)** the Northern Hill, Western Dune and Southern Hill conservation areas revised in 2015, with restrictions regarding construction and planting, and mandate for the authorities to carry out nature conservation efforts (maintenance), and to ensure public access to the protected areas. In addition, there is the nature and game reserve, Anholt Seal Reserve, which includes the Tuft on the easternmost tip of Anholt, home to Denmark's largest seal colony. The seal reserve was established in 1990, with the official regulation of traffic around Anholt's eastern tip and the surrounding marine territory. The legal order was issued by the Danish Ministry of the Environment.

The **seal** population around the Tuft is roughly 800–1000 individuals, primarily harbor seal, but also gray seal. The seal reserve is a breeding ground where harbor seals also give birth and nurse their pups. The Anholt seals are important to the Danish seal population as a whole, but also very interesting to science internationally (*re* Phocine Distemper Virus). Anholt is also home to several kinds of **bat**, and surveys have demonstrated that at least seven different species of bat are present on the island.

As magnificent and unique as the natural landscapes of Anholt are, they are equally vulnerable. For Anholters *and* owners of holiday homes, as well as holiday visitors to the island, nature protection is a high priority. While people are highly aware of generally known threats like harmful activities or pollution, the negative effects of light pollution on the island's vulnerable natural habitats is less known – and it must become a similarly important part of people's nature awareness. The DSA project is therefore an extremely important additional aspect of nature protection on the island.

Permission for large groups to access protected parts of the island of Anholt

Permission to access the privately owned protected area at nighttime has been given by the owner of the island. When larger groups, for instance as part of teaching activities or dark-sky outreach events, require access to a protected location at night, notification is sent in advance to the authority for nature protection, at the Municipality of Norddjurs.

6. Documenting the Sky Quality on Anholt

As explained earlier, the island of Anholt is widely known as the darkest place in Denmark, and known for its stillness, remarkable natural settings and dark nights.

The group of dark-sky enthusiasts who founded the DSA in January 2019 declared their purpose and mission, as a *"non-profit, non-political association"*, aiming (here in our English translation) to *"achieve one or more certificates from the association IDA [now: DarkSky International], by:*

- *defining and sharing out the tasks in relation to the requirementes set out by IDA.*
- *cultivating and handling collaborative efforts with various stakeholders.*
- *collecting and disseminating knowledge about light pollution and the conservation of natural darkness."*

See https://darkskyanholt.dk/vedtaegter/ for the full Articles of Association (in Danish), and see Appendix D for the Founding document of DSA, from the first Annual Assembly.

All association members and stakeholders agree that Anholt is, indeed, among the truly dark places on Earth. Therefore, to pursue and fulfull our purpose, we recognized that our next step was to begin systematically gathering data to document the actual darkness on Anholt. The results and status of DSA's ongoing effort to do so are outlined below.

6.1 Long-Term Measurements

In 2019 a permanent measuring station – "Anholt 1" – was was installed in the Desert, east of Anholt village. Using a Unihedron technical measurement solution, Anholt 1 has continuously been generating sky quality data since 2019. The raw data material has been processed into readable statistical material, and the graphs below demonstrate and verify the quality of Anholt's dark sky.

In December 2023, a second permanent measuring station – "Anholt 2" – was installed on the southern part of the island, on Sønderbjerg ("Southern Hill") and became operational in mid-December 2023. An example of our continuous data (logged at one-minute intervals) is found in Appendix F. Note: Anholt 2 faces Anholt Offshore Wind Farm, located 17 km to the southwest, so it measures the mandatory light sources on the wind farm's turbines (see also Section 8.1.).

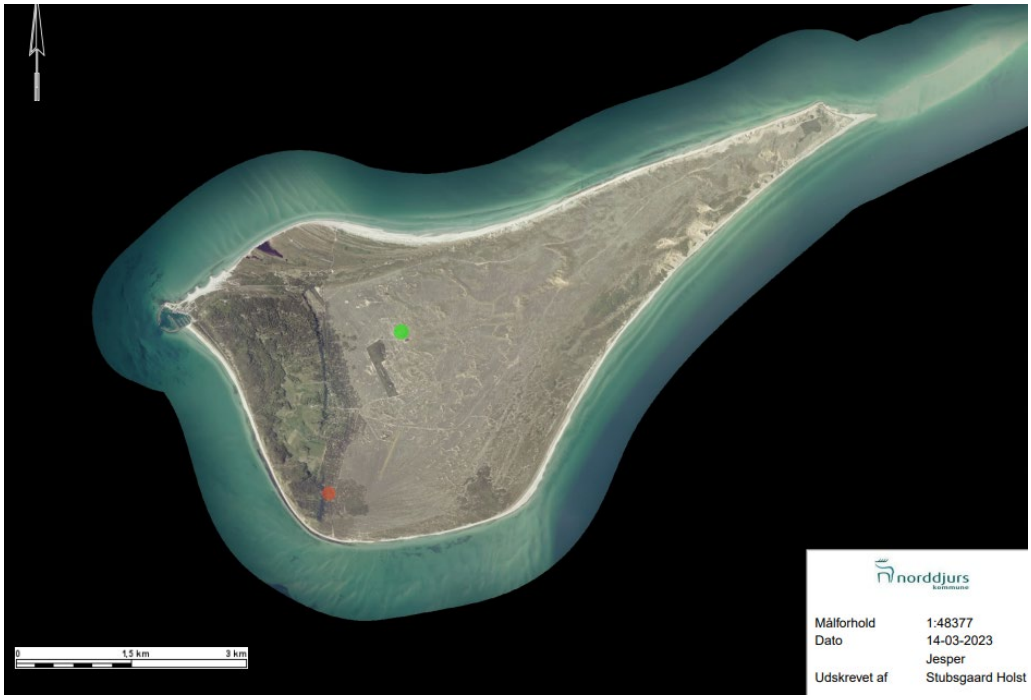


Figure 6.1.A. *General overview of the entire island of Anholt and the two permanent measuring stations: green dot = Anholt 1; red-orange dot = Anholt 2.*

Figure 6.1.B. *Precision map of the two permanent measuring stations:*
upper red star in the Desert = Anholt 1; lower red star, on Southern Hill = Anholt 2.

To validate the sky measurements from Anholt 1, several measurements have also been conducted with portable equipment, placed at various sites. Table 6.1.A shows measurements from 2019 and 2020, with the relevant locations marked in Figure 6.1.C. The chart's headings read: date (day/mo./year format), time, location (No./name), temperature (°Celsius), 5 measurements, and their average.

Table 6.1.A. *Examples of measurements, data from 2019 and 2020.*

Date	Time	Location num.	Lokation name	Temp	1. measure	2. measure	3. measure	4. measure	5. measure	Mean measure
05-05-2019	00:56:00	2	Vibehøj	14	21,88	21,82	21,78	21,82	21,85	21,83
05-05-2019	00:27:00	4	Sønderborg	13	21,75	21,77	21,83	21,75	21,75	21,77
05-05-2019	01:43:00	5	Nordstrand	21	21,83	21,81	21,8	21,79	21,81	21,81
05-05-2019	02:15:00	7	Ostebakken	12	21,87	21,9	21,9	21,81	21,97	21,89
05-05-2019	00:08:00	9	Nordbjerg	15	21,84	21,88	21,88	21,85	21,84	21,86
28-10-2019	21:52:00	2	Vibehøj	16	21,17	21,16	21,17	21,21	21,24	21,19
28-10-2019	22:09:00	4	Sønderborg	16	21,21	21,14	21,18	21,13	21,19	21,17
28-10-2019	21:37:00	5	Nordstrand	18	21,25	21,28	21,14	21,16	21,23	21,21
28-10-2019	22:45:00	7	Ostebakken	16	21,19	21,19	21,18	21,1	21,11	21,15
28-10-2019	21:19:00	9	Nordbjerg	16	21,25	21,28	21,23	21,25	21,26	21,25
05-01-2020	02:31:00	4	Sønderborg	16	21,63	21,55	21,57	21,57	21,57	21,58
05-01-2020	02:37:00	4	Sønderborg	16	21,6	21,59	21,62	21,63	21,52	21,59
05-01-2020	02:57:00	2	Vibehøj	16	21,63	21,63	21,64	21,63	21,59	21,62
05-01-2020	00:00:00	9	Nordbjerg	15	21,63	21,59	21,56	21,57	21,59	21,59
05-01-2020	03:35:00	5	Nordstrand	10	21,73	21,65	21,7	21,72	21,72	21,70
05-01-2020	03:54:00	7	Ostebakken	10	21,79	21,76	21,7	21,71	21,7	21,73
05-01-2020	00:00:00	1	Flyveplads	10	21,67	21,67	21,67	21,67	21,67	21,67
22-03-2020	00:28:00	2	Vibehøj	3	21,81	21,87	21,84	21,83	21,82	21,83
22-03-2020	00:46:00	9	Nordbjerg	6	21,76	21,8	21,79	21,82	21,8	21,79
22-03-2020	01:00:00	5	Nordstrand	6	21,79	21,79	21,84	21,77	21,81	21,80
22-03-2020	01:20:00	7	Ostebakken	10	21,76	21,84	21,79	21,79	21,77	21,79
22-03-2020	01:38:00	1	Flyveplads	3	21,86	21,85	21,85	21,84	21,89	21,86
09-11-2020	23:10:00	4	Sønderborg	16	21,49	21,48	21,39	21,47	21,41	21,45
09-11-2020	23:24:00	2	Vibehøj	14	21,35	21,26	21,26	21,27	21,25	21,28
09-11-2020	23:40:00	9	Nordbjerg	14	21,34	21,26	21,27	21,28	21,26	21,28
09-11-2020	23:59:00	5	Nordstrand	14	21,32	21,27	21,26	21,24	21,26	21,27
09-11-2020	00:19:00	7	Ostebakken	13	21,34	21,29	21,28	21,29	21,28	21,30
09-11-2020	00:30:00	1	Flyveplads	13	21,4	21,34	21,34	21,31	21,32	21,34

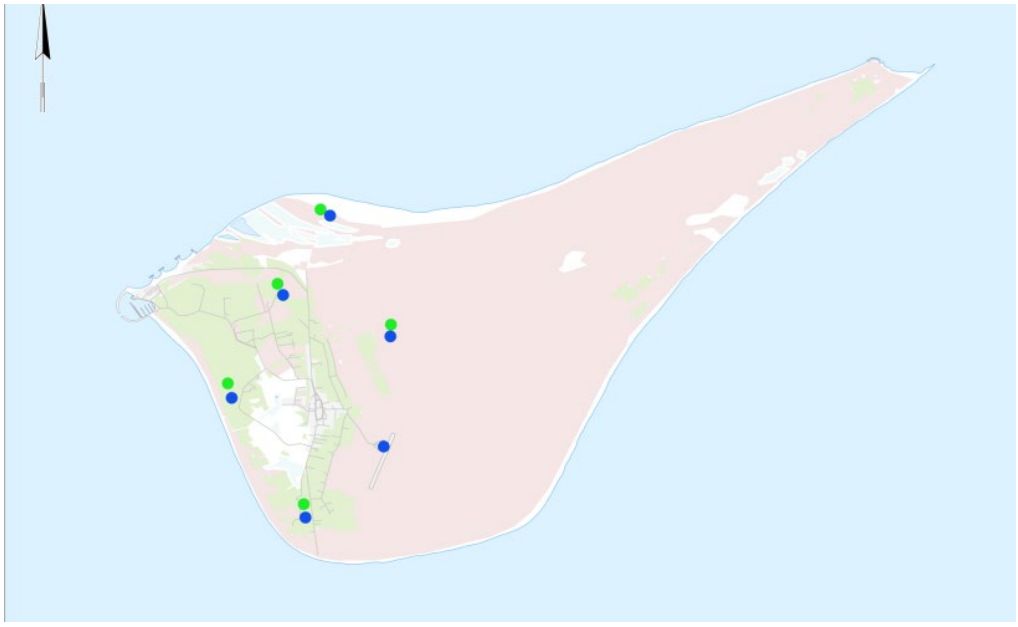


Figure 6.1.C. *Measurements made in 2019 and 2020 with portable equipment in various locations, used for comparisons: green dots = 2019; blue dots = 2020.*

6.2 SQM-L Measurements

To document the sky quality on Anholt, measurement data have been sorted by lunar calendar and cloud coverage. The cloud coverage data was obtained by open source, from the Danish Meteorological Institute (DMI), and was gathered from several weather stations in the Kattegat to produce data for cloud coverage, shown in a 10 x 10 km grid. Although the accuracy is high for these cloud coverage data, for future measurements, the DSA project will draw cloud coverage data directly from the DMI weather station located at Anholt Harbor. For one thing, our data will not be a weighted average for relatively "nearby" measuring stations. For another, the measurement interval will be much shorter: 10 minutes.

Since February 2024, we have been gathering this data again. The ceilometer and cloud cover meter in the weather station at Anholt Harbor were out of order for some time. But following DSA's ongoing dialogue with DMI, their now refurbished measuring equipment at Anholt Harbor has been recording cloud cover data since October 11, 2023.

Examples of the graphics we can generate based on this data are included below, and they show significant progress in our efforts to make the data not only accessible but also understandable. Both graphics are based on data from the same night (January 13–14, 2024) so it is encouraging to see that they roughly communicate the same cloud cover as measured from Anholt 1 and Anholt 2. This confirms we are definitely on the right track.

A few words on the island's geography will explain why these two SQM station, strategically placed, more than adequately cover the island's entire area of 22.37 square km – 8.64 square miles. Geographically (see map 6.1.A), there is only one hilly, elevated area (the darker area to the west) and one flat, low-lying area (the lighter Desert area to the east), and each of these two areas has an SQM station.

As regards light domes, their limited extent and luminance are exemplified on the photos available at our web site, https://darkskyanholt.dk/fotogalleri/ .

Having said all this, in the interest of ensuring precision our DSA Anholt-based tech person and our Ribe-based partner from the Mandø project (described below) are currently discussing a technical issue – regarding the absorption in the glass of the Anholt 2 equipment's white casing. They will check this issue and, if needed, rectify and recalibrate in the coming weeks. The equipment itself is shown in Figure 6.3.A.

This is just one example that demonstrates the vigilance of the DSA volunteers in seeking to maintain high standards and credibility – to DSI and to the public at large. It also illustrates how valuable, even essential, it is to have technical skills and expertise in a volunteer-driven organization like ours and in our wider network of partners, for whose help we are extremely grateful.

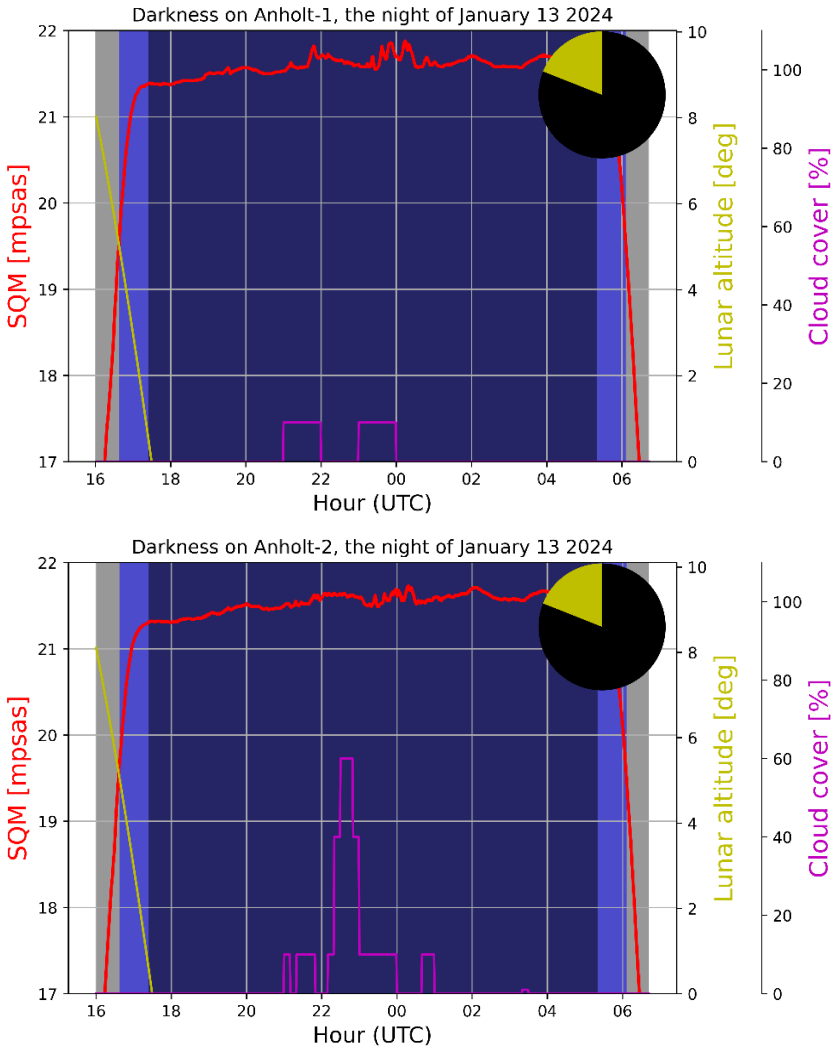


Figure 6.2.A. *Example of two parallel sky quality measurement graphics, based on data from Anholt 1 and Anholt 2 for the same night, registered on a 24-hour clock. Credit: Morten Høyrup, parter from the Mandø island dark-sky project.*

Since its early stages, the DSA process has had a constructive and very fruitful dialogue with two other Dark Sky projects in Denmark: the one on Møn/Nyord island, and the one on Mandø island. In January 2024 we also established contact with Hawboerne – the group behind the newly certified Dark Sky Park Bulbjerg, in North Jutland, and we look forward to networking with all three groups in the future.

Recently, on October 3, 2024, two members of the DSA board – Anne Dixgaard and Peter Stolt – had the privilege of attending the official inauguration of Dark Sky Park Mandø. The event featured speeches from the Mayor of Esbjerg, from the Esbjerg councilwoman who initated the Mandø bid for DSI certification, and from other prominent local stakeholders – plus excellent local food. A flutist played as the sun set and the stars shone down from a clear sky. We anticipate that this will be the first step in establishing a Dark Sky community in Denmark.

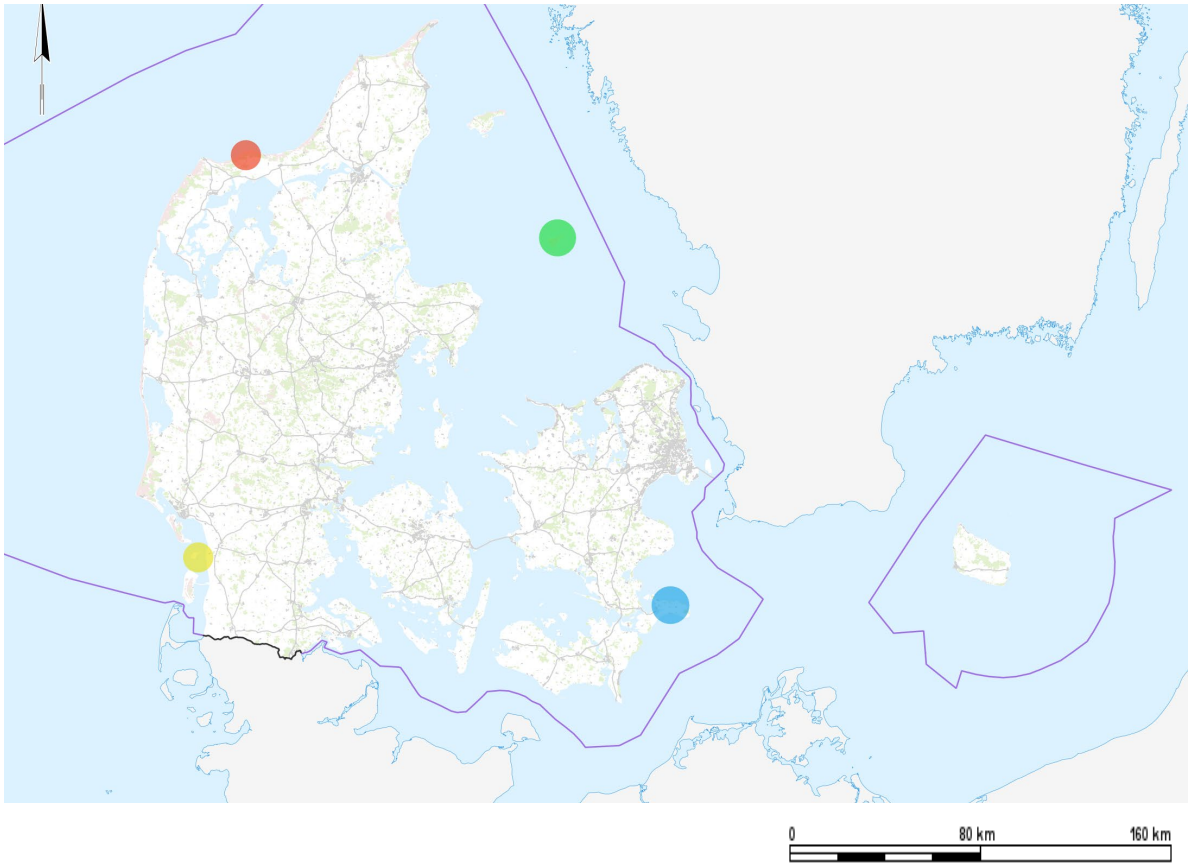


Figure 6.2.B. *Denmark, outlined in purple, including the island of Bornholm at far right. Significant dark sky locations, two with Dark Sky Park (DSP) certification. Marked clockwise from lower left: yellow dot = Mandø island; red dot = DSP Bulbjerg; green dot = Anholt island; blue dot = DSP Møn and Nyord island.*
Credit: © GeoDanmark-data fra Styrelsen for Dataforsyning og Effektivisering og Danske kommuner. Downloaded on January 9, 2024 by the Municipality of Norddjurs for this application.

One particular networking effort merits special mention: We have greatly benefited from the data processing expertise of Mr. Morten Høyrup, who generously undertook to process the Anholt data while he was working on the Mandø dark-sky project. DSA is setting up a local oranization so we can process our own data in the future. At the moment, the processed measurement data for the two measuring stations, Anholt 1 and Anholt 2, is directly accessible via the two links below. At the recent Dark Sky Park Mandø inuguration (October 3, 2024) we consulted with Morten Høyrup on the next steps in transferring knowledge and software – he has also generously offered to share the latter with DSA – so DSA and the Municipality of Norddjurs can set up our own dark-sky-data processing.

The selected diagrams on the following pages are examples of sky quality measurements for Anholt, with more graphic representations at the links below. New data is uploaded regularly to these links (some simultaneously, from Anholt 2), and accessible graphics are also generated at regular intervals. We are currently updating our links to data and graphics on the DSA website, under the menu item *Mørkeste sted* (“darkest place”).

Links to the freshest data, which is uploaded and updated automatically or by DSA periodically:

Anholt 1: https://obs.ribekatedralskole.dk/darksky-test/anholt-1/total_Anholt-1_.html
and
Anholt 2: https://obs.ribekatedralskole.dk/darksky-test/anholt-2/total_Anholt-2_.html .

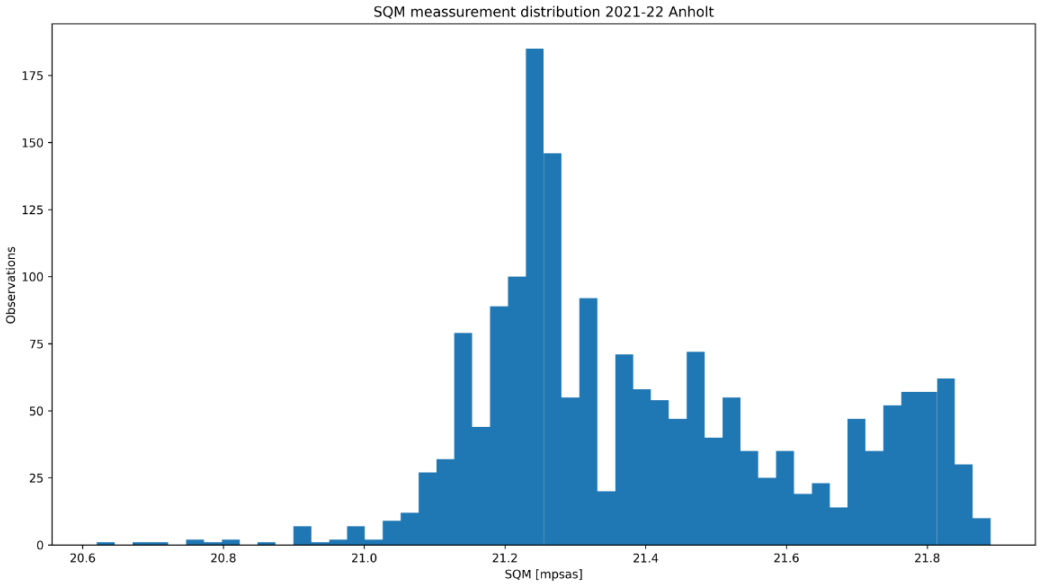


Figure 6.2.C. *One example of graphically represented SQM data.*

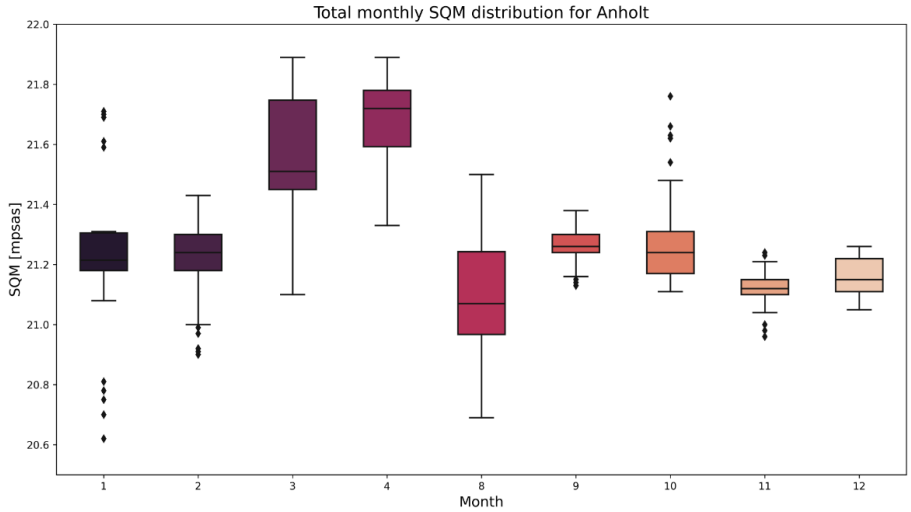


Figure 6.2.D. *Another example of graphically represented sky quality measurement data.*

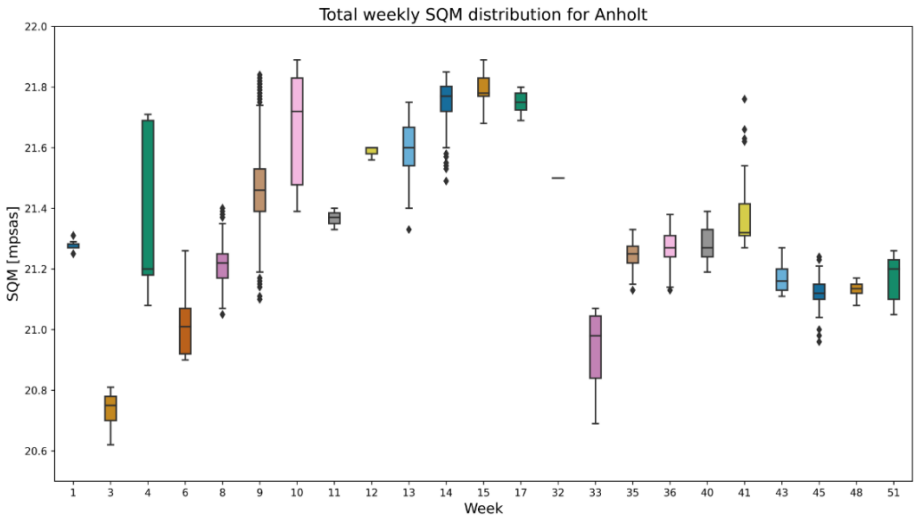


Figure 6.2.E. *A third example of graphically represented sky quality measurement data.*

6.3 Photo documentation of the Anholt night sky

The following series of **astrophotos** – panoramic and zenith photos – document the sky quality on Anholt. These and many more are found at *https://darkskyanholt.dk/fotogalleri/* .

The specifications and settings were chosen by the astrophotographer Jakob Andersen based on advice and suggestions in e-mail correspondence (Dec. 2022) between our partner Ole J. Knudsen of Aarhus University and Ashley Wilson of DarkSky International. We thank all three of them for their help with these excellent photos.

Photos were taken at three locations, shown as large red dots on the island image below:

- the **western vantage point** at Southern Hill, including westward view towards light domes of Grenaa (town on the Jutland mainland) and the Anholt Offshore Wind Farm.
- the **middle of the Desert**, at center.
- near the upper **eastern tip of the island**, next to Anholt Lighthouse, including the eastwards view towards light domes of Varberg (town on the Swedish mainland) and the "Route Tango" shipping lane in the eastern Kattegat strait.

Figure 6.3.A. *The island of Anholt with the three astrophoto locations – west, center and east – indicated by large, solid red dots.*

The **technical specifications** are included for each photo in the caption. The astrophotographer, Jakob Andersen (Clearskyastro.dk), has explained (our translation) that *"the photos are lens-corrected and compiled using a panorama program. North is indicated on all photos [white "N"]. Beyond this, no editing of the photos has taken place."*

The **camera equipment** used was a *"Camera: Nikon D5500 – Tracker: Ioptron skytracker pro – Lenses: Samyang 24 and 14mm (results in 21 and 35mm with APS-C crop factor)."*

Western vantage point, Anholt panoramas – circular and linear horizons

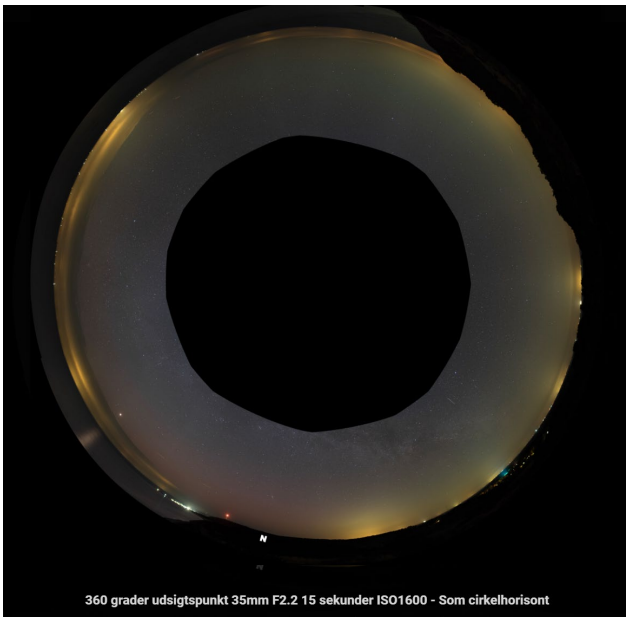


Figure 6.3.B.i *Western vantage point. Specifications: "360 degrees; 35mm; F2.2; 15 seconds; ISO 1600; as circular horizon". The reddish dot left of the "N" is the radar station. Photo credit: Jakob Andersen, Clearskyastro.dk.*

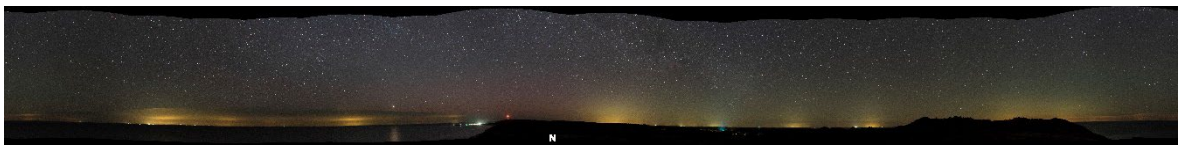


Figure 6.3.B.ii *Western vantage point. Specifications: "360 degrees; 35mm; F2.2; 15 seconds; ISO 1600; as panorama". The reddish dot left of the "N" is the radar station. Photo credit: Jakob Andersen, Clearskyastro.dk.*

Figure 6.3.B.iii *Western vantage point. Specifications: "360 degrees; 35mm; F2.2; 15 seconds; ISO 5000; as panorama". The reddish dot left of the "N" is the radar station. Photo credit: Jakob Andersen, Clearskyastro.dk.*

Middle of the Desert, Anholt panoramas – circular and linear horizons

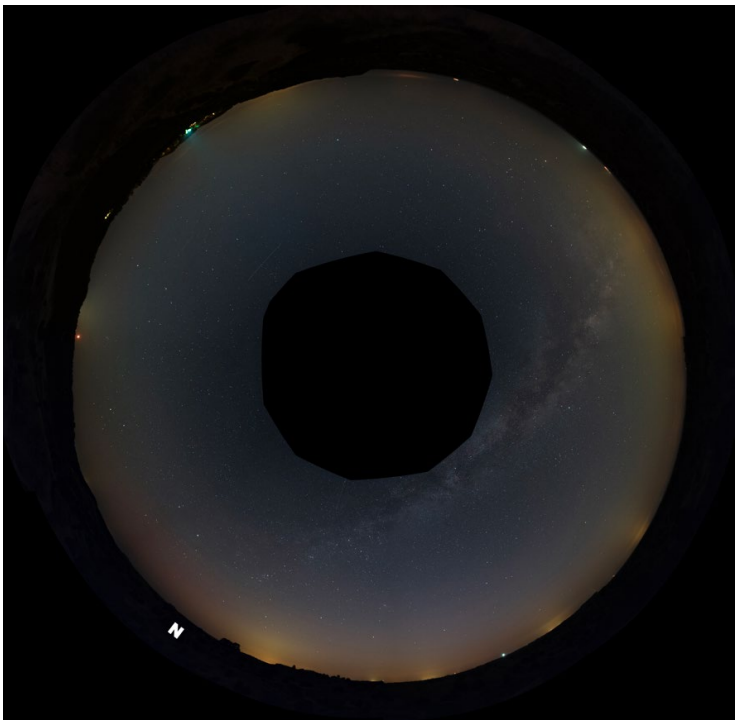


Figure 6.3.C.i Middle of the Desert. *Specifications: "360 degrees; 21mm; F3.5; 30 seconds; ISO 1600; as circular horizon". Light domes and points: passing ships.Photo credit: Jakob Andersen, Clearskyastro.dk.*

Figure 6.3.C.ii Middle of the Desert. *Specifications: "360 degrees; 21mm; F3.5; 30 seconds; ISO 1600; as panorama". Light domes and points: passing ships.Photo credit: Jakob Andersen, Clearskyastro.dk.*

Figure 6.3.C.iii Middle of the Desert. *Specifications: "360 degrees; 21mm; F3.5; 30 seconds; ISO 5000; as panorama". Light domes and points: passing ships.Photo credit: Jakob Andersen, Clearskyastro.dk.*

Eastern tip of the island, Anholt panoramas – circular and linear horizons

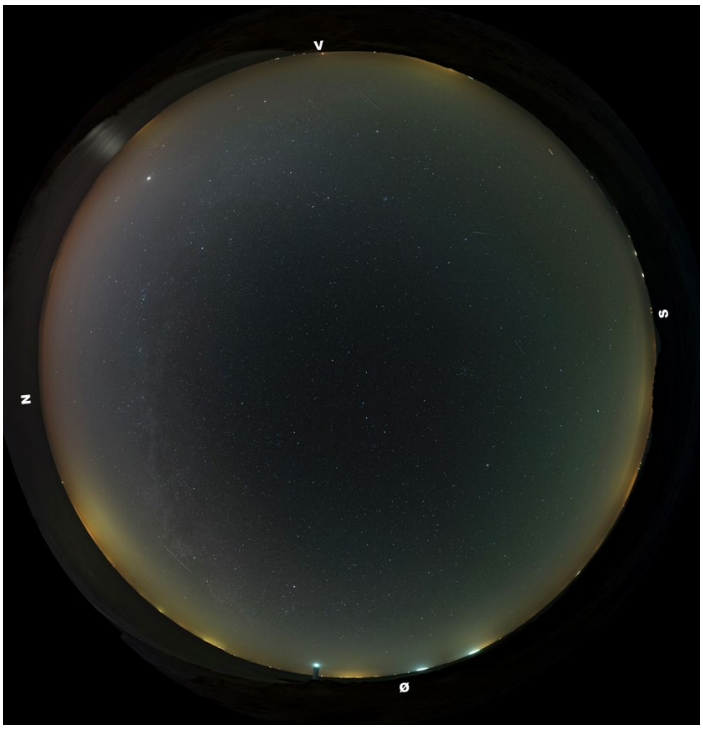


Figure 6.3.D.i Eastern tip of the island. *Specifications: "360 degrees; 21mm; F3.5; 30 seconds; ISO 1600; as circular horizon". The light source at the bottom, near the east ("Ø") is the lighthouse. Photo credit: Jakob Andersen, Clearskyastro.dk.*

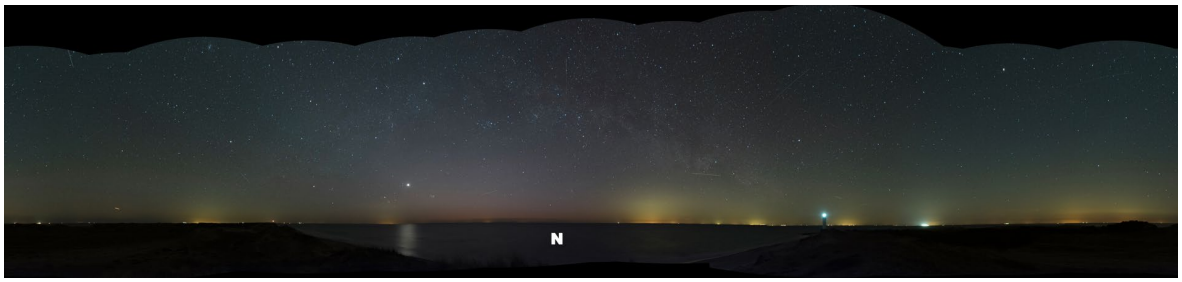


Figure 6.3.D.ii Eastern tip of the island. *Specifications: "360 degrees; 21mm; F3.5; 30 seconds; ISO 1600; as panorama". The light source to the right of the "N" is is the lighthouse. Photo credit: Jakob Andersen, Clearskyastro.dk.*

Figure 6.3.D.iii Eastern tip of the island. *Specifications: "360 degrees; 21mm; F3.5; 30 seconds; ISO 5000; as panorama". The light source to the right of the "N" is is the lighthouse. Photo credit: Jakob Andersen, Clearskyastro.dk.*

Zenith photographs, Anholt – Western vantage point, and middle of the Desert

Figure 6.3.E.i Western vantage point – zenith. *Specifications: "21mm; F3.5; 30 seconds; ISO 1600 – zenith". Photo credit: Jakob Andersen, Clearskyastro.dk.*

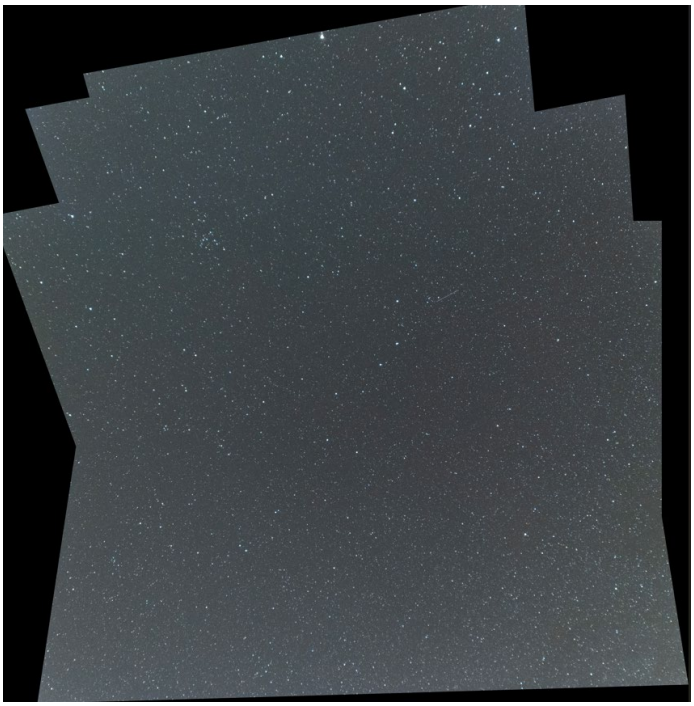


Figure 6.3.E.ii Western vantage point – zenith. *Specifications: "21mm; F3.5; 30 seconds; ISO 5000 – zenith". Photo credit: Jakob Andersen, Clearskyastro.dk.*

Figure 6.3.E.iii Middle of the Desert – zenith. *Specifications: "21mm; F3.5; 30 seconds; ISO 1600 – zenith". Photo credit: Jakob Andersen, Clearskyastro.dk.*

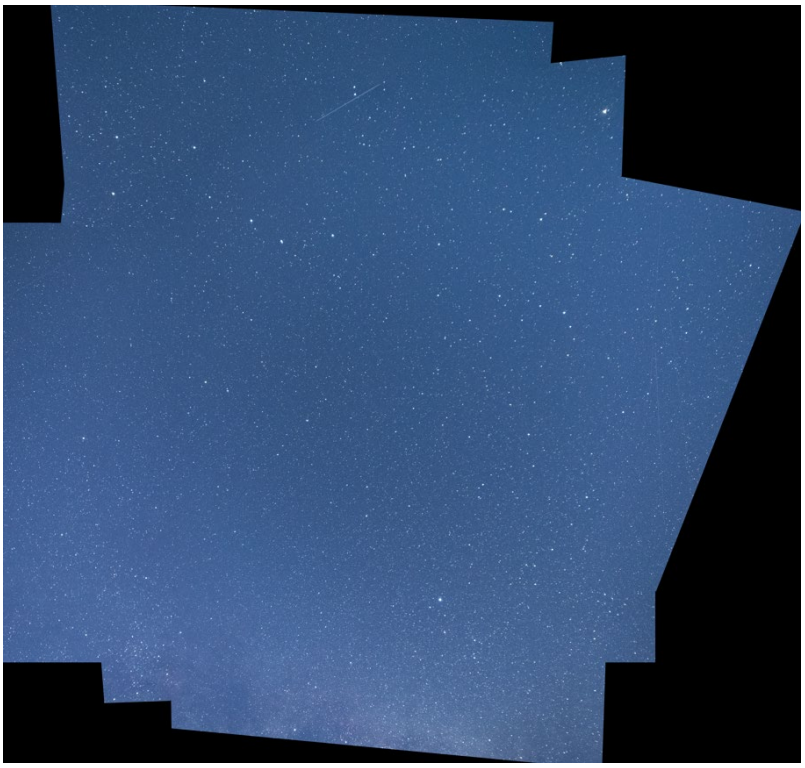


Figure 6.3.E.iv Middle of the Desert – zenith. *Specifications: "21mm; F3.5; 30 seconds; ISO 5000 – zenith". Photo credit: Jakob Andersen, Clearskyastro.dk.*

6.4 Measurement Program

The DSA measurement program follows two main tracks: The first continues and improves data collection and processing from the current measuring station, Anholt 1. The second is based on a newly installed measuring station, Anholt 2, with Internet access to upload sky quality data directly to our homepage.

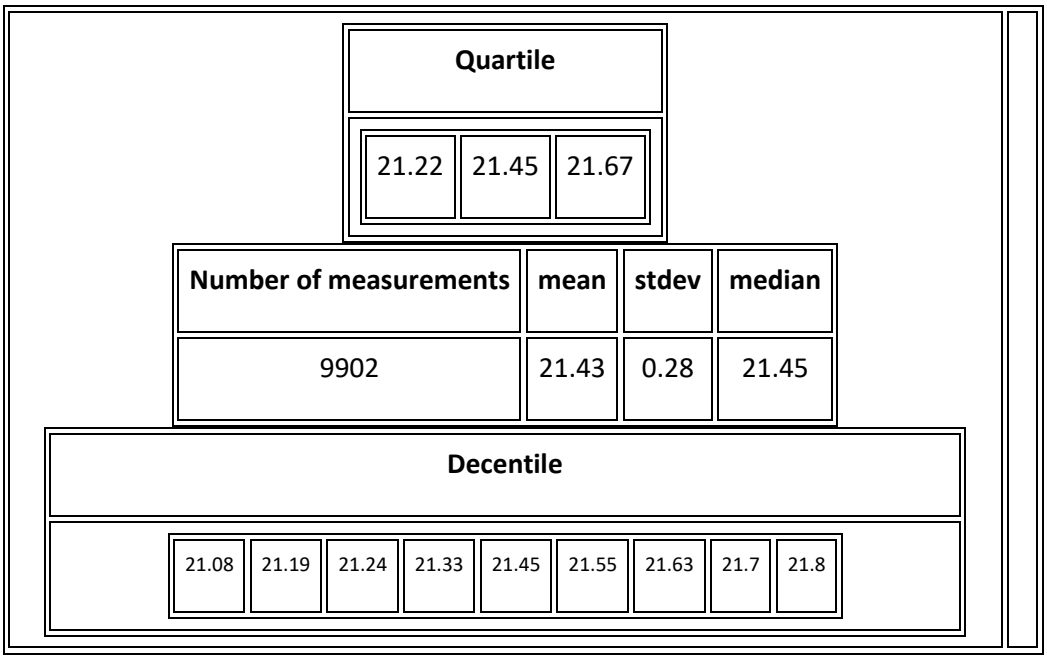
First, the **status on Anholt 1**: Since its installation in the Desert – Anholt 1 was installed in 2019 – all equipment there has worked to full satisfaction. The system, which, as noted, is a Unihedron solution, has a solar charger, which has provided a stable data flow. The task of loading data from the station, then passing it on for further processing, has mainly been handled by one member of DSA. As explained in Section 6.2, the task of actually processing the data has so far has been handled by one person, a partner from another dark-sky project in Denmark, but outside DSA. This arrangement has worked well so far, as both of these key persons possess broad and deep knowledge about the set-up. However, in terms of the future viability of the project, this organization is too vulnerable. Efforts are currently under way to educate of group of DSA members, enabling them to service the measuring station and to upload data. Similarly, for the actual data processing we are working to train several people to appropriately process the data.

Second, the **status on Anholt 2**: As mentioned in Section 6.1, DSA purchased new equipment that has now been successfully installed as on the island's Southern Hill. Anholt 2 has been continuously gathering and transmitting data since mid-December 2023 (see examples of actual data in Appendix F).

Figure 6.4.A *Equipment for Anholt 2, the new, second fixed measuring station on Anholt: a Unihedron Photometer SQM sky quality meter with lens, waterproof housing for Sky Quality meter, and Solar Charger.*

Taking inspiration and expert guidance from Mr. Høyrup of the Mandø project, we have connected our Anholt 2 station to a power supply and set it up for Internet access. This solution enables us to continuously upload sky quality data to the DSA homepage, as described elsewhere.

Darkness on Anholt-1 (total 2021-2023)



Quartile		
21.22	21.45	21.67

Number of measurements	mean	stdev	median
9902	21.43	0.28	21.45

Decentile								
21.08	21.19	21.24	21.33	21.45	21.55	21.63	21.7	21.8

Figure 6.3.B *Example of Anholt data available online. Excerpt of the data for Anholt 1. Extracted on February 15, 2024 via the above link for Anholt 1.*

7. Light Management Plan and Lighting Inventories

General conditions on the island of Anholt, framing our LMP and LI work

Two main conditions frame the task of mapping and managing artificial light on Anholt:

1) The nature protection measures on the island, described above, mean that built-up areas are only found, and are concentrated, on one specific part of the island.
2) The building-ownership groups on Anholt fall into very few categories (two of which are residential; see Fig. 5.4.A), easing registration and outreach.

Condition 2) relates to the seasonal variation in the number of people on the island. In the peak summer season the need for artificial lighting is limited, due to the light nights. Conversely, in winter many summer cottages are not used at all, so no lights are on. The tables below show a considerable number of outdoor lights. However, dark-sky support among year-round islanders, holiday home owners, and visitors has been overwhelming.

The ***first basic tool*** – both for the outdoor lighting inventory's current status and for our continuing light-management work towards 100% DarkSky compliance – is our total list of all addresses on the island (see Appendix D and Appendix E). It is worth noting that several addresses have no buildings. Decades ago, some owners bought a number of lots but only built on one lot, leaving the rest as "wilderness" around their holiday home. In principle, such "empty lots" could be sold and built on, but this rarely happens.

Note that because the island's lighting is so well-defined and geographically limited, the Lighting Inventories (LIs) themselves underpin and catalogue our actual compliance with the Light Management Plan (LMP, see document next page). Thus, the two elements, LI listings and LMP work, are inextricably linked. All lighting is dealt with below in:

- Section 7.1. Public lighting – Anholt Village and infrastructure
- Section 7.2. Private lighting, notably Anholt Harbor

Our ***second basic tool*** is the set of "Progress plan" tables seen in the individual sections. We will use these summaries as we continue to work towards fully DSI-compliant lighting.

The general status of current and future projects

We in DSA continue to motivate home and property owners on Anholt to register the light sources on their buildings and plots, and we also continue to spread information and emphasize the importance of installing cutoff lighting.

The road lighting in the town itself has been expanded, according to local wishes, for public safety: more uniform and traffic-safe illumination. As discussed elsewhere, new lamposts have the same dark-sky-approved light fixtures, positioned in collaboration with the local citizens's association, with the Municipality of Norddjurs as the project partner.

DSA is in ongoing dialogue with the harbor operator, Anholt Havn A/S, and a process is under way to screen off some of the lighting around the harbor's barbecue area. We have

an agreement that for future replacements of light fixtures and sources, the harbor will prioritize light sources with a maximum color temperature of 3000 Kelvin. See also written support letter from Anholt Harbor (Appendix A – XI).

norddjurs kommune

Light Management Plan for the Island of Anholt

The very dark sky above the isolated Island of Anholt and the encouraging work locally to protect the dark sky and minimize light pollution has been - and will in the future be - fully supported by the Norddjurs Municipality. The Dark Sky Anholt project is moreover an important inspiration to the municipal work within lightning in general on its mainland territories as described in the Municipality's Lighting Plan 2024. Since 2022 all public streetlights fixtures on Anholt have been exchanged to a fully DSI compliant version. For the future maintenance and renewal of Public Lighting on Anholt, Norddjurs Municipality undertakes to install lightning that is fully DSI compliant, Dark Sky Anholt should be consulted prior to maintenance /replacement.

Thus, Norddjurs Municipality will in cooperation with the residents on Anholt provide an ongoing commitment to adopt dark sky compliant lighting practices and ordinances for public lighting. All public lighting will adopt:

- that the use of outdoor light at night is only prescribed when it is strictly needed, where it is needed, and in the appropriate amount for a specific task. The purpose of outdoor light allowed under this policy will be specifically to ensure public safety
- that all outdoor lighting fixtures >500 initial lamp lumens are fully shielded and make appropriate use of timers and motion sensors. The few public lights apart from street lighting (among them the school and fire station) are scrutinized for a near future full compliance
- that lighting controlled with motion-activated switches limiting the duration of illumination to less than five minutes after activation could be - but necessary will be - exempted from the other requirements of this proclamation
- that lighting will continue to be chosen to minimize the amount of short-wavelength light emitted into the nighttime environment i.e. the correlated color temperature (CCT) of lamps will not exceed 3000 kelvins
- that any Illuminated signs are to be avoided. For businesses within the Park, sign lights are extinguished completely during the hours the business is closed
- that any installation of temporary lighting will adhere to the LMP to the greatest possible extent and the duration will be limited to the shortest possible time

There are very few illuminated signs on Anholt. The guidelines for the use of artificial lighting on signs follows the general guidelines recommended by DarkSky International which has been communicated by Dark Sky Anholt. The association Dark Sky Anholt and Municipality of Norddjurs will in joined effort continue focus on illuminated signs to develop a specific guideline for illuminated signs including design criteria and provision e.g. luminance levels, size limit etc. A specific action plan to ensure illumination of signs meets the criteria and provision will be effectuated by Dark Sky Anholt. Further, a specific agreement with Municipality of Norddjurs not to illuminate signs on public building will be made. Guidelines for illumination of signs, activities to ensure all illuminated signs meets the guideline and the agreement with Municipality of Norddjurs not to illuminate signs on public building will be included in the annual report.

On behalf of Dark Sky Anholt, January 16, 2025
Anne Dixgaard

On behalf of Norddjurs Kommune, January 16, 2025

Kim Tommy Jensen, Vej- og ejendomschef, Norddjurs kommune

Danish national legislation on lighting

Denmark has various acts governing lighting, but very few provisions are explicitly related to reducing light pollution. The country's Environmental Protection Act has no specific reference to light pollution. However, the Nature Protection Act has a few, for instance regulating illuminated outdoor billboards.

A small victory is that recently (on Sept. 17, 2024) the Danish Road Directorate published a 156-page report treating "The Impact of Lighting on Animals, Plants and Human Beings" in some detail, using the concept of ALAN (Artificial Light At Night) and touching on light design – and concluding with the photo at right. The mere commissioning of this report indicates better legislator awareness of light pollution (Danish: https://vejregler.dk/h/7e0fba84-06dd-483b-898a-c7b3e3affaa1/8ceba5637f80440eb7be2ae14adec011?showExact=true&fbclid=IwY2xjawHDq0RleHRuA2FlbQIxMAABHSXNsXN5_tvmsdigtqSJlcg72KZfk-kQK5kMTs4hl87WZD73xW_Cin065w_aem_cAXj-myTxNf-_X7JacECQg).

Moreover, the Building Act regulates the amount of light permitted on building sites, and the Act on Public Road Lighting stresses the need to protect the night sky from unnecessary light. Individuals can complain to the local municipality or the local police about nuisance caused by a specific light source.

The Danish-language site https://lysforurening.dk/regler/ has more in-depth information about Danish legislation and light pollution, and links to other relevant public websites.

Therefore, night-sky-friendly initiatives build on commitments from local stakeholders, associations and public bodies – as in our case: DSA + island stakeholders + Municipality of Norddjurs, which is the public authority governing Anholt. (Cf. Appendix A with "Letters of Support", and Appendix G with exerpts from the municipal lighting policy and plan).

7.1 Public Outdoor Lighting – Anholt Village and infrastructure

Anholt Village and infrastructure highlights

DSA reached a landmark in autumn 2022, when all streetlights in the island's residential area had been replaced with new, **dark-sky friendly, sustainable streetlights**.

This replacement was proposed and advised by DSA, and it was funded jointly by the Municipality of Norddjurs and the Local Action Group (LAG) for Danish Small Islands (note: LAG groups are ultimately funded by the European Union; see Section 4.2, end of section.) The material is 100% weathering steel ("corten steel"), and the warm tones of the rust-colored lighting elements blend in with the natural surroundings. A downward-facing screen ensures that these "post light" street lamps give off low light pollution.

Also, they are designed and constructed to enable later disassembly and re-use of the material after their estimated 50-year life span is over. All of this supports the sustainable vision of DSA's project – and we welcome inquiries or visits from anyone looking for inspiration on sustainable, low-impact light solutions.

This particular streetlight model – **Anto Corten – was approved by the DSI technical manager and is now on DSI's own list of dark-sky friendly lighting** (see fig. 7.1.A below, and cf. https://www.darksky.org/our-work/lighting/lighting-for-industry/fsa/fsa-products/#!/Lampas/c/142723519).

Also, we were extremely pleased to see that Lampas, marking the recently celebrated Dark Sky Week 2024, showcases Anholt as an example in a Facebook post about dark-sky friendly lighting: https://m.facebook.com/lampas.denmark . See the **gray Case Info Box after Table 7.2.B** for details on the DSA–Lampas partnership and light awareness.

Figure 7.1.A. *Streetlight in Anholt village, and DarkSky certificate. One of the installed Lampas outdoor fixtures, made of weathering steel. The municipal authority is installling a further 11 of these light sources in and around the village in locations decided on in dialogue with the Anholters. This fixture is listed as DSI-approved on the DSI web site, along with several other Lampas fixtures.*

Figure 7.1.B. *Streetlamps in Anholt village (the only village on the island).* ***Map at left****: operational streetlights (pink dots, 44 in all) as of November 2023.* ***Map at center****: result of public consultation with the Anholters (emphasized dots show potential new lamps).* ***Map at right****: operational streetlamps after renovation and improvement of Anholt village streetlamp system (red dots, now 51 in all, as of Nov. 15, 2024). Maps courtesy of the Municipality of Norddjurs.*

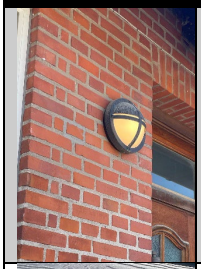
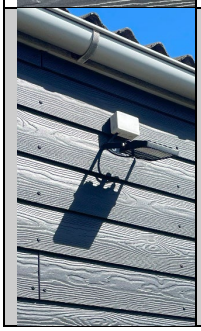
One **crucial infrastructure feature** is **Anholt Lighthouse**, which is notable not only for its distinctive design but also for its remote location on the island's eastern tip. Its location makes it a vital landmark for anyone navigating the Kattegat strait. About 300 shipwrecks are registered around Anholt, some sunk many centuries ago and some more recent.

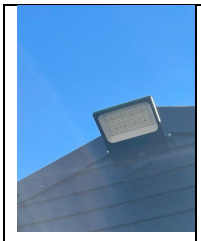
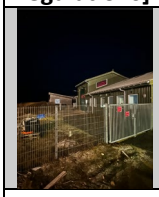
Historically, the first brick-built coal-fired lighthouse in Denmark was erected on the site in 1780 and roofed in 1805. In 1881, it was raised to its current height of 42 meters, and a design by the Danish architect and engineer Jens E.D. Møller was completed in 1895. Technically, the light cone sits at a height of 40 m and is visible from a distance of 14 nautical miles. The beacon is at long./lat. 56.44,25 / 11.39,03, and the light characteristics are “F1 W.15s”: short white flashes regularly repeated at 15-second intervals.

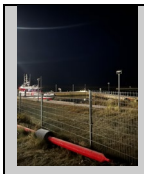
Legally, to ensure marine safety in the Kattegat strait, Anholt Lighthouse must be in constant operation with the current specifications prescribed by Danish law, even though this is not DSI-compliant (cf. ** in Table 7.1.A.). The light cone must not be shielded.

In conclusion, we have never experienced any light pollution from the Lighthouse – since in the Desert you are surrounded by dunes, so the light cone is not visible from there. Astronomers visiting the island have said the same. (Cf. Ole J. Knudsen.)

Table 7.1.A. *Public Outdoor Lighting Inventory – buildings managed by local (municipal) government or national government, or by public organizations*

Image	*Building / structure*	*Description*	*Num-ber*	*Color*	*Shielding*	*Sen-sor*	*<3000 K*	*DSI com-pliant*
	School	By entrance. Integrated motion-activ. sensors. Switch-off time: under 5 min.	2	Yellow	Semi-cutoff	**Y**	**Y**	**Y**
	Fire station	By entrance. Switch-off time: under 5 min.	1	Yellow	Non-cutoff	**Y**	**Y**	**Y**
	Fire station (overview of position on façade: far right) 	Spotlight on façade Switch-off time: under 5 min.	1	Blue	Non-cutoff	**Y**	**Y**	**Y**

	Fire station	Spotlight at gate – only activated for fire-fighting missions or by nearby movement. Switch-off time: under 5 min.	1	Blue	Non-cutoff	**Y**	**Y**	**Y**
	Water/ electricity / utility building	On facade	3	Yellow	Non-cutoff	**N**	**Y**	**N**
	Roads and streets	Street lighting	51	Yellow	Full-cutoff	**N**	**Y**	**Y**
Image	***Building / structure***	***Description***		***Color***	***Shielding***	***Sen-sor***	***<3000 K***	***DSI com-pliant***
SEE NOTES	**BELOW THIS**	**TABLE**						
*	Lighthouse	Mandatory safety beacon	1	White	Non-cutoff	**N**	**N**	**N**
** **[overview photos only; mandatory lighting, cf. military regulations]**	**Harbor – Navy SAR station (see "blue group", Table 7.1.B)**	Spotlight on boathouse gable	1	Blue	Semi-cutoff	**Y**	**N**	**Y**
	**Harbor – Navy SAR station**	Fixture along the facade facing the boathouse door	4	Blue	Non-cutoff	**Y**	**N**	**Y**
ditto	**Harbor – Navy SAR station**	Spotlight over boat-house door	2	Blue	Semi-cutoff	**Y**	**N**	**Y**
ditto	**Harbor – Navy SAR station**	Fixture above boathouse doorway	2	Yellow	Full-cutoff	**N**	**Y**	**Y**
ditto	**Harbor – Navy SAR station**	Spotlight on outermost tip of jetty – only activated for SAR missions	5	Blue	Semi-cutoff	**N**	**Y**	**Y**

	**Harbor – Navy SAR station**	Spotlight on and around jetty – only activated manually for SAR missions	10	Blue	Semi-cutoff	**N**	**Y**	**Y**
ditto	**Harbor – Navy SAR station**	End of jetties	3	Yellow	Full cutoff	**N**	**Y**	**Y**
[no photos or disclosure of Information; cf. military regulations]	**Navy coastal radar station**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
***	Public village facilities (3)	Entrance lighting	3			**N**	**Y**	**Y**

NOTES TO TABLE 7.1.A

** A **lighthouse** with a beacon is located on the easternmost tip of the island. This lighthouse (the oldest in Denmark) is a protected heritage site and cannot be removed or altered. Operationally, it has a mandatory safety function for marine traffic that must be complied with, and continued. The beacon is sustainably powered by a solar panel and uses an incandescent bulb. See Fig. 6.3.D.i–iii, captions.*

*** The Danish Navy has minor installations on Anholt. We may not photograph the Danish Navy's **SAR station**, although we can disclose information about its lighting, cf. above. There is also a **radar station**, but taking photos at or near the site is prohibited. No information may be disclosed, except that its lighting complies with military regulations. We can only submit "N/A", but Anholters say they see only a few red marking lights, alerting potential aircraft passing at low elevation. See Fig. 6.3.B.i–iii, captions.*

**** Anholt Village has a local museum, a public toilet, and a recycling station with semi-private outdoor lighting – and all these **public facilities** are run by volunteers organizations working for the public good.*

Activities to achieve fully DarkSky-compliant lighting – govt. and public organizations

There is close, ongoing dialogue with these stakeholders about the status of outdoor DarkSky-compliant lighting. **National and municipal government bodies** have a direct pathway to working with DSA and our Municipality towards full compliance with DarkSky International's standards. Replacing large numbers of lights is less a question of funding than of strategic focus – and our Municipality is intent on moving this process forward. Compliance will continue to improve, step-by-step, through direct dialogue.

For the small non-profit/volunteer **organizations, which are semi-private but work in the interest of the public at large** – maintaining the island's community house and museum – the replacement of their very small number of outdoor light sources is a question of funding. DSA and the municipality will help to obtain the funds needed, and once again the dialogue will take place directly.

Regarding light reflection, most road surfaces on Anholt consist of dirt or gravel. Where there is black-top, 80% of the streetlamps are placed off to the side, giving very little reflection from the road surface.

Table 7.1.B. *Progress plan to achieve DarkSky-compliant outdoor lighting — managed by national or municipal government or public organization.*

Location	***2024 – DarkSky compliance achieved (%)***	***2029 – DarkSky compliance achieved (%)***	***2034– DarkSky compliance achieved (%)***
School	**100**		
Fire station	**100**		
Water/electricity	30	**100**	
Roads and streets	**100**		
Air landing strip (has no lights)	**100**		
(cf. notes, Table 7.1.A)			
Lighthouse *****	0 (100% mandatory)	0	0
Navy installations (Table 7.1.A blue group)**	75 (estimated 25% mandatory)	75	75

7.2 Private Outdoor Lighting – The only large business on Anholt: Anholt Harbor

Anholt Harbor

Classified as an "emergency harbor", Anholt Harbor (built 1902–1903) has long given commercial vessels and private boats shelter in stormy weather. Shipwrecks scattered on the seabed around Anholt interest amateur divers – and recall the days before modern communication could warn of shifting reefs and sudden storms. Today, the island's **Marine Rescue Station** (a Danish Navy SAR station), equipped with the newest technology, still carries out many search-and-rescue operations every year.

Due to its **classification status,** Anholt Harbor is required by law to have specific types and numbers of lights. However, all jetty/pier lampposts are fully shielded, as are the lights on the "Sailor's house" facilities building. But in terms of our darksky work, we are pleased to say that DSA has full support from the management team (cf. Appendix A – XI).

Regarding **ownership**, Anholt Harbor – formally incorporated as "Anholt Havn A/S" – is a subsidiary of the harbor in Grenaa – "Grenaa Havn A/S" – and according to the Danish Companies Act, Anholt Harbor is a private limited company. This ownership model is an option in Danish law, under a provision used especially for "traffic harbors". These are quite numerous in Denmark, due to the country's island-and-peninsula geography.

Anholt Harbor is by far the island's most important workplace, and it is also the single most important light-source actor on the island. Therefore, in the interest of

completeness, we are including an exhaustive inventory of the harbor's lighting. (We have not included other, smaller businesses and artisanal workshops, most of which are run from private homes and have very few, if any, ourdoor light sources – as in the typical example seen in the first row of Table 7.2.A, below.)

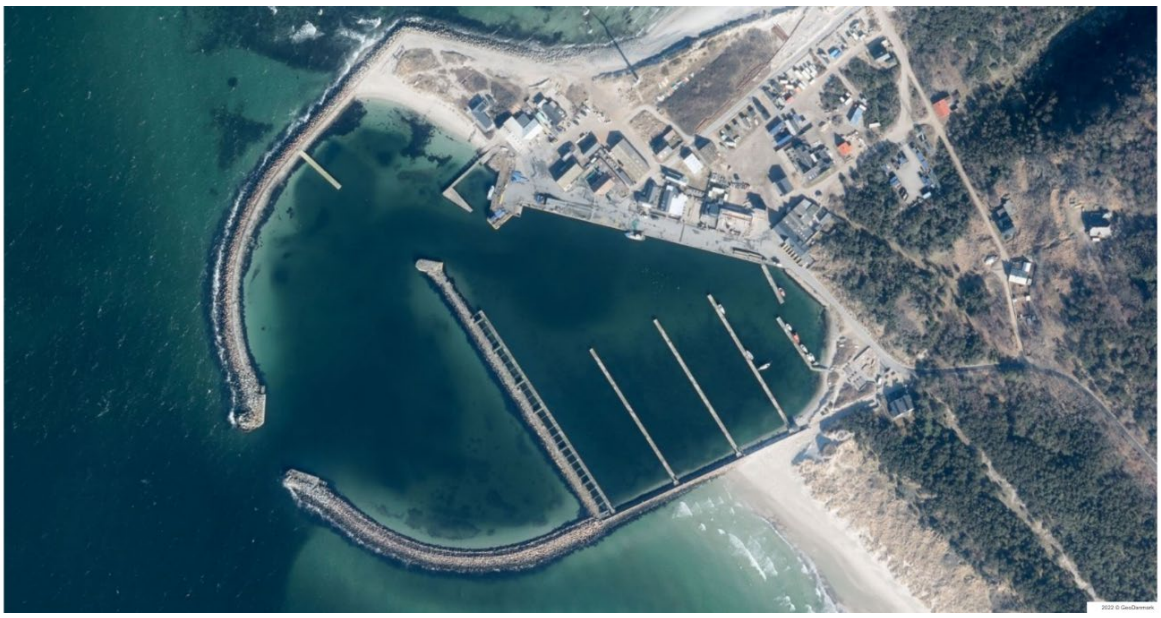


Figure 7.2.A *Aerial overview of Anholt Harbor.*

Figure 7.2.B *Panoramic "flat" overview of Anholt Harbor, seen across the barbecue area.*

Activities to achieve full DarkSky-compliant lighting - Anholt Harbor private lighting

The harbor team has supported the Dark Sky project from the start. The harbor also wishes to see more year-round activitity on the island, which aligns perfectly with DSA's

aims. Anholt Harbor has an **ongoing, direct dialogue with DSA to achieve DSI compliance** as quickly as possible over the coming years (see also support letter, Appendix A – XI).

Two specific examples: **1)** Kirsten Hvid Schmidt (CEO/managing director) and Klaus Jensen (head of daily operations) have undertaken to install shielding on all small lamps in the harbor area (see Fig. 7.2.C.), also preventing glare to cars and bicycles. **2)** During ongoing maintenance, spent bulbs will be replaced with even better bulbs – although at present (autumn 2024), all light sources are already at/below 3000 Kelvin and 500 lumen.

Figure 7.2.C. *Barbecue area at Anholt Harbor. Examples of non-shielded lighting (at left; 2023) and with dark-sky friendly shielded lighting (at right; 2024). By year-end 2025, all these lights will be shielded.*

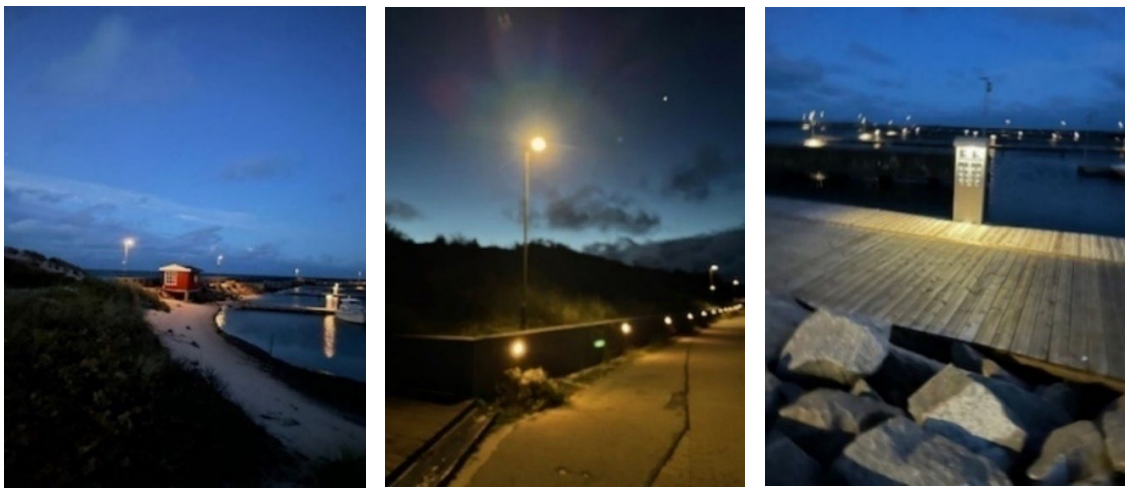
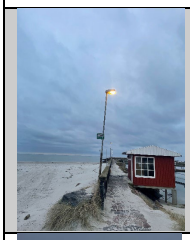
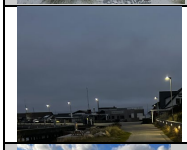
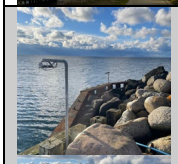
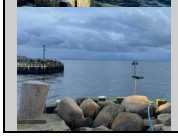
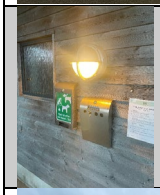
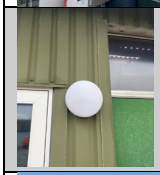
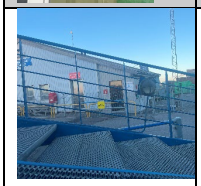


Figure 7.2.D. *After-dark view of various parts of Anholt Harbor. Left: pier and jetty. Center: road leading to hostel. Right: boat-charging stations, NOTE: These are all in protective wrapping all winter; no light.*

Table 7.2.A. *Private Outdoor Lighting Inventory – Anholt Harbor (only large business on Anholt) and example of a typical small business on Anholt*

Image	*Building / structure*	*Description*	*Num-ber*	*Color*	*Shielding*	*Sen-sor*	*<3000 K*	*DSI com-pliant*
 	**Example of a typical small business: grocery store, "Brugsen", two walls of the building**	No outdoor light sources (only indoor lights, lit when open for business; these only shine through the windows)	0					**Y**
	**Harbor – Jetties (see "green group", Table 7.2.B)**	Jetty lighting masts	12	Yellow	Semi-cutoff	**N**	**Y**	**Y**
	**Harbor – road /parking areas**	Street lighting masts	23	Blue	Semi-cutoff	**N**	**N**	**N**
   	**Harbor entrance**	Spotlights at entrance to harbor, where boats sail in	4	Yellow	Semi-cutoff	**N**	**Y**	**Y**

	**Harbor – jetty / pier facilities**	Lights in boat charging stations – which are fully wrapped all winter, so no light at all in winter.	32	Yellow	Full cutoff	**N**	**Y**	**Y**
	**Harbor – jetty**	Mast at end of jetty (same type as "Jetty light masts" above, but full cut-off)	6	Yellow	Full cutoff	**N**	**Y**	**Y**
	**Harbor – promenade + barbecue area**	Spotlight in wall near BBQ area. DSA + Anholt Harbor have agreed, and shields are in production now; for mounting in 2025.	(52 + 19 =) 71	Blue	67 Non-cutoff + 4 Shielded *[NOTE: all will be shielded in 2025. See Fig. 7.2.C.]*	**N**	**Y**	**N**
	**Harbor – "Sailor's house" w/facilities**	Bulkhead lamps	6	Yellow	Semi-cutoff	**Y**	**Y**	**Y**
	**Harbor – fuel-pump stand**	Overhead lamp	2	Yellow	Semi-cutoff	**Y**	**Y**	**Y**
	**Harbor – workshop**	Lamp by door, under awning, fitted with timer	1	Yellow	Non-cutoff	**N**	**Y**	**Y**
	**Harbor – ferry accessway (see "purple group", Table 7.2.B)**	Bulkhead lamp	3	Yellow	Semi-cutoff	**N**	**Y**	**Y**
	**Harbor – ferry office**	Spotlight on facade	4	Yellow	Non-cutoff, under awning (passive cutoff)	**N**	**Y**	**Y**

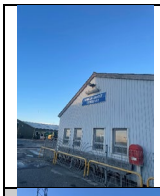
	**Harbor – ferry office**	Spotlight on gable	1	Blue	Semi-cutoff	**Y**	**N**	**Y**
	**Harbor – ferry office**	Fixture on gable and above entrance	2	Yellow	Semi-cutoff	**N**	**Y**	**Y**

Table 7.2.B. *Progress plan to achieve DarkSky-compliant lighting — Anholt Harbor*

Location	***2024 – DarkSky compliance achieved (%)***	***2029 – DarkSky compliance achieved (%)***	***2034– DarkSky compliance achieved (%)***
Harbor – jetties and boating facilities **(Table 7.2.A green group**)	54	95	**100**
Harbor – ferry accessway and office **(Table 7.2.A purple group)**	60	**100**	

CASE INFO BOX about the Lampas—DSA partnership

How Dark Sky Anholt sparked a new awareness about light in a light manufacturer

Lampas is a Danish manufacturer of professional lighting founded in 1971 and from the beginning based on a high emphasis on Danish design and architecture. In 2021 we were contacted by a new customer, asking about our ANTO L1014 street light for a very particular reason – the light looked to be very low in light pollution. Did we know whether it was compliant for use in a Dark Sky Park?

Lampas has always been aware of the risk of light pollution. This is one of the reasons why the ANTO L1014 post light was designed the way it was (by Danish studio VE2). However, becoming a supplier to Norddjurs Municipality and the Dark Sky Anholt project took our knowledge to a whole new level. Coming to know the amount of unwanted side effects of light pollution to insects, birds, mammals, people and road safety (to mention a few) and stepping up to the technological criteria – colour temperature, dimming etc. – that accompany the obvious focus on light distribution has laid the foundation for a new strategic focus.

Since the first contact was made, Lampas has moved on to have 9 designs Dark Sky Approved with hopefully more to come. We have been inspired to inform about light pollution and how to avoid it

on our website as we recognise a growing interest from our customers.

This is besides falling in love with stars and opening our eyes to the dark all over again. Without a doubt, Dark Sky Anholt helped us take a big step further into the world of darkness-friendly lighting and simply sparked a new awareness about light in a light manufacturer.

Signed

Henrik Andersen,
CEO, Lampas

7.3 Outdoor Lighting Inventory Summary

The tables above, along with the specific example in Section 7.4, show how we are working with residents, holiday homeowners and others on the island, cataloguing each street and road. This gives us a strong tool to keep focusing on achieving full DarkSky International compliance of all outdoor lighting in the years to come. Add to this the broad, sincere interest in the dark sky project and there is every reason to be confident in our work to manage outdoor lighting on Anholt. Of course we are aware there is some way to go in converting the widespread goodwill of all stakeholders to actually reach the goal of 100% compliance within 10 years – a goal to which we in DSA nonetheless remain committed.

The table in this section summarizes the percentages of already achieved DarkSky-compliant outdoor lighting across the island. As noted, our work continues, and the Lighting Inventories are also the basis of our ongoing light management work, as of the summer/autumn of 2024.

Table 7.3.A. *Outdoor Lighting Inventory Summary – Public and private areas, compliance Anholt*

	Number of light fixtures	%
Public outdoor lighting (incl. Lighthouse)		
Public outdoor, total light sources	**90**	
DSI-compliant	86	**96%**
DSI-non-compliant	4	4%
Private outdoor lighting (homes & businesses)		
Homes and summer cottages, total light sources (incl. 380 summer holiday homes) DSI-compliant Extrapolation based on percentage obtained from self-reported and DSA-registred light fixtures (average 1 outdoor light per building) (cf. Figure 7.4.C)	**453**	
DSI-compliant	285	**63%**
DSI-non-compliant	168	37%
Main business, Anholt Harbor, total light sources	**167**	
DSI-compliant	91	**55%**
DSI-non-compliant	76	45%
All other businesses (all small), total light sources	**34**	
DSI-compliant	34	**100%**
DSI-non-compliant	0	0%
Grand total for outdoor light sources	**744**	
DSI-compliant	**496**	**67%**
DSI-non-compliant	**248**	**33%**

7.4 Detailed examples of ongoing Light Management Plan work

The two examples in this section document the results of DSA's work with light management. As shown on our annual Event Cycle (Figure 9.2.1.), in December–January we reconfirm with stake-holders and in that connection we will take stock of the progress made. As we recalculate figures (also once a year; we will work this into the annual cycle and board work), we will track our compliance progress.

The first example is our ongoing systematic registration of private outdoor lighting across Anholt. As noted elsewhere, property owners have been encouraged several times to input this data themselves, using a link to a form (see Appendix E: Danish self-reporting form with English translation). Data entered using this link is automatically inserted into the data set. Alternatively, they have filled in a paper form, and we have typed in the data for them. We plan to do a follow-up campaign during the next dark season.

This example is summed up in Figure 7.4.A, which shows the data registered for one specific road on the island – Ørkenvej ("Desert Road"; column 1) – indicating:

- Column 2: "How many of this type of lamp do you have?"
- Column 3: "House number?"
- Column 4: "What color is the light source in the lamp?"
  (*Gullig* = Yellowish; *Varm/Rødlig* = Warm/Reddish)
- Column 5: "How is the lamp shielded re light radiating upwards? (over 90 degrees)"
- Column 6: "Do you have outdoor lighting on your house, or on your land?"
  (*Ja* = Yes; *Nej* = No)

Vejnavn hus/sommer-hus på Anholt?	Hvor mange af denne type lampe har du?	Husnummer?	Hvilken farve har lyskilden i lampen?	Hvordan er lampen afskærmet ift. lys der kastes opad? (Over 90 grader)	Har du uden-dørs belys-ning på dit hus eller i terræn?
Ørkenvej	1	6	Gullig	Semi-Cutoff / Delvis afskærmet	Ja
Ørkenvej		10			Nej
Ørkenvej		25			Nej
Ørkenvej		25			Nej
Ørkenvej		27			Nej
Ørkenvej		27			Nej
Ørkenvej	2	29	Gullig	Semi-Cutoff / Delvis afskærmet	Ja

Ørkenvej	10	45	Varm / Rødlig	Full Cutoff / Fuldt afskærmet	Ja
Ørkenvej	2	59	Gullig	Semi-Cutoff / Delvis afskærmet	Ja
Ørkenvej	1	69	Gullig	Full Cutoff / Fuldt afskærmet	Ja
Ørkenvej	2	71	Gullig	Non Cutoff / Ingen afskærmning	Ja
Ørkenvej	3	73	Varm / Rødlig	Full Cutoff / Fuldt afskærmet	Ja
Ørkenvej	1	75	Varm / Rødlig	Semi-Cutoff / Delvis afskærmet	Ja

Figure 7.4.A *Example of Outdoor Light Inventory data registered for a specific road on the island: Ørkenvej ("Desert Road").*

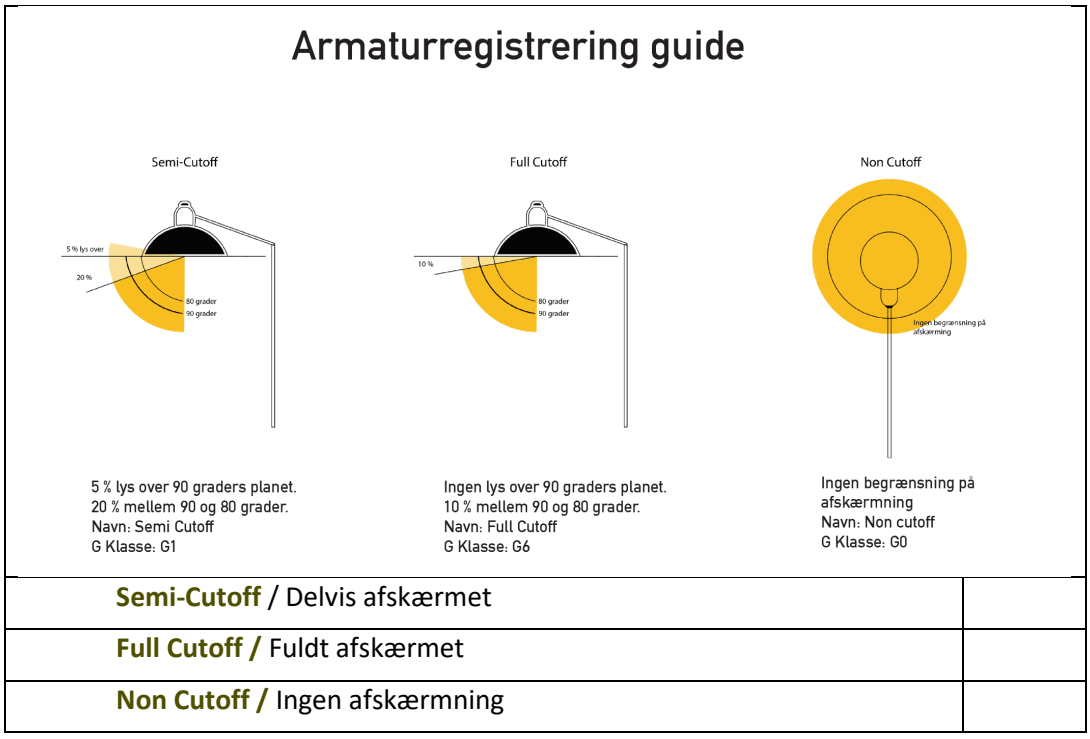


Figure 7.4.B *Part of the guidance material for home owners on Anholt, to ensure correct data entry. "Light fixture registration guide". (See also Appendix D for specific examples.)*

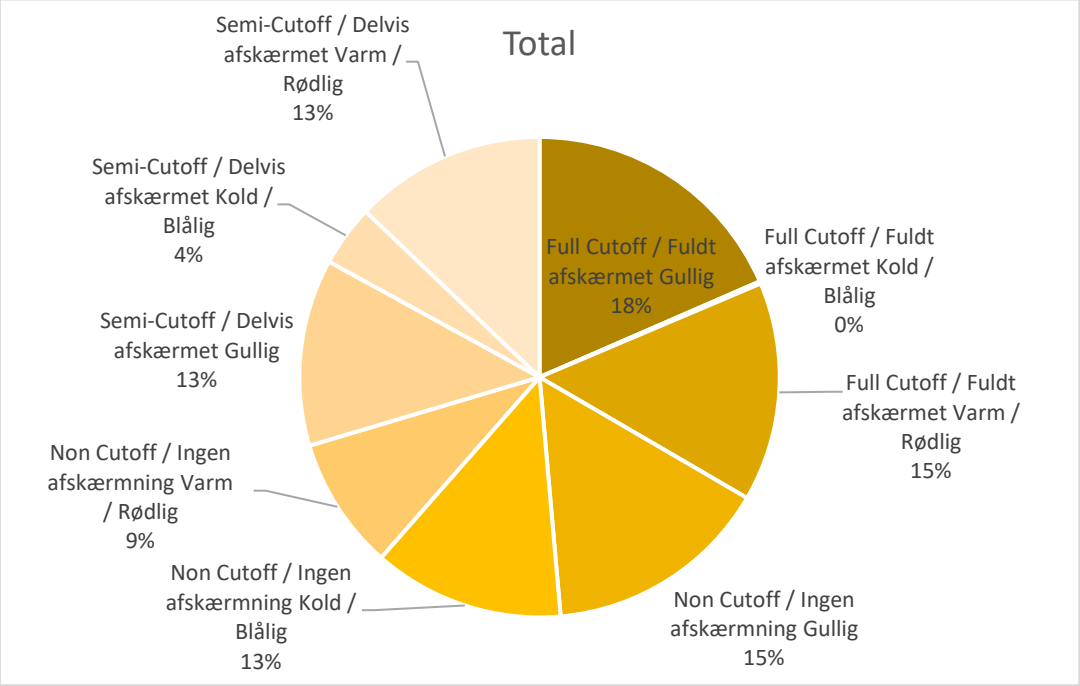


Figure 7.4.C *DSA has so far registered 169 private-home light fixtures on the island of Anholt (for full-year and summer holiday homes) in self-reporting forms submitted by property owners. This diagram shows the proportion of various types of shielding/screening of the 169 light sources this segment represents (average 1 outdoor light source per home). The proportion of DSI-compliant lighting in this segment, i.e. excepting all non-cutoff sources (even warm red), is: (100 – [9+13+15% =] 37 =) 63%. We regard this conservatively calculated sample as representative for all private homes and light sources. Thus, this figure has been extrapolated to be valid for all 453 private homes /summer cottages and is therefore applied in Table 7.3.A.*

NOTE: *In practice, an island walk-through has showed that, like the examples in Appendix D, many self-reported fixtures stated as "non-cutoff" are, in fact, mounted under large awnings or other overhanging structures that give* ***extensive passive shielding*** *– a typical feature of the traditional "Danish summerhouse" building style.*

NOTE ALSO: *During the dark-sky season, very few holiday homes on Anholt are in use at all. This means that* ***most of these "summer cottages" give off no light in the dark months****, from any light source.*

Color tone translation: Gullig = *Yellowish;* Varm/Rødlig = *Warm/Reddish;* Kold/Blålig = *Cold/Bluish.*

New, extra educational material

The second example is new educational material. Besides all the information we have already extensively distributed and posted, physically and online, we are working with the designs and ideas shown below. Our aim is to make an extremely accessible and easily understandable, visually based, printed educational poster, with accompanying post-card-sized "theme cards". This plan may change as design evolves.

These will appear on the Anholt ferry (we have gratefully received the ferry's permission to post material) and in prominent places such as public information boards, at the sailboat harbor, etc. – next to the various information we already post there.

Our present design for the postcard-sized educational material is as shown below:

- Side A (small images) with four different visuals of real-life light situations and dark-sky-friendly solutions: forehead lamps + house lighting + bicycle lights + cars.

- Side B (larger image at right; same for all) with easy, dark-sky-friendly text in Danish – and possibly English/German/Swedish – with strong visual DSA branding.

Figure 7.4.D *Draft of the new DSA postcard design. Side A – showing 4 different themes – will be typical Anholt scenarios, notably including walking and bicycles (most visitors' main modes of transport). Side B will be the same for all 4 themes, and will probably end up stating our message in 4 languages.*

In addition, the poster below (blue text at left), which everyone on the island has already previously received, will be re-posted and re-launched. See English translation (right).

[English translation]

How can I make sure my outdoor lighting is dark-sky friendly?

1** There should only be light **where you need it.
2** You should only turn on light **when you need it.
***Tip:** Timers, timed on–off switches and sensors can help with this.*
***3** Use the **right amount of light**, in terms of intensity.*
4** Use light sources with a "color temperature" of **2000–3000 K (Kelvin).
5** Your light should be **fully screened** and shine **directly at the ground.

Bad lighting ***Good lighting***

[DSA logo]

Figure 7.4.E *Danish poster (left). Part of our original educational material (English translation, right).*

A note on DSA's work with private-home lighting, and on awareness in Denmark

Like the support from the large public and private stakeholders, the interest in DSA's project from owners of homes and holiday cottages on Anholt has been overwhelming.

However, **when encouraging and motivating private home owners, it is important to proceed with care and respect**. Pointing a finger is no fruitful way to go, so we focus on conversations and education about dark-sky issues – as the whole project greatly depends on widespread understanding and continuing support in the local community.

Obviously, the core of the dark-sky movement is to raise awareness of the negative effects of artificial lighting, and this will continue to be the guiding principle of our activities towards full DarkSky-compliant ourdoor lighting around private homes, too. While other types of climate and pollution discssions have been going on in Denmark for many years, **the issue of light pollution is only now beginning to gain awareness here**.

DSA shares information and education at each of our events, supporting all our other efforts as we continue to appeal on all fronts (public info-boards, articles, online campagins, flyers/poster info on the ferry, etc.).

Also, Lampas – the manufacturer of the new street lamps in Anholt Village – has suggested that a campaign with special prices on dark-sky friendly lamps might be arranged; another example of collaborative activities in our pipeline. Achieving total DarkSky compliant lighting will call on us in DSA to continue to present new knowlegde about light pollution to Anholters, holiday-home owners, campers and boaters, inviting and preparing them to reconsider their outdoor lighting.

8. Managing Current and Future Threats to Dark Sky Quality

As explained at length above, there is a strong case for giving attention to outdoor lighting on the island of Anholt. Based on the positive and ongoing dialogue among stakeholders and private building owners, and on the cooperation between DSA and the Municipality of Norddjurs, we have every reason to be confident that through managing the lighting on Anholt, the quality of the darkness on Anholt is now, and will continue to be, protected.

Population growth in the largest cities in the Kattegat strait region – notably Aarhus Municipality (on the Danish side; population 367,039)[4] and the Gothenburg metro area (on the Swedish side; population 1.07 million)[5] – is expected to continue. Generally, the amount of artificial lighting in cities has so far only gone up. However, there are indications that outdoor lighting design will begin to receive more attention in the coming years, as DSA and other local dark-sky organizations strive to increase awareness.

Two things are worth emphasizing when discussing light pollution from major cities specifically related to the DSA project:

1) For efforts to promote artificial light management, Anholt itself can serve as a real-life example and inspire others seeking dark-sky friendly lighting solutions.

2) As shown above in the documentation of the darkness on Anholt, the island's isolated location in the middle of the Kattegat gives superb natural/geographical protection against light pollution.

8.1. Wind farms in the Kattegat strait

In terms of external light influences, we must mention Anholt Offshore Wind Farm, located west of the island (see green-framed marking on map below), about halfway to the mainland, Jutland. The lighting that marks the wind turbines is regulated by both Danish and international law, which prescribes a white flashing light to ensure flight safety. However, these lights have an intelligent adjustment system to regulate brightness according to the weather situation.

DSA is in ongoing dialogue with the operator of the windfarm, who has confirmed that a possible next step may be a system that regulates lights according to aircraft activity in the area. This solution – to remedy the disadvantage to the dark sky – is under way, but requires approval from national and international flight authorities. Note that regulations prohibit use of the small landing strip on Anholt itself after dark, so the island's own landing strip has no light whatsoever and does not influence this issue at all.

On a positive note, as of February 2024, thanks to our dialogue with the operator, they have greatly reduced the light sources in Anholt Offshore Wind Farm: Before, all 111 wind turbines had a constantly blinking light source. Now, only about half are lit under normal conditions – meaning about a 50% reduction in wind turbine light from this wind farm.

[4] Source for Q1 2024: https://ledelsesinformation.aarhuskommune.dk/Embed#vfs://global/AARHUS-I-TAL/BEFOLKNING_I_TAL.xview .
[5] Source, estimate for2022: https://www.citypopulation.de/en/sweden/metrogoteborg/ .

Also, for future compliance it is worth noting a cutting-edge technology developed by a Danish company, TERMA: In connection with the consultation round in 2022 regarding new offshore wind parks in the Kattegat strait (notably Sønderbjerg Wind Farm – a plan that was postponed indefinitely), we made the authorities specifically aware of TERMA's **"Aircraft Detection Lighing System" (ADLS)**, which can be used to ensure that "the strong lights on wind turbines are only active when a plane is near". ADLS is already operating successfully around the world (see: https://www.terma.com/products/radars/aircraft-detection-lighting-solution/; "improve 'light-off" time by up to 95%") – and has also been installed in two Danish windfarms in the North Sea, both newly inaugurated (Sept. 2024, as Vesterhav Nord and Vesterhav Syd) and visible in daylight from the West Coast of Jutland, near Hvide Sande.

The red-framed areas on the map show private operators' proposals for future offshore wind farms in the Kattegat. While we and others definitely support a more sustainable future, the green transition and wind energy, the positioning of further wind farms has given rise to debate and concerns. The present wind turbines in Anholt Offshore Wind Farm (framed in yellow-green) have a maximum height – from sea level to wing tip – of 142 meters, but current proposals indicate that future wind turbines may be as tall as 340 meters above sea level.

The plans for locations, designs, and years of initiation are currently unknown. However, several consultations rounds are planned or under way, and there is little doubt that in the coming decades more offshore wind farms will be built in the Kattegat.

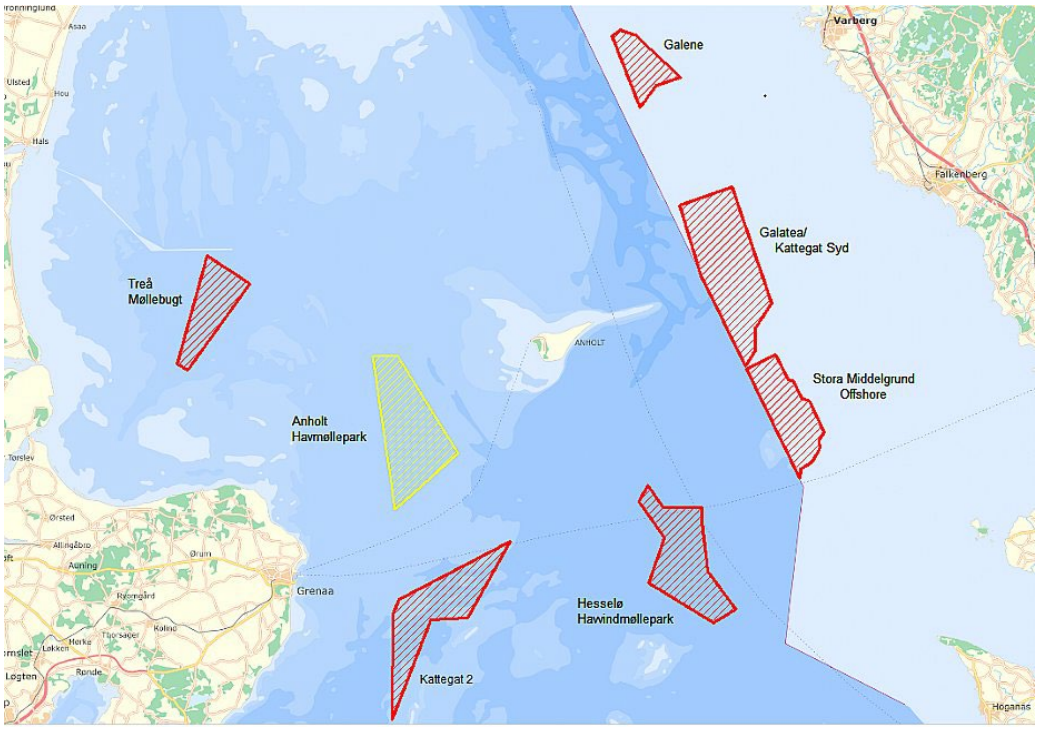


Figure 8.A. *Wind farm overview of the Kattegat. Yellow-green-framed area = Anholt Offshore Wind Farm. So far, this is the only existing wind farm in the area. Light-blue area = Swedish waters. Red-framed areas = proposed wind farms. Consultations on the Hesselø proposal are currently under way.*

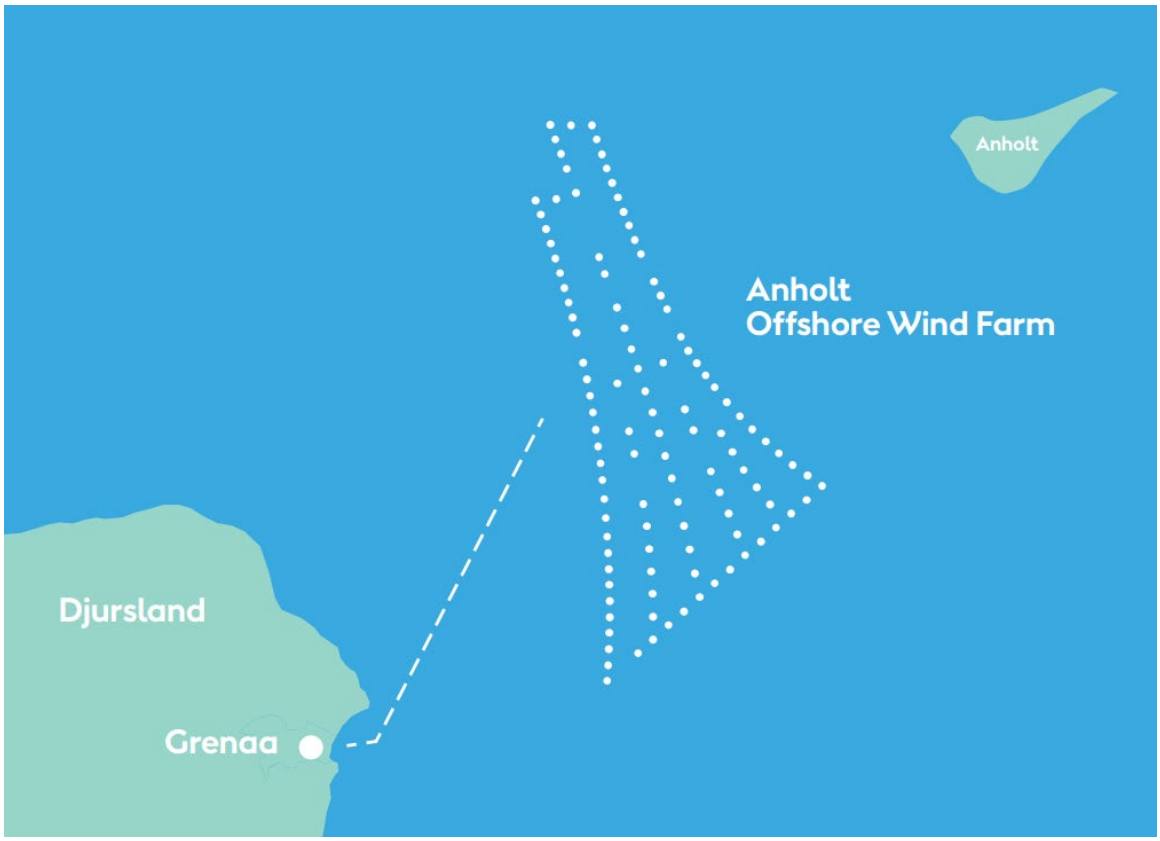


Figure 8.B. *The Anholt Offshore Wind Farm. White dots = 111 wind turbines. Dotted line = undersea cable. (Source: https://orsted.com/-/media/www/docs/corp/com/our-business/wind-power/wind-farm-project-summary/anholt_uk_2018.ashx?la=en&hash=7707175e111c65a4aefc353291091ee4)*

8.2. Vessels in the waters of the Kattegat

Often while enjoying the stillness and spectacular views on Anholt, one spots a large vessel on the horizon – especially in the waters east of the island, looking towards Sweden. This is no surprise based on the marine traffic statistics for the Kattegat strait: the Danish Maritime Authority states that up to 70,000 merchant vessels pass through the Kattegat each year – many sailing around Anholt to the east. The number of vessels passing through the Kattegat may have reached its maximum, but there is no sign that this traffic will decline in the future.

The chances of DSA or the international Dark Sky movement affecting merchant vessel traffic are extremely slim. However, fortunately such vessels are currently passing, and will continue to pass, Anholt at distances where their artificial light has a very limited affect on Anholt's night-sky quality.

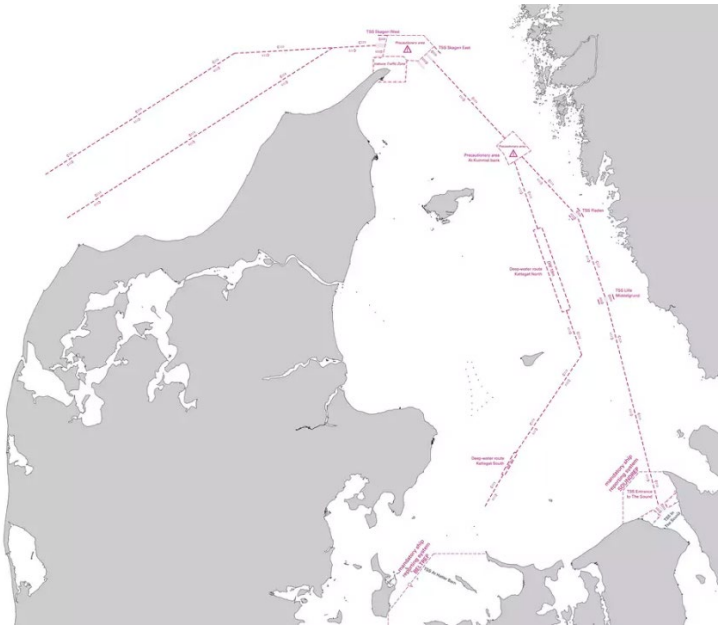


Figure 8.C. *Sailing routes for large merchant vessels in the waters of the Skagerrak (north of the tip of Jutland) and the Kattegat (between Jutland and Sweden).*

8.3. Tourism and visitor numbers

As noted earlier, Anholt attracts many visitors during the summer, from late June to mid-August. On a typical peak season day (in July), up to 4000 people are on the island. Around 90% of visits (sometimes more) occur during the summer. Anholt's landscape and geography mean that visitors are concentrated on the western part of the island: in holiday homes, houses, in the campground, or in the marina. The island has only 6 km of black-top roads, so very few visitors bring their car, and the number of local vehicles is limited. People mainly get around by bicycle or on foot.

Although summer puts considerable pressure on the island's few shops, restaurants and logdings, tourism on Anholt is very laid back – which is logical, given that visitors come for tranquility, unspoiled natural settings, darkness, and the wide beaches and fresh air.

From a Dark Sky perspective, it is noteworthy that most visitors come during the bright summer nights, which naturally limit star-gazing. Inversely, some two-thirds of private housing (summer cottages) are dark most of the year, and the marina is virtually empty for about 10 months each year. A surge in visitors numbers is a potential threat to nature conservation and dark-sky quality, but we remain confident that growth in tourism will be kept under control – and, as outlined in section 9, we have increased our efforts to guide and educate visitors to Anholt on how to behave respectfully to nature and the dark sky.

Part of Anholt's strategy is to stretch tourism beyond summer, even into winter, with the attraction of quiet, dark, unspoiled nature. One way to do this is Dark Sky events, and any rise in off-season visitors will comply with our Dark Sky ambitions, including education.

9. Outreach and Education

Generally speaking, in DSA we have been working quite hard with events and activities on Anholt itself, and also sought to reach out to a wider audience in Jutland and Denmark at large. We have included out the most notable fruits of our efforts below.

9.1. Written information, academic papers, and press items

In the interest of brevity, this section gives only summary outlines of projects, papers, articles, etc. These can be verified and pursued, with rich photo material, via the links.

- **Review** of the lighting on the island of Anholt, by two light design MA-level students (of Aalborg University); **report** by Camilla Monberg Rathsach and Giacomo Lenzi. Anholt_Street lighting analysis and recommendations (1).pdf

- **Paper** by Camilla Monberg Rathsach and Assistant Professor Mette Hvass of Aalborg University (https://vbn.aau.dk/en/persons/138302). Their **presentation** drew considerable attention at the Light Symposium in Copenhagen, September 2022: sustainable lighting of cities by considering the Moon as a light source. https://iopscience.iop.org/article/10.1088/1755-1315/1099/1/012046?fbclid=IwAR3KleLYKzccYJprG5BxqAk1rW1NWI8NKzwoosxlXbS1s14MuJE9tw7IckcH

- **Article** by Camillas Monberg Rathsach on the Anholt project, regarding wildlife and moonlight vs artificial light; published (in English) in the Canadian **magazine** *Hakai.* https://hakaimagazine.com/news/to-protect-wildlife-from-artificial-light-look-to-the-moon/?fbclid=IwAR33vo2VZeSW6AeZL4OWVp5fdEc4xeq1t6F4gzzvrli1brTnCILQRUMiKWg

- New **research project** by Mette Hvass, on Anholt, about living with and in darkness, supported by the large Danish consultancy firm COWI. Project **description** (in Danish) from Aalborg University. “Five good reasons to turn down outdoor lighting”. https://www.aau.dk/fem-gode-grunde-til-at-skrue-ned-for-belysningen-i-uderummet-n101715?fbclid=IwAR0tnB3CMnjebxYqEYBidPt0AJMiVIUywAqyTeg5Xpt8-CZyqXtAofTvMRc . Ms. Hvass will continue her darkness research in the coming years, for example in “Art of Darkness”, a three-year international project beginning in January 2025 with researchers from prominent European universities.

- **Recommendation** (in Danish) from the Danish Society for Nature Conservation (Danmarks Naturfredningsforening; see also their Letter of Support in Appendix A, VIII), citing **Anholt** as one of five star-spotting locations in Denmark and also mentioning **DSA’s work** – although at the time (on July 28, 2023), Møn & Nyord was still the only Dark Sky Park in Denmark. https://www.dn.dk/nyheder/5-gode-steder-at-se-pa-stjerner/?fbclid=IwAR3TggrNUwv31tcWxLKxqP2LkGiKNVx8t0Ue_XvjPcai_8RkVQV94GTXlgk

9.2. Events on Anholt, and the "DSA Annual Dark-Sky Event Cycle"

Making progress – examples of how far we have come

Bearing in mind that the key question was first was asked in the summer of 2018, during the annual Anholt Festival, we feel that we have come far. That question was: "Why doesn't Anholt, with its beautiful, clear and starry night sky, have a Dark Sky certificate?"

Since then, much hard work has been done to gather material, raise awareness, promote technical and technological change, and do everything it takes to earn a place among DSI's list of documented spots with exceptional natural darkness. And each year, the association that grew from that key question – DSA – has seen our efforts rewarded.

A typical example of an event is our **celebration of the annual Perseid meteor shower**:

- In **August 2019**, a group of 8 people walked out into the Desert in the darkness to enjoy the shooting stars.

- In **August 2022** – after two years of COVID-19-imposed restrictions, 276 people took that same walk.

- In **August 2023**, our two-day Perseid event had 36 participants on the first day and 30 on the second day. Considering the serious storm that struck Anholt that week (with prior weather warnings causing many people to leave for the mainland) and heavily cloudy skies on both nights (not a single star was visible on the second night), we were satisfied with the turnout.

  Fortunately, both groups enjoyed the stellar presentations done by Mette Hvass (Associate Professor, PhD, M. Arch, of the Lighting Design Lab at Aalborg University; see also Section 9.1.) about architectural lighting design, and Tom Axelsen (board member in a fellow Danish dark-sky association; more details below) about the Dark Sky Møn & Nyord project – not to mention veteran physicist and astronomer Ole J. Knudsen (of Aarhus University) and musical magician Aksel Striim ("Viking musician", performer, instrument-builder, composer and educator).

- In 2024, we had two splendid nights with Mars, Jupiter and the full moon rising almost simultaneously. Also, we saw the Space-X rocket returning, lit up like a gigantic shooting star.

- From 2025 and beyond, the two Perseid days will also figure prominently in the **DSA Dark-Sky Event Cycle** (see Figure 9.2.1).

Chronology of key events

May 2019 To kickstart the process and get an idea of the potential local support for a dark-sky project, a group held the first public dark-sky event on Anholt on **May 31, 2019**. The event was announced all over the island in physical posters (at right) and the local quarterly newspaper/newsletter *Anholt Posten*.

Tom Axelsen, the driving force behind Møn & Nyord Dark Sky Park and Dark Sky Community certificate, was invited to Anholt to give a presentation of the work behind the certificates. He gave an introduction to DarkSky International (then IDA) and talked about how to gather collaborators, partners and data for the application, ending his presentation with a profound lecture on the positive effects of fighting light pollution. About 35 people attended the event, and the overall atmosphere was enthusiastic and very positive. A decision was made to bring the Dark Sky Anholt project to life.

Guests Tom Axelson, in a "Møn – Aspiring to Dark Sky" logo jacket (at left) and Peter Christensen from the Energy Academy on Samsø (at right).

August 2019 The Dark Sky Samsoe project visited Anholt as a part of the European Interreg Night Light project (https://www.interregeurope.eu/nightlight/).

After a talk given by Peter Christensen from the Energy Academy on Samsø – a Danish island known internationally for its high self-sufficiency in renewable energy, and located in the western part of the Kattegat – all participants went on a guided tour into the starry, full-moon night. Eight people participated in the full event.

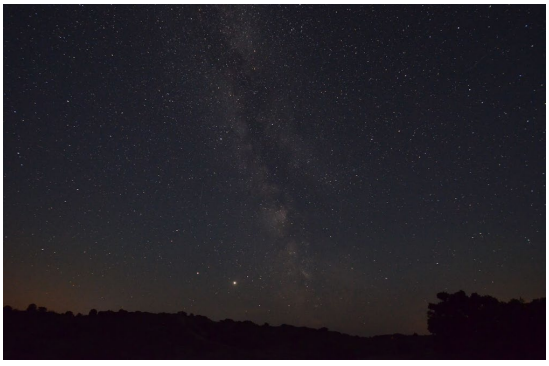
Later that month, the founding meeting of "the Dark Sky Anholt association" (DSA) took place on Anholt, on **August 31, 2019** (see Appendix B for the association's founding document, in Danish).

October 2019 Sadly, the planned event 'Full Moon Autumn Walk' was cancelled due to heavy rain. It was organized alongside the Anholt Gin juniper-berry-picking event during Denmark's autumn school-break holiday (always in mid-October).

November 2019 DSA travelled to the island of Samsø to meet up with the Dark Sky Samsø project group, giving a talk and visual presentation.

2019 → 2020 COVID lockdown year, and the "white nights" of spring and summer – so our activities were under legal restrictions.

August 2020 'Time for re-enchantment – Starshower', an event held on Anholt (poster at right →). Three astronomers from the Dept. of Physics and Astronomy at Aarhus University gave lectures on light pollution and on the Perseids. The participants walked out into the Desert to lie down in the dunes for a guided visual tour around the clear starry night sky. A total of 110 people took part in this event.



Sky views from August 2020, long-exposure photos: moonrise with clouds (at left) and Saturn, Jupiter and the Milky Way (at right). Photo credit: Astronomer Frank Grundahl.

December 2020 'Dark Sky Symposium' to celebrate natural darkness and the Geminids. Planned as a weekend event featuring celebrities, astronomists, a biologist, historians, a specialist on light affecting the human body, and the Norwegian writer Sigri Sandberg (*An Ode to Darkness*). Regrettably cancelled, due to the COVID lockdown.

May 2021 DSA joined other nature-based organizations in the international "Travel Trade Workshop for Soft Adventure", held online and convened by VisitDenmark, the country's national tourist authority (in this case their New York office). We have since been invited to such promotional and network event, running over several days, as a destination for astro-tourism and Soft Adventure.

August 2022 "Sky-sail" poster → for a Perseid full-moon event: 276 participants over two days and nights, featuring astronomers, Viking musicians and various celebrations, walks and enjoyment of natural darkness.

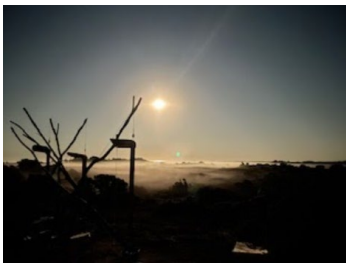
This event was the initial "flagship", a sort of prototype for our outreach efforts to the wider public – showcasing darkness, informing, entertaining, and fascinating participants. This combination promotes astro-tourism in general and extends the season (also creating commercial opportunities for the island community). As of spring 2024, we are working with a Danish travel agency that can offer "astro-tourist package trips" to bring even more people to enjoy Anholt during the dark season.

Viden Djurs – high school visit from the mainland. Every August since 2020, a high school class from a mainland upper-secondary school (Viden Djurs, see study programs at https://videndjurs.dk/en/our-study-programs) has come to Anholt to take part in the Perseid star event in the Desert. Thematic names: 'Time for re-enchanment – Starshower' (2020); 'Star safari – a heavenly zoo' (2021); 'To infinity … and beyond' (2022). High school teachers covering the physics and astronomy, art & design, history, and biology prepare the students for the event, and they follow up afterwards in their classroom teaching.

The elementary school on Anholt is gathering school material to launch a program on astronomy and physics to attract elementary school classes from around the nation to come to Anholt for long or short educational courses involving the island's children.

Skyguide community-based classes held to train local Anholters to lead events about natural darkness and star observations. The first class was in 2021; the second in 2023. They were taught by our partner Ole J. Knudsen of Aarhus University (mentioned e.g. in Section 4.2 – and seen here showing meteorites and lunar fragments to one of our dark-sky event groups before departing for a night walk in the Desert.) (Photo credit: Morten Abildstrøm).

October 2022 + 2023 For the autumn school break in mid-October, we introduced a concept similar to the Perseid meteor shower, but revolving around the Orionids. Only a small group appeared, but we plan to repeat this event annually with better promotion, notably across the Central Denmark Region (which Anholt is a part of, in administrative terms). The Orionid event will be is a recurring annual event going forward.



Left to right: Shooting star, long-exposure shot, Aug. 16, 2020; Perseid event in August 2022, with "Viking musician" wind-harp instruments for the concert (center) and in full-moon silhouette. Photo credit: astronomer Frank Grundahl (left); Anne Dixgaard (center); Alexander Gabold (right).

Outreach 2024 and beyond: DSA's annual Dark Sky Event Cycle

The summer white-night season has few dark-sky events, although we educate and raise people's awareness of DSA and DSI all year round. Therefore the events in our annual cycle are contentrated in the dark months, as shown in Figure

We already have **4 annual meteor-shower events** (2 in August, focusing on the Perseids + 2 in October, focusing on the Orionids).

On **24 November 2024**, DSA took part in a dialogue and outreach workshop with the Danish dark sky community, invited by Aarhus University's Ole J. Knudsen.

In addition, we have two new partners who have committed to doing events with DSA in the coming autumn/winter 2024/2025, and in the years to come:

The **Norddjurs Municipal Library** will host a literature-themed event about nature, the stars and the universe. The first in this series, scheduled for Autumn 2025, has the working title: "The seven sisters in real life – stargazing and literature'." We will dig into Lucinda Riley's world-reknown eight-volume novel series and how it has inspired millions of readers around the world to be curious about the starry night sky.

The Jutland-based travel and tour company **Fyrholt Rejser** (https://fyrholtrejser.dk), which specializes in combining trekking with nature/history/culture/meditation, is poised to organize dark-sky-centered walking tours on Anholt in the dark season.

DSA will also, in April 2025, collaborate with a third, local partner – **the association Friends of Anholt Lighthouse** (Anholt Fyrs Venner) – to arrange a very special night event: a long walk in the darkness to the lighthouse, with storytelling about the island's history of shipwrecks, darkness and light, as we awaken and use our senses in the dark. Quite exceptionally, this night walk will include access to the lighthouse itself (normally closed to the public). We also expect this event to become part of the DSA annual event cycle.

In July 2025, we will explore flora and fauna during the light Nordic summer nights. What birds can we see and hear? How do plants react in light, and in darkness? And why is protection of the darkness so vital for the biodiversity we fight to keep and enhance?

It is worth noting that not least for commercial partners, who will play a big role in realizing the Anholt strategy of more dark-sky visitors and astrotourism, the continuing efforts of DSA towards achieving DSI certification – and, eventually, our actual certification – plays an important role in their long-term commitment.

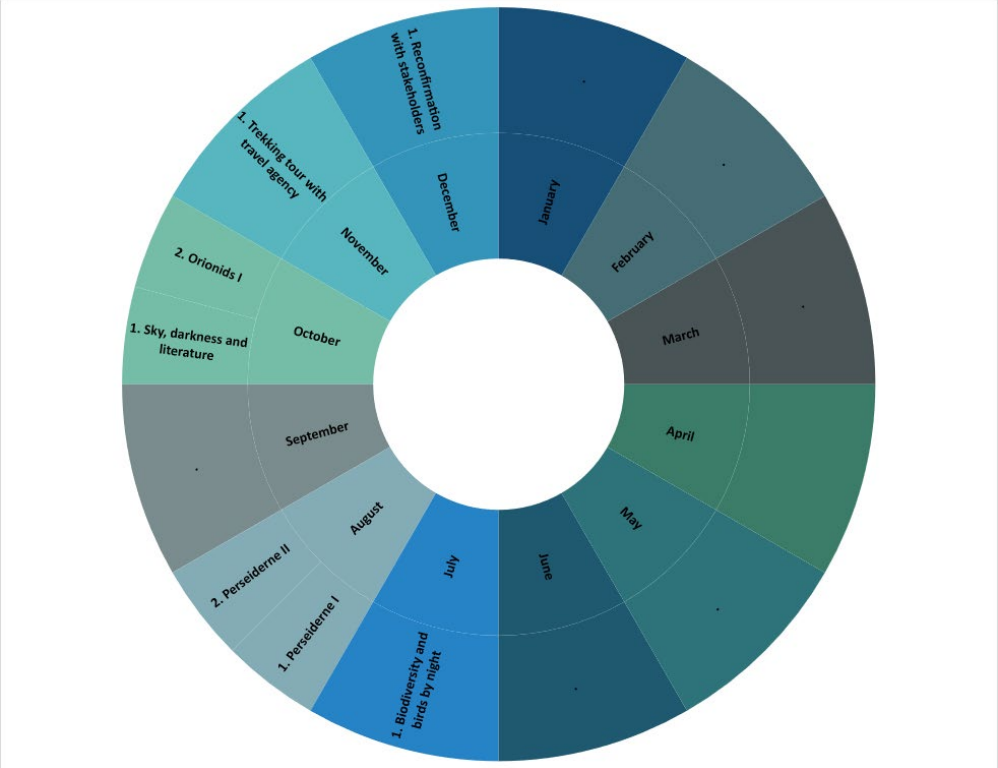


Figure 9.2.1 *DSA Dark-Sky Event Cycle (here, for the 2024/2025 season).*

9.3. Media coverage and social media

Since 2019 we have been posting articles in the island's own quarterly printed newspaper/newsletter ***Anholt Posten*** and keeping our members updated on our Facebook profile, with yearly or half-yearly newsletters.

The **Facebook profile for Dark Sky Anholt** has enjoyed considerable attention (see Section 4.1) and is active – especially in the star-friendly season, naturally. We share news on light pollution, astronomical events, and DSA events on Anholt.

Over the years the project has received national media coverage in several **newspaper articles**, starting with the national newspaper *Jyllandsposten* (in Danish):
"Astronomers and university staff guide folks to dark-sky areas"
https://jyllands-posten.dk/rejser/ECE12421432/astronomer-og-universitetsfolk-guider-folk-til-dark-skyomraader/

The **DarkSky International web site** itself features the lighting used on Anholt: lampposts designed and produced in Denmark (https://lampas.dk/produkter/anto-l1014-parklampe/).

As the **Municipality of Norddjurs** became increasingly involved in process of applying for the Dark Sky Park certificate for Anholt, the municipality took the lead – applying for funding for the complete replacement of public light sources on the island. Now all 51 public lampposts are dark-sky compliant. When the project received a large grant from the EU body EAFRD – The European Agricultural Fund for Rural Development – **local and regional media** covered and celebrated the investment in preserving Anholt's dark sky:

- "Island in the Kattegat is one of the darkest places in the world – and here, the streetlights are meant to shine as little as possible"
  https://amtsavisen.dk/oestjylland/oe-i-kattegat-er-et-af-de-moerkeste-steder-i-verden-her-skal-gadelamperne-lyse-saa-lidt-som-muligt
- "Anholt – a shining example for others"
  https://norddjurs.dk/nyheder/2022/nov/anholt-et-lysende-eksempel-for-andre

The new public street lighting was covered on **prime-time public radio** in October 2022.

Examples of **photos shared by DSA members and other Anholt star enthusiasts**:

"Star kiss" (left); and "Star-cycles", a pair of late-night bicycles on Southern Hill (right). Photo credits: Mads Hagbarth Damsbo, May 8, 2018.

A **feature article**, written by DSA chairwoman Anne Dixgaard, about light pollution was published in the Jutland newspaper *Aarhus Stiftstidende* in 2021. Aarhus is the second-largest city in Denmark and the mainland city closest to Anholt. In recent years, Aarhus has replaced 27,000 light sources in lampposts with blue-white LED lighting. We shared this feature article on all our other media platforms.

"Aarhus is lit up like an operating room with cheap LED lights. Where did the darkness and the magic go?

https://stiften.dk/debat/aarhus-er-oplyst-som-en-operationsstue-af-billigt-led-lys-hvor-blev-moerket-og-magien-af

A final good example of the support the Dark Sky project meets everywhere is the **sports race shirt for the annual Anholt Marathon**, which was designed for the running event in 2022: a black ground with a "star-white" profile of Anholt.

9.4. Consulting, hearing and helping the year-round Anholters

Through DSA board members living on the island, we take part in dialogues between the island's administrative authority (the Municipality of Norddjurs) and the local community about challenges relating to our Dark Sky efforts. This will also help us as we pursue our plans to improve Dark Sky quality in the future. And as noted in Section 4.2 on networks and support: the support of the local community is vital and, fortunately, widespread.

One specific example is they way we are helping to handle certain spots in Anholt village that are perceived by the Anholters as "dark spots" – particularly places that required more illumination than the current renovated lighting provides. The DSA representative has done walks and talks with other Anholters to pinpoint these spots, then corresponded with the Municipality to determine exactly where and how much lighting was needed.

As the following quote shows, the municipal representative was well aware of the Dark Sky principle on Anholt of not installing more lighting than strictly necessary, and he was also willing and ready to assist with new, appropriate measure to the best of his ability:

"Could you be more specific. Where? (Best of all: show on a map) And how much? … As everywhere else, we have upgraded the lighting, although on Anholt there is some distance between the illuminated spots; but essentially we were supposed to renovate the existing [lighting], and with Dark Sky as the driver of the project, we didn't aim to put up any more light than necessary. // But I understand your wish, and I'd like to hear back from you as soon as possible, and then, from here, I can check out what the cost of them [the new lamps] will amount to, and whether this is something we would be able to get done/get ordered this year."[6]

[6] Danish original; Morten Abildstrøm of DSA retains the source e-mail, from a partner at the Municipality of Norddjurs: *"Kan I være mere specifik. Hvor? (gerne på et kort) og hvor meget? … Vi har som alle andre steder opgraderet belysningen, om end at der er lang i mellem nogle lyspunkter på Anholt, skulle vi som udgangspunkt renoverer det oprindelige og med Dark Sky som motor for projektet, skulle der jo ikke mere lys op end nødvendigt. //Men jeg forstår jeres ønske, jeg vil gerne snarest have en tilbagemelding på hvad i ønske, også herfra kan jeg undersøge hvad de løber op i, og om det er noget vi kan få udført/bestilt i år."*

9.5. Educational material for residents, home owners, and visitors

As mentioned throughout the application, since our founding we have sought to inform and educate both Anholters and island guests to take care of the darkness. We issue a quarterly newsletter, including recommendations on lighting "Do's and Don'ts". This list is also published in the island's newsletter, *Anholt-Posten*, so it reaches all Anholters and additional subscribers, and all members of DSA. A poster on dark-sky-friendly outdoor lighting has been e-mailed to all owners of residential or holiday homes on the island, along with a letter from the Municipality of Norddjurs inviting each household to self-report the status of its outdoor lighting.

The message and the spirit we will seek to spread among the community and visitors runs like this (our English translation is based on the Danish original draft; we may also have a good German translation done when, hopefully, certification is achieved):

> *Dear guest,*
>
> *You are now making your way into a certified Dark Sky area full of natural darkness at night, and with a sky full of brightly twinkling stars. Both are a rare phenomenon today, due to ever-increasing amounts of light pollution.*
>
> *It is our hope that, together, we can take care of the uniquely dark natural surroundings and the starry night skies that profound darkness allows us to observe. In doing this, we and the generations who follow us will be able to glimpse the vast universe in which our own little Planet Earth hangs suspended. We will also be safeguarding Anholt's biodiversity and the exceptional opportunity this environment gives year-round Anholters and island visitors to tap into the ancient circadian rhythm of sleep and awakening, and to build up and experience the equally ancient human capability of seeing in the dark.*

As also recommended by DSI, as we have mentioned earlier, we are currently making dark-sky educational material in a simple, practical and informative hand-out format (flyer and/or postcard format; see Figure 7.4.D. for design so far). The material will be inexpensive yet appealing, and preferably robust, so as to minimize printing resources and costs.

We aim to have the flyer/postcard material ready during the 2024/25 dark season, and to distribute copies to all island residents and holiday-home owners after New Year. Copies will also be presented to regular visitors and first-time visitors to Anholt, and we will have a permanent poster on the ferry to promote dark-sky awareness and conversations, and to boost our own visibility in DSA as an association and event organizer.

The concrete goals of the new postcard initiative will be better light management on the island and spreading useful take-home messages on good, dark-sky friendly lighting.

10. Astro-Tourism

Tourism is an important aspect in the continuing development of Anholt island. Tourism accounts for a large share of the island's economy and jobs, thereby helping to sustain the existing year-round community of Anholters, with its elementary school, basic health care, grocery store and small businesses, services and amenities. The tourism that Anholt offers has a unique focus on nature, with events that cater to a specific tourist segment. Examples are the yearly lobster festival, music events, and the Anholt Marathon.

Mainly concentrated around the 6 to 8 weeks of summer holiday, July is the island's busiest month. The "shoulder season" sees a significant drop-off in tourist numbers, with almost zero tourism in winter.

The huge difference in summer-vs-winter tourist numbers challenges the island's tourism-based businesses, making it hard to offer year-round opportunities for tourist activities.

Astro-tourism may prove to be a key element in creating another unique type of tourist experience on the island that can attract visitors year round, thereby boosting the island's economy and creating more job activity throughout the year. Bear in mind that the sky gets even darker during the shoulder seasons and in the wintertime – a strong argument for inviting astro-tourists, either individually or in groups, to our array of events.

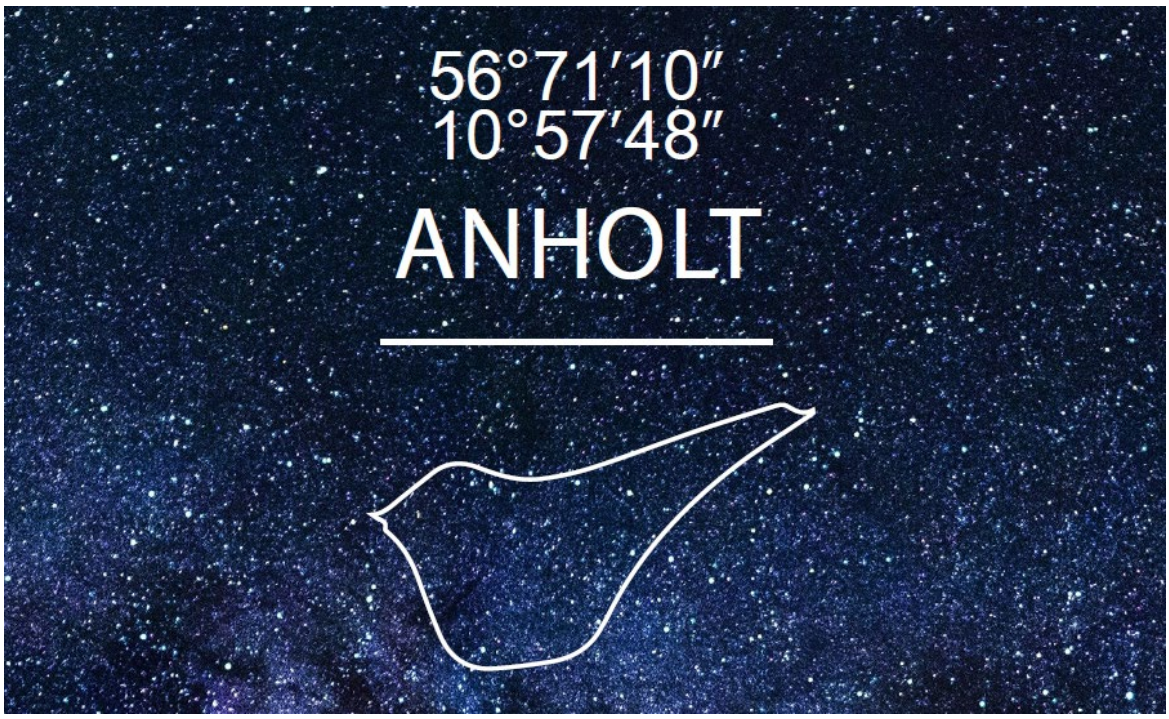


Figure 10.A. *Visual profiling of DSA from our first DSA newsletter, spring 2020.*

The Municipality of Norddjurs has a tourism policy (under the official Partnership Agreement with VisitAarhus, in Danish at: https://norddjurs.meetingsplus.dk/welcome-da/udvalg/okonomiudvalget/06-09-2022/protocol/51-udkast-til-partnerskabsaftale-mellem-norddjurs-kommune-og-visitaarhus-2023-2026pdf?downloadMode=open) that dedicates a specific section to the island of Anholt. The wording here supports unique dark-sky tourism experiences on the island, with natural darkness as a central theme (https://www.visitaarhus.dk/aarhusregionen/byer-og-steder/anholt/dark-sky-anholt) . Striking astro-photography and descriptive passages (in Danish) even tip visitors (here in our translation) to *"Check the phases of the Moon – you can see more shooting stars when there is no Moon in the sky"*. There is also a link to our DSA website.

Figure 10.B. *One of the images used to depict Anholt's dark-sky quality to potential astro-tourists on the VisitAarhus tourist website in Danish, where its caption reads: "Anholt, Denmark's darkest place." (https://www.visitaarhus.dk/aarhusregionen/byer-og-steder/anholt/dark-sky-anholt) . Photo credit: Frank Grundahl.*

All this makes astro-tourism a perfect fit for the municipal strategy, not least because of its potential to bring more jobs to the island – a crucial part of maintaining the long-term viability of the local year-round community of Anholters.

We have noted that DarkSky International recently released a set of guiding principles to ensure that dark sky experiences benefit communities, honor local knowledge and ways of life, and give high priority to the protection of the night environment. As these principles provide a sustainable framework for astro-tourism, it is quite natural for us at DSA to endorse these principles, and we will also highlight them as we educate.

11. Additional content to fully complete Applicant Self-Checklist

These two photos have been added for the sake of completeness, re the Self-Checklist, ***Item F1 – "The Milky Way is readily visible."***

Both accessed on Dec. 17, 2024 at https://www.visitaarhus.dk/aarhusregionen/byer-og-steder/anholt/dark-sky-anholt. Photo credits in white on photos.

12. References

References and resources, mainly relating to Section 5.2, Cultural History and Significance:

1995 – *Anholt gennem tiderne ["the Island of Anholt through the ages"]*; Århus Amt Erhvervsafdelingen; editing and copywriting: Ulrich Kleiminger; illustrations: Jens Hougaard Nielsen.

2012 – Descriptions of the island's geological origins are found, for instance, on the website of the Natural History Museum of Denmark (Statens Naturhistoriske Museum): https://snm.ku.dk/natureksperterne/alle_opslag/2012/2012.1/anholt/ .

2014 – Encyclopedic information in Danish, in *Den Store Danske* – Lex.dk; by Bjarne Flou and Niels Ulrik Hansen; https://denstoredanske.lex.dk/Anholt .

2017 – TV2 Østjylland (Danish television channel, East Jutland newsroom); program with host Casper Clemmensen called "hunting for history on Anholt", including historical accounts of Viking Age battles. https://www.tv2ostjylland.dk/norddjurs/jagten-paa-anholts-historie .

In addition, in the text itself we have included numerous links to relevant original sources (some in Danish, some in English) for purposes of verification and further information.

13. Appendices

Appendix A
Additional letters of recommendation and support from organizations and bodies

Appendix B
Founding document of the Dark Sky Anholt (DSA) association

Appendix C
Anholt, an island created by the Kattegat strait – history, legend and lore

Appendix D
Anholt – Outdoor Lighting Inventory, specific examples of outdoor lighting, public and private

Appendix E
Anholt – Home owner self-reporting form for outdoor lighting

Appendix F
Example of light measurement data from the new measuring station – Anholt 2

Appendix G
Example of light measurement data from the new measuring station – Anholt 2

Appendix A – Additional letters of recommendation and support from organizations and bodies

Note: Although we are applying as a Dark Sky Park, some of these letters, being of older date, use the term “Dark Sky Sanctuary”.

I. The landowner of the island of Anholt
Mr. Jens Christian Rostgaard von der Maase (Danish attorney at law)

II. The local government authority, signed by the mayor incumbent at that time, April 2020:
Mayor Jan Pedersen, for the Municipality of Norddjurs

III. The association of residents on the island of Anholt
Ms. Liselotte Arentz Sørensen, for Anholt Borgerforening (Anholt Citizens Association)

IV. The association of homeowners (including holiday homes) on the island of Anholt
Chairman Ms. Trine Heidemann Jensen, and Morten Abildstrøm, for Anholt Grundejerforening

V. Educational network – youth education programs the Norddjurs area
Mr. Morten Bang Sørensen, for Viden Djurs (in Grenaa, Denmark)

VI. Business network in the Djursland region (in Danish only)
Mr. Ole Sørensen, for Business Djursland (in Kolind, Denmark)

VII. Tourism organization, depart for coastal tourism in the Aarhus area
Mr. Flemming Rasmussen, for VisitAarhus, Kyst- og naturturisme (in Kolind, Denmark)

VIII. Denmark’s largest nature conservation organization, local committee for Norddjurs
Mr. Morten Abildstrøm, for Danmarks Naturfrednings Forening, lokalafd. Norddjurs

IX. The regional authority, which is also responsible for regional development in Djurland
Mr. Kim Kofod Hansen, for Region Midtjylland (the Central Denmark Region)

X. Hans Kjeldsen, Professor at the Department of Physics and Astronomy,
Aarhus University, Denmark

XI. Anholt Harbor, Ms. Kirstin Hvid Schmidt, Managing Director

Appendix A – I

Støtteerklæring / Letter of support

Anholt, 12/4 2024

Støtte til Anholt som Dark Sky Park

Jeg er i de senere år løbende blevet orienteret om, at foreningen Dark Sky Anholt arbejder på, at Anholt kan få et Dark Sky-certifikat via ansøgning til organisationen DarkSky International. Processen med indsamling af data og samarbejde med diverse interessenter og partnere blev igangsat i 2019. Initiativtagerne og sidenhen foreningen Dark Sky Anholt har fået støtte fra Norddjurs Kommune, RegionMidt, og diverse andre foreninger på Anholt samt bred opbakning fra virksomheder og borgere mv., som deltager i og følger projektet. Der er således tale om en velfunderet proces.

Dette er baggrunden for, at jeg hermed giver min anbefaling af og fulde støtte til at få Dark Sky certificeret på Anholt. Jeg er ejer at de fredede områder på Anholt (85% af jorden på Anholt) og giver hermed også Dark Sky Anholt tilladelse til at opholde sig i områderne efter solnedgang, i forbindelse med Dark Sky-aktiviteter og arrangementer.

Denne støtteerklæring er udfærdiget til brug for Dark Sky Anholts ansøgning til Dark Sky International, og jeg giver hermed – nu og fremover – min opbakning til foreningens projekt, indenfor de rammer, som jeg råder over.

In support of Anholt as a Dark Sky Park

In recent years I have been kept abreast of the association Dark Sky Anholt's efforts to achieve Dark Sky certification on Anholt, by application to the organization DarkSky International. The process of collecting data, and working with a wide variety of partners and stakeholders, was launched in 2019. The initiating group, and later the Dark Sky Anholt association, has received support and resources from the Municipality of Norddjurs, the Central Denmark Region and various other associations on Anholt, and also from enterprises and local islanders and others who are actively participating in, and following, the project. The process is therefore well established.

On this basis, I hereby give my recommendation and full support to the process of seeking Dark Sky certification for the island of Anholt. I am the landowner of the protected areas on Anholt (85% of the land on Anholt), and I hereby also give Dark Sky Anholt permission to be present on these land areas after sunset, in connection with Dark Sky activities and events.

This Letter of Support has been prepared for use in Dark Sky Anholt's application to Dark Sky International, and I hereby give my support – now and in the future – to the association's project within the framework and the mandate I have.

Med venlig hilsen / Sincerely,
Advokat Jens Christian von der Maase (Attorney)

Kammerherregården Anholt
Bygaden 7
8592 Anholt
Denmark

Appendix A – II

Letter of recommendation

Support for a Dark Sky Sanctuary on the Island of Anholt

The Dark Sky Association on Anholt, and a number of stakeholders, wish to be granted a Dark Sky Sanctuary certificate by the International Dark Sky Association. The process of collecting data and organizing a broad variety of stakeholders for the application, amongst other activities, was launched in 2019. Since then, the initiative has received wide support and plenty of manpower from diverse associations, businesses, and locals who are actively participating in the project. The process is therefore well-established.

Anholt is the most fantastic island in Denmark, situated a 3-hour boat-ride from the mainland. Its unique light, and darkness, are simply the most unspoiled in Denmark. A dark night on Anholt is truly dark, and one clear, frosty evening in particular provided me with the most sensational experience of stillness, darkness and the universe. With no lights to disturb me.

I believe that many have yet that experience to come, and that Anholt holds great potential for powerful experiences beyond the usual, hectic summer holiday experiences – ones that can only be found in Denmark by visiting Anholt.

That is the reason why we recommend, and fully support, the certification of Anholt as a Dark Sky Sanctuary. We support the process, and in the future will continue to support, the project within the boundaries of our mandate.

Støtte til Dark Sky Sanctuary på Anholt

Foreningen Dark Sky Anholt arbejder på, at Anholt kan få certifikatet Dark Sky Sanctuary af International Dark-Sky Association. Processen med indsamling af data og diverse samarbejdspartnere blev igangsat i 2019 og initiativtagerne har fået støtte fra diverse foreninger på Anholt og bred opbakning fra virksomheder og borgere mv, som deltager i og følger projektet. Der er således tale om en velfunderet proces.

Anholt er den mest fantastiske ø i Danmark med næsten 3 timers sejlads fra fastlandet og lyset og mørket er i al sin enkelhed det mest uspolerede i Danmark. En mørk nat på Anholt er mørk og især en aften i vintertid med klar frost og en skyfri himmel, har givet mig personligt den største oplevelse af stilhed, mørke og universet. Intet lys forstyrrede mig.

Jeg tror mange har den oplevelse til gode og at Anholt rummer stærke oplevelser udenfor den hektiske sommersæson og vel og mærke oplevelser, som du kun kan få i Danmark ved at besøge Anholt.

Dette er baggrunden for, at vi kan give vores anbefaling af og fulde støtte til at få Dark Sky Sanctuary certificeret Anholt. Vi støtter op om projektet og vil fremover, indenfor de rammer som vi råder over, forsætte med at støtte projektet.

Dato/date 21. april 2020

På vegne af/On behalf of

Norddjurs Kommune/Norddjurs Municipality

Jan Petersen,
Borgmester/Mayor

norddjurs kommune

Appendix A – III

Letter of recommendation

Support for a Dark Sky Certificate for the Island of Anholt

The Dark Sky Association on Anholt, and a number of stakeholders, wish to be granted a Dark Sky Sanctuary certificate by the International Dark Sky Association. The process of collecting data and organizing a broad variety of stakeholders for the application, amongst other activities, was launched in 2019. Since then, the initiative has received wide support and plenty of manpower from diverse associations, businesses, and locals who are actively participating in the project. The process is therefore well-established.

As many of the locals know and have as a key reason for living on the island, the night sky on Anholt is wonderfully dark and starry. The island is also widely known, and rightfully so, as a summer holiday getaway due to its unique nature, wide beaches, and relaxed atmosphere in the tiny city center, and at the campgrounds, cafés, restaurants, and harbor. Hiking in the desert or along the coastline is also a revered activity. But late summer, autumn and winter also have something special to offer, and a Dark Sky Certificate will bring attention to these lesser-known diversions. With a minimum of light pollution, and thereby clear view of the starry skies, Anholt is attractive to multiple interest groups. Because Anholt is constantly working on creating more sustainable tourism, and a sustainable business environment in general, the islanders would like to expand the tourist season to year-round tourism.

With a Dark Sky Certificate, and in the longer term an observatory, Anholt will be able to attract school classes and students from other educational institutions around the nation; this would enrich the school life of the local children too.

That is the reason why we recommend, and fully support, the certification of Anholt as a Dark Sky Sanctuary. We support the process, and in the future will continue to support, the project within the boundaries of our mandate.

Støtte til Dark Sky Certifikat til Anholt

Foreningen Dark Sky Anholt arbejder på, at Anholt kan få certifikatet Dark Sky Sanctuary af International Dark-Sky Association. Processen med indsamling af data og diverse samarbejdspartnere blev igangsat i 2019 og initiativtagerne har fået støtte fra diverse foreninger på Anholt og bred opbakning fra virksomheder og borgere mv, som deltager i og følger projektet. Der er således tale om en velfunderet proces.

De fleste anholtere ved det godt, og nogle er her af samme årsag, der er dejligt mørkt og stjerneklart på Anholt. Anholt betragtes i vid udstrækning, og med rette, som et udpræget sted for sommerferier med sin unikke natur, vidtstrakte sandstrande, hyggelige by-, camping-, café- restaurant- og havnemiljø og gode lange gåture i ørkenen eller langs kysten. Men sensommer, efterår og vinter har absolut også noget i særklasse at byde på, og et Dark Sky certifikat vil være en anledning til at få gjort højlydt opmærksom på, hvad Anholt også der har at byde på. Med meget lidt lysforurening og et klart udsyn til stjernehimlen er det attraktivt for mange forskellige interessegrupper at komme til Anholt og da Anholt altid arbejder på at skabe mere bæredygtigt turisme- og erhvervsliv, er det attraktivt for øens beboere at udvide turistsæsonen til helårsturisme.

Med et Dark Sky certifikat, og på sigt et observatorium, kan Anholt tiltrække skoleklasser og uddannelsesinstitutioner fra hele landet, noget der også vil være berigende for øens skolesøgende børn.

Dette er baggrunden for, at vi kan give vores anbefaling af og fulde støtte til at få Dark Sky Sanctuary certificeret Anholt. Vi støtter op om projektet og vil fremover, indenfor de rammer som vi råder over, forsætte med at støtte projektet.

På vegne af/On behalf of Anholt Borgerforening/Anholt Citizens Association

Liselotte Arenta Sørensen Arenta Sørensen Anholt 8/6-2020

Formand/Chairman

Appendix A – IV

Letter of support

Støtte til Dark Sky Sanctuary på Anholt

Foreningen Dark Sky Anholt arbejder på, at Anholt kan få certifikatet Dark Sky Sanctuary af International Dark-Sky Association. Processen med indsamling af data og diverse samarbejdspartnere blev igangsat i 2019 og initiativtagerne har fået støtte fra diverse foreninger på Anholt og bred opbakning fra virksomheder og borgere mv, som deltager i og følger projektet. Der er således tale om en velfunderet proces.

In support of Dark Sky Sanctuary on Anholt

The Association Dark Sky Anholt and a number of stakeholders wish to be granted a Dark Sky Sanctuary on Anholt by International Dark-Sky Association. The process on collecting data and a broad variety of stakeholders etc. for the application, has been launched in 2019 and has received support and manpower by a wide circle of associations, enterprises and locals who are actively participating in the project. The process is therefore well-established.

Dette er baggrunden for, at vi kan give vores anbefaling af og fulde støtte til at få Dark Sky Sanctuary certificeret Anholt. Vi støtter op om projektet og vil fremover, indenfor de rammer som vi råder over, forsætte med at støtte projektet.

This is the reason why we want to recommend and fully support the process of getting a Dark Sky Sanctuary certificate on Anholt. We support the process and will in the future continue to support within the framework that is our mandate.

På vegne af

Anholt Grundejerforening

Formand Trine Heidemann Jansen

Morten Abildstrøm

On behalf of

The island of Anholt homeowners' Association
DK8592 Anholt
DENMARK

President Trine Heidemann Jansen
Morten Abildstrøm

Morten Abildstrøm
Gennem Landet 48
8592 Anholt - Denmark
Tlf. 2128 9879

Appendix A – V

Letter of support

Støtte til Dark Sky Sanctuary på Anholt

Foreningen Dark Sky Anholt arbejder på, at Anholt kan få certifikatet Dark Sky Sanctuary af International Dark-Sky Association. Processen med indsamling af data og diverse samarbejdspartnere blev igangsat i 2019 og initiativtagerne har fået støtte fra diverse foreninger på Anholt og bred opbakning fra virksomheder og borgere mv, som deltager i og følger projektet. Der er således tale om en velfunderet proces.

In support of Dark Sky Sanctuary on Anholt

The Association Dark Sky Anholt and a number of stakeholders wish to be granted a Dark Sky Sanctuary on Anholt by International Dark-Sky Association. The process on collecting data and a broad variety of stakeholders etc. for the application, has been launched in 2019 and has received support and manpower by a wide circle of associations, enterprises and locals who are actively participating in the project. The process is therefore well-established.

(.....)

Dette er baggrunden for, at vi kan give vores anbefaling af og fulde støtte til at få Dark Sky Sanctuary certificeret Anholt. Vi støtter op om projektet og vil fremover, indenfor de rammer som vi råder over, forsætte med at støtte projektet.

This is the reason why we want to recommend and fully support the process of getting a Dark Sky Sanctuary certificate on Anholt. We support the process and will in the future continue to support within the framework that is our mandate.

På vegne af

On behalf of

Viden Djurs
N. P. Josiassens Vej 44
DK-8500 Grenaa
Tlf. +45 87 58 04 00

Appendix A – VI

Business Djursland
Ny Lufthavnsvej 21
8560 Kolind
Mail; kontakt@businessdjursland.dk

Djursland d. 12. november 2019

Støtte til Dark Sky Sanctuary på Anholt

Business Djursland støtter op om det fantastiske initiativ som Foreningen Dark Sky Anholt arbejder på, at Anholt kan få certifikatet Dark Sky Sanctuary af International Dark-Sky Association.

På Anholt er der dejligt mørkt, så mørkt at øen bør få papir på at være det i særklasse. Anholt er nemlig den mindst lysforurenede plet på Danmarks kortet og et af de steder i Nordeuropa med størst mulighed for at se en uspoleret stjernehimmel. Mørke og stjerner er ved at være en sjældenhed i en verden med alt for meget kunstig belysning, på Anholt er der stadig mulighed for at få en oplevelse af at være en del af himmelrummet.

Med et certifikat, sikre Anholt sig ikke kun opmærksomhed fra mennesker og organisationer, med interesse for mørke og stjernehimmelen, men der bliver en ekstra motivation lokalt for strategisk og politisk at arbejde for at bekæmpe lysforurening og for at bevare og genoprette så meget mørk nattehimmel som muligt på Anholt.

Et Dark Sky Sanctuary certificeret vil være med til, at det også i fremtiden bliver muligt at lave arrangementer, tiltrække turister og give alle interesserede oplevelser der foregå i mørke og stjerneskær. For selv om Anholt ligger forholdsvis afsides, og ikke umiddelbart er truet af potentiel lysforurening er det vigtig at sikre konsensus lokalt for at bevar og genoprette disse mørke nætter.

Dette er baggrunden for, at vi kan give vores anbefaling af og fulde støtte til at få Dark Sky Sanctuary certificeret Anholt. Vi støtter op om projektet og vil fremover, indenfor de rammer som vi råder over, forsætte med at støtte projektet.

Vi takker for jeres store arbejde for at bevare Nattemørket på Anholt

Ole sørensen
Formand Business Djursland

På vegne af
Business Djursland

Business Djursland
Ny Lufthavnsvej 21 – 8560 Kolind
www.Businessdjursland.dk

Appendix A – VII

4. december 2019

Letter of support

Støtte til Dark Sky Sanctuary på Anholt

Foreningen Dark Sky Anholt arbejder på, at Anholt kan få certifikatet Dark Sky Sanctuary af International Dark-Sky Association. Processen med indsamling af data og diverse samarbejdspartnere blev igangsat i 2019 og initiativtagerne har fået støtte fra diverse foreninger på Anholt og bred opbakning fra virksomheder og borgere mv, som deltager i og følger projektet. Der er således tale om en velfunderet proces.

Dette er baggrunden for, at vi kan give vores anbefaling af og fulde støtte til at få Dark Sky Sanctuary certificeret Anholt. Vi støtter op om projektet og vil fremover, indenfor de rammer som vi råder over, forsætte med at støtte projektet.

In support of Dark Sky Sanctuary on Anholt

The Association Dark Sky Anholt and a number of stakeholders wish to be granted a Dark Sky Sanctuary on Anholt by International Dark-Sky Association. The process on collecting data and a broad variety of stakeholders etc. for the application, has been launched in 2019 and has received support and manpower by a wide circle of associations, enterprises and locals who are actively participating in the project. The process is therefore well-established.

This is the reason why we want to recommend and fully support the process of getting a Dark Sky Sanctuary certificate on Anholt. We support the process and will in the future continue to support within the framework that is our mandate.

Flemming Rasmussen
Vicedirektør | Director of Coastal Tourism
VisitAarhus, Kyst- og naturturisme
Ny Lufthavnsvej 21,
8560 Kolind

Letter of support

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This is the reason why we want to recommend and fully support the process of getting a Dark Sky Sanctuary certificate on Anholt. We support the process and will in the future continue to support within the framework that is our mandate.

På vegne af:

Danmarks Naturfrednings Forening (DN), lokal afdeling DN Norddjurs

Formand Arne Holm-Hansen
Morten Abildstrøm

On behalf of:

Denmarks Nature conservation association, local committee DN Norddjurs

Chairman Arne Holm-Hansen
Morten Abildstrøm

Morten Abildstrøm
Gennem Landet 48
8592 Anholt - Denmark
Tlf. 2128 9879

Appendix A – IX

Central Denmark Region
Regional Development
Skottenborg 26
8800 Viborg
Denmark
Tel. 7841 0000
kontakt@regionmidtjylland.dk

To whom it may concern

Letter of support

Date 08.02.2021
Mette Boel
Tel. +45 24900078
mettbl@rm.dk

The Association Dark Sky Anholt and a number of stakeholders wish to be granted a Dark Sky Sanctuary on Anholt by International Dark-Sky Association.

The process on collecting data for the application, has been launched in 2019 and has received support and manpower by a wide circle of associations, enterprises and locals who are actively participating in the project.

Central Denmark Region is committed to promoting attractive living conditions and sustainable development, especially in rural areas of our region such as Anholt.

Our rural strategy focuses on empowerment of local communities in developing the social, environmental and commercial resources of a given rural area.

Thus, we fully support Association Dark Sky Anholt and their effort getting a Dark Sky Sanctuary certificate on Anholt by International Dark-Sky Association. The process is well-established, we support it and will continue to support within the framework that is our mandat.

On behalf of Central Denmark Region

With kind regards

Kim Kofod Hansen
CEO, Regional Development, Central Denmark Region

Appendix A – X (page 1 of 3; Danish orig. followed by English translation by Ole K. Knudsen)

Letter of Support from

Hans Kjeldsen, Professor at the Department of Physics and Astronomy, Aarhus University

AARHUS
UNIVERSITET
INSTITUT FOR FYSIK OG ASTRONOMI

Dark Sky Anholt støtteerklæring

Institut for Fysik og Astronomi

Hans Kjeldsen

Professor

Dato: 28. juni 2023

Mobil: +45 23382160
E-mail: hans@phys.au.dk

Web:
http://au.dk/hans@phys

Vi ønsker med denne erklæring at udtrykke stor støtte til arbejdet med at etablere Dark Sky Anholt, et projekt som har fokus på oplevelse og fascination af nattehimlen og som knytter til ved undervisning og turisme.

Med henvisning til den eksisterende samarbejdsaftale imellem Norddjurs Kommune og Aarhus Universitet bekræfter Aarhus Universitet, ved Institut for Fysik og Astronomi hermed vores hensigt til, at støtte aktiviteterne i forbindelse med aktivitetsgruppen Dark Sky Anholt på nedennævnte områder.

Hvis Dark Sky Anholt opnår økonomisk, logistisk og teknisk støtte til projektet fra Norddjurs Kommune, og evt. eksterne donatorer, tilbyder Aarhus Universitet at formalisere et samarbejde om projektet indenfor den eksisterende ramme af samarbejdsaftalen mellem Norddjurs Kommune og Aarhus Universitet.

Aarhus Universitet vil kunne levere konsulentbistand angående placering af Dark Sky oplevelsesområder, og deres design, den astronomirelaterede del af markedsføringen af Dark Sky Anholt, oplæring af en første generation af Dark Sky guider med hensyn til generel baggrundsviden om visuel astronomi, stjernehimlens mytologi og historier og tips til god og inspirerende astronomiformidling. Desuden kan vi vejlede med hensyn til lysdesign på Anholt, og mulighederne for fremtidig udvikling af Dark Sky Anholt.

Dark Sky Anholt refererer i markedsføringen og øvrige udførelse af projektet til Aarhus Universitet som samarbejdspartner, med henblik på at styrke rekrutteringen af unge til STEM-fagområderne generelt og specielt til at vælge Aarhus Universitet som studiested.

Aarhus Universitets støtte forudsætter, at vi har indblik i og kan påvirke hvordan Dark Sky Anholt markedsføres og præsenteres i undervisnings- og turistmæssig sammenhæng.

AARHUS
UNIVERSITY
DEPARTMENT OF PHYSICS AND ASTRONOMY

Vi ser meget frem til at samarbejde med Norddjurs Kommune og aktivitets- og projektgruppen bag Dark Sky Anholt omkring dette spændende og vigtige projekt.

Venlig hilsen og på vegne af astronomigruppen ved Aarhus Universitet

Hans Kjeldsen
Professor ved Institut for Fysik og Astronomi, Aarhus Universitet

Appendix A – X (page 3 of 3; English translation by Ole J Knudsen)

Declaration of support for Dark Sky Anholt

With this declaration we wish to expres our sustained support for the efforts to establish Dark Sky Anholt, a project focusing on the experience and fascination of the night sky, linking to education, outreach and tourism.

Referring to the existing agreement of collaboration between Norddjurs Kommune and Aarhus University, Aarhus University - represented by the Department of Physics and Astronomy - confirm our intention of supporting the activities connected to the efforts by the active group Dark Sky Anholt in the areas mentioned below.

Provided that Dark Sky Anholt obtains economical, logistical and technical support for the project from Norddjurs Kommune and possible external donators, Aarhus University offers a formal collaboration around this project within the existing framework of the agreement of collaboration between Norddjurs Kommune and Aarhus University.

Aarhus University is able to give consulatory advice concerning the placement of Dark Sky areas of relevance, the design of these areas, the part of the marketing of Dark Sky Anholt related to astronomy, training of a first generation of Dark Sky guides concerning general background knowledge on visual astronomy, the mythology and stories of the starry skies, and advice on good and inspiring astronomical outreach. In addition we can give support concerning lighting design on Anholt and the future development possibilities for Dark Sky Anholt.

In the marketing efforts and other parts of the practical work related to the project, Dark Sky Anholt will refer to Aarhus University as collaborating partner, with the aim of strengthening the recruitment of young persons into the STEM-disciplines in general and especially to choose Aarhus University for their studies.

The support from Aarhus University is offered on the requirement that we will see and have influence on the marketing and presentation in educational and tourism related connections.

We look forward very much to a collaboration with Norddjurs Kommune and the project and activities group behind Dark Sky Anholt concerning this exiting and important project.

Best wishes on behalf of the astronomygroup at Aarhus University

(signed)

Hans Kjeldsen
Professor at the Department of Physics and Astronomy, Aarhus University

/translation by OJK.

Appendix A – XI Letter of Support from Anholt Harbor (page 1 of 2; English transl. next page.)

ANHOLT HAVN

Foreningen Dark Sky Anholt

Grenaa, den 25. oktober 2024

Støtteerklæring til Dark Sky Anholt

I samarbejde med foreningen Dark Sky Anholt og Norddjurs Kommune har vi på Anholt Havn allerede gennemført mange tiltag for at erstatte eksisterende belysning med mørkevenlige lyskilder.

Efterhånden som vi fortsætter med at forny og opgradere havneområdet, vil vi tilstræbe at få de bedst mulige løsninger på plads, i samarbejde med Dark Sky Anholt og vores samarbejdspartnere på fastlandet.

Vi udtrykker hermed vores fortsatte støtte og opbakning til Dark Sky Anholt, hvis formål er at sikre og forbedre kvaliteten af øens mørke nattehimmel.

Anholt Havn er forpligtet til at opfylde dansk lovgivnings krav vedrørende visse belysnings-elementer ifm. sikkerhed, molelys, molefyr og kystredningstjenesten.

Skulle der ved enkelte tilfælde være behov for at Anholt Havn slukker for belysningen, vil vi være imødekommende overfor for et sådant behov.

Med venlig hilsen
ANHOLT HAVN A/S

Kirsten Hvid Schmidt
CEO

Anholt Havn A/S · c/o Grenaa Havn A/S · Havnecentervej 1 · 8500 Grenaa · Telefon (+45) 87 58 76 00

(Appendix A – XI Page 2 of 2. English translation by DSA of support letter from Anholt Harbor)

ANHOLT
HARBOR

The Dark Sky Anholt Association

Grenaa, October 25, 2024

Declaration of support for Dark Sky Anholt

In collaboration with the association Dark Sky Anholt and the Municipality of Norddjurs we have already carried out many initiatives at Anholt Harbor to replace existing lighting with dark-sky-friendly light sources.

As we gradually continue to renovate and upgrade the harbor area, we will endeavor to put into place the best possible solutions, working with Dark Sky Anholt and the partners we cooperate with on the mainland.

We hereby express our continued support and backing of Dark Sky Anholt, whose objective is to ensure and improve the quality of the island's dark night sky.

Anholt Harbor is under obligation to comply with the requirements in Danish legislation regarding certain lighting elements that relate to safety, pier lighting, pier beacons and the marine search-and-rescue service.

If, on certain specific occasions, there is a need for Anholt Harbor to turn off harbor lighting, we will do what we can to accommodate any such requests.

Yours sincerely,
ANHOLT HAVN A/S

[SIGNATURE]

Kirsten Hvid Schmidt
CEO

Anholt Havn A/S · c/o Grenaa Havn A/S · Havnecentervej 1 · 8500 Grenaa [Denmark] · Phone: (+45) 87 58 76 00

Appendix B – Founding document of the Dark Sky Anholt (DSA) association (in Danish only)

Referat – Stiftende generalforsamling Foreningen Dark Sky Anholt 31-08-2019

Referent: Aisha Seeberg

Præsentation af fremmødte
Kay Verner Nielsen
Alf Arén
Laurits Møbjerg
Simon Døssing
Aisha Seeberg
Nicolai Hende
Anne Dixgaard

Dagens dagsorden
Valg af ordstyrer
- Laurits vælges som ordstyrer

Valg af referent
- Aisha vælges til at tage referat af mødet.

Registrering af fremmødte
- Kay Verner Nielsen
- Alf Arén
- Laurits Møbjerg
- Simon Døssing
- Aisha Seeberg
- Nicolai Hende
- Anne Dixgaard

Valg af stemmetællere
- Der vælges ikke stemmetællere, da der er enighed om at stemme ved håndsoprækning.

Gennemgang af vedtægter og afstemning om vedtægter
Navn
- Foreningens navn er Foreningen Dark Sky Anholt
- Ingen kommentarer, vedtaget

Formål
- Gennemgang.
- Ingen ændringer. Formålet enstemmigt vedtaget

Medlemskreds
- Gennemgang.

1

- Ingen ændringer. Enstemmigt vedtaget

Generalforsamling
- Gennemgang.
- Fastsættelse af kontingent: 150 kr. Enstemmigt vedtaget
- Ændring: Valg af bestyrelse skal ske forskudt således, at hele bestyrelsen ikke skiftes ud på én gang. Formand, næstformand og kasserer vælges i 2019 for 2 år og øvrige medlemmer vælges i 2019 for 1 år således, at fra 2020 vælges alle altid for 2 år.
- Enstemmigt vedtaget.

Ekstraordinær generalforsamling
- Gennemgang.
- Enstemmigt vedtaget.

Bestyrelsen
- Gennemgang.
- Ændring: Foreningens daglige drift varetages af formanden. Kassereren fungerer som kasserer og er en del af bestyrelsen.
- Enstemmigt vedtaget.

Økonomi, regnskab og revision
- Gennemgang.
- Ændring: Valg af revisor træffes på først kommende bestyrelsesmøde
- Enstemmigt vedtaget

Tegningsregler
- Gennemgang.
- Ændring: Foreningen tegnes af formanden.
- Enstemmigt vedtaget.

Vedtægtsændringer og ophør
- Gennemgang.
- Enstemmigt vedtaget.

Vedtægter for Foreningen Dark Sky Anholt godkendes med de noterede ændringer.

Valg af bestyrelse
- Præsentation af dem der har valgt at stille op til følgende bestyrelsesposter:
  - Anne Dixgaard stiller op til formandsposten og bliver enstemmigt valgt.
  - Aisha Seeberg stiller op som næstformand og bliver enstemmigt valgt.
  - Kay Verner Nielsen stiller op som bestyrelsesmedlem og bliver enstemmigt valgt.
  - Laurits Møbjerg stiller op som bestyrelsesmedlem og bliver enstemmigt valgt.
  - Nicolai Hende stiller op som kasserer og bliver enstemmigt valgt.
  - Simon Døssing stiller op som 1. suppleant og bliver enstemmigt valgt.
  - Alf Arén stiller op som 2. suppleant og bliver enstemmigt valgt.
  - Valget er foregået ved håndsoprækning da ingen ønskede skriftligt valgt.

Valg af revisor
Fortages ved første kommende bestyrelsesmøde. Forslag til revisorkandidat vendes og der er bud på hvem der skal spørges inden næste bestyrelsesmøde.

Eventuelt

- Hvornår skal det kommende bestyrelsesmøde finde sted? Det næste bestyrelsesmøde finder sted i uge 42, nærmere dato udsendes senere.
- Arbejdsopgaver til næste gang: Light Management Plan påbegyndes, lysmålinger genoptages, oprettelse af bankkonto + kontingentbetaling, Letters of support skabelon udarbejdes, artikel til Anholt Posten, oprettelse af hjemmeside, oplæg til samarbejdspartnere skal formuleres
- Der er mulighed for at søge Underværker fonden senest den XXX september, hvad skal der søges om? Udstyr til events der understøtter ansøgningsprocessen: stjerneguideuddannelse, indhentning af kultur- og vidensfolk, liggeunderlag, hængekøjer, kikkerter.

Tak for et godt møde og på gensyn i uge 42, 2019

Appendix C – Anholt, an island created by the Kattegat strait – history, legend and lore

The Celestial body of ancient Scandinavia.

The sun knew not where she had her hall,

the stars knew not where they had a stead,

the moon knew not what power he possessed.

This is how the famous Norse poem called "Vølupsa" (the song of the sorcerer) begins its creation myth, and this is how Scandinavians viewed the celestial body for thousands of years. In Norse myth, the gods arranged the celestial body in the beginning of time, and through generations, the stars became both a source of legend, memory and guidance for the Vikings of the north.

Many stars was said to originate from fallen gods or giants, while other stars was connected to the ancestors and the dead. Most famous is the tale of the mighty god of thunder and storm, called Thor, who boldly claims that:

I killed Tjazzi, the Powerful minded giant

I threw up the eyes of Ovaldis son into the

bright heavens.

They are the greatest sign of my deeds

Those which all men can see afterwards.[7]

Another legend implicating Thor is the tale of the star we call Venus. This star was named "Aurvandil-toe" in Scandinavia, referring to the tale of the god Thor rescuing the legendary hero Aurvandil from the giants. As Thor carried him across the frozen rivers of Elivàgar, one of Aurvandil's toes froze off in the cold waters, and so Thor threw it into the sky, creating this star, also called "The toe of Aurvandil".

The most important star to the Vikings by far, carries the modern Latin name Polaris, the North star, but the Vikings called it *Leidarstjarna* ("the guiding star"). This star became instrument for the entire Norse seafaring culture, because it shows the exact direction North. Therefore the star would often guide the dragon-boat fleets of the Vikings back home after their raids abroad, and it became the starting point for all Viking-age navigation.

[7] Andy Orcard. Dictionary of Norse myth and legend. Cassel. 1997.

The light Scandinavian summer nights did not allow the Vikings to rely solely on the stars for navigating on the open seas. But in wintertime, when the lands of the North were locked in snow and ice, and the Viking clans would honor their ancestors and gods, the "celestial body of Scandinavia" would be at the center of their tales and legends.

Scandinavian legends of the celestial body were born from the cultural meetings between people from the countries we now know as Sweden, Norway and Denmark – and the body of water that connected them all was the Kattegat strait. It was here that all these tales and legends of the stars and the celestial body were first exchanged and retold. And right here, in the middle of this cultural exchange center, we now find the unique island of Anholt.

The Vikings called the island *Anundr* ("the glory of the ancestors"), but several modern scholars suggest that the Vikings actually viewed the island as being the furious sea-goddess Ran, who was worshipped by all seafarers and crews of the dragon fleets. Old place names and legends suggest that Anholt is, indeed, connected to the myth of Ran, and therefore this small and beautiful island is a very important cultural sight for all Scandinavian people today.

Arriving to the shores of Kattegat, you can travel in the wake of the Vikings' dragon fleets to Anholt, the place where Norse seafarers and mighty Vikings worshipped the stars for countless generations.

Casper Clemmensen

Anholt, Denmark

The Year of Our Lord 2023

Appendix D – Regarding Anholt, Outdoor Lighting Inventory, specific examples of outdoor lighting, public and private

The following examples, shot in January 2024, illustrate lighting used across the island.

Public lighting

Light sources in public areas, such as Anholt Village and Anholt Harbor.

The village

In 2024, the public road lighting in Anholt Village consists of 51 light sources: LAMPAS Dark Sky certified fixtures (type ANTO L1014). All street lights were upgraded to this model in 2022, with the 3000 Kelvin option.

DSA played a significant role in the fixture upgrade project, also helping to secure partial funding of the project, corresponding to 36,500 US dollars, through the European Union's LAG funding pools (see Section 4.2).

Technical specifications, cf. Lampas datasheet [cf. https://lampas.com/products/anto-l1014-post-light/]

ANTO L1014 - POST LIGHT WITH CYLINDRICAL MAST

DESIGN: VE2

LIGHT DISTRIBUTION
Direct, symmetrical or asymmetrical light distribution. Possibility of projectadapted light distribution via a wide selection of light distribution lenses and reflectors.

MATERIALS
Lamp housing: Untreated corten steel, hot-dip galvanised steel or powder-coated, hot-dip galvanised steel
Shade: Impactresistant polycarbonate clear or opal white
Post: Untreated corten steel, hot-dip galvanised steel or powder-coated, hot-dip galvanised steel

DIMENSIONS

Height:	3150 / 3650 / 4150 mm
Post:	Ø 88,9 mm
Lamp housing:	Ø206 mm. Depth 365 mm
Weight:	41 / 46 / 51 kg

LUMINOUS FLUX

Luminous efficacy:	>134 Lm/W
Lumen, 70 Ra:	3000K: 1206-3216LM, 4000K: 1264-3372LM

LIGHT SOURCE

LED type:	Philips Fortimo FastFlex G4+
Operational life:	>120.000 hours v/Ta 25° C. L80B10
Total consumption:	Standard 15W (9-24W)
Colour temperature:	3000K, 4000K
Colour rendering:	CRI>70
Colour accuracy:	3 steps SDCM

DRIVER

Driver type:	Philips Xitanium
Operational life:	>100.000 hours
Surge protection:	>10 kV
Control:	Compatible with Dynadimmer, 1-10V by default. Compatible with DALI, Zhaga book 18 as optional extra.

INSTALLATION
For casting or flange mounting

CONNECTION
3 cables max 5 x 10 mm². Connection box and fuse are included

CLASSIFICATION
IP66, IK10, Insulation safety class II

CERTIFICATION
ANTO L1014 is Dark Sky Approved by DarkSky International. 3000k or lower must be selected to meet DarkSky International certification criteria.

Lampas

Lampas.com

The village has a few public buildings with outdoor light sources. Most either have automatic on–off switching (motion sensors) or are mainly used during daytime working hours. For the streetlamps, the lumen level is turned down at night to 40% of the initial level (see excerpts from the "lighting plan" from the Municipality of Norddjurs, Appendix G). This means that for most of the night, the streetlights serve as "guiding lights" rather than "street illumination".

The light sources on the fire station – the brightest in the village – are only activated when an alarm sounds. The only public building lit at night is the island's combined electricity and power plant.

The harbor area

Anholt Harbor has its own road illumination system, consisting of 23 lampposts, light sources at the harbor entrance/exit, and supplementary light on solid and floating jetties. Harbor illumination is extremely important, due to this area's risks (drowning and capsizing accidents), and this lighting is primarily a crucial and mandatory safety measure.

The few public buildings in the harbor area are well-lit for various reasons:

*The **ferry office** and the **ferry landing** for Grenaa–Anholt Færgefart*
The two areas around the ferry office and the ferry landing are illuminated when the ferry is in operation (daily in the summer; four times weekly in the winter), or when fork lifts are loading/unloading goods. The vast majority of such activities take place in daylight; very rarely during dark hours. Outside normal working hours the area is only lit by the general harbor lighting (as described above).

*The SAR (search and rescue) **Marine Rescue Station** under the Danish Navy (Søværnet)*
When an alarm sounds – which in many cases is at night – powerful lights are turned on around the SAR station.

When the SAR unit is not actively engaged, the station's outdoor lighting is turned off.

Private lighting

A virtually complete register of the island's private lighting has been set up by DSA. Several times we have encouraged **private property owners** to register their own light sources, using notices in the local newsletter, on bulletin boards, and also by means of a personal "digital letter" sent with the administrative help of the Municipality of Norddjurs to each owner's "digital e-mailbox" (a service all Danes are obliged to sign up for).

The **campground** is privately owned and has the vast bulk of its tourists in the bright days and nights of summer. Lighting here is very limited in winter, but even so we have an ongoing dialogue with the campground, and will continue to educate and reach out to campers during the summer season.

DSA's bulletin board postings have been physical, in the form of posters in local shops (with paper forms for manual registration, returned to DSA) and also in the form of social media posts with a QR code for online registration. The form is included (in Danish, with English translation) as Appendix E: *Dark Sky Anholt – LMP – Armaturregistrering (Dark Sky Anholt – LMP – Registration of light fixtures).*

Example 1: Unshielded light source, yellow light.

Example 2: Shielded light source, placed under a house awning, which acts as a passive shielding.

See note below.

Example3: Light source with no shielding, placed under a house awning, which acts as passive shielding.

Note to examples 2 and 3:

This type of light source is very commonly seen around Anholt, meaning that the actual number of pollutive light sources is assumed to be smaller than the number of such sources in the registered data, based on self-reporting (i.e. based on the data entered by home owners themselves).

Appendix E – Anholt, home owner self-reporting form for outdoor lighting

[Danish original, with English translation on next pages]

Dark Sky Anholt – LMP – Armaturregistrering

Tak for hjælpen med at registrere de udvendige lyskilder på Anholt.

Denne formular bidrager til at vi kan få data over alle udvendige lamper på Anholt, idet det skal bruges til ansøgningen om Dark Sky Certifikat.

Vi registrerer ingen navne kun adresser og vi behandler kun udendørs belysning.

DETTE SKEMA SKAL UDFYLDES EN GANG FOR HVER TYPE AF UDVENDIG LAMPE DU HAR.

Desuden skal vi også bruge et billede af hver type lampe.

Start:

A: Tag et billede af hver type af udvendig lampe.

B: Send det til pr. email:

Emne: [Skriv din adresse]
Til: [redacted]@gmail.com.

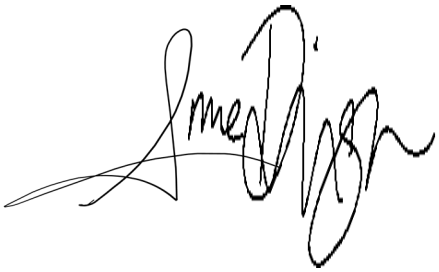
C: Udfyld skemaet bagpå.

D: Hvis du har flere typer af udvendige lamper, skal du udfylde endnu et skema. (Et skema, pr. lampetype)

E: Aflever dette skema i den lille sorte postkasse foran biblioteket. *(Med label: Anholt El & Teknik)*

Mange tak for hjælpen.

Dette skema kan også udfyldes elektronisk. Scan QR kode (Brug QR kode app, eller brug kamera app på smartphone for at åbne)



1	Vejnavn hus/sommerhus på Anholt?

2	Husnummer?

3	Har du udendørs belysning på dit hus eller din grund?	(Kryds af)
	Ja (Forsæt formular)	
	Nej (Afslut formular)	

4	Hvor mange af denne type lampe har du?

5	Hvilken farve har lyskilden i lampen?	(Kryds af)
	Varm / Rødlig	
	Gullig	
	Kold / Blålig	

6	Hvordan er lampen afskærmet ift. lys der kastes opad? (Over 90 grader)	(Kryds af)

[English translation of the preceding Danish original]

Dark Sky Anholt – LMP – Registration of light fixtures

Thank you for your help in registering the external light sources on Anholt.

This form will help us to collect data about all external lamps on the island of Anholt, as we need this data four our application for a Dark Sky certificate.

We are not recording any names, only addresses, and we are only dealing with outdoor lighting.

PLEASE FILL IN THIS FORM ONCE FOR EACH TYPE OF EXTERNAL LAMP YOU HAVE.

In addition, we also need a photo of each type of lamp.

Start:

A: Take a photo of each type of external lamp.

B: Send it, via e-mail, to:

Subject: [write your street address]
To: [redacted]@gmail.com.

C: Fill in the form on the reverse side.

D: If you have more than one type of external lamps, please fill in another form for each type. (One form per type of lamp.)

E: Drop off this form in the little black mailbox in front of the library. *(With label: Anholt El & Teknik)*.

We sincerely thank you for your help.

You can also fill in this form electronically. Scan the QR code (use a QR code app, or use the camera app on your smartphone to open).

1	Street/road name for location of house/holiday house on Anholt?

2	House number?

3	Do you have external lighting on your house or your property?	(Tick box)
	Yes (Continue in form)	
	No (Conclude form)	

4	How many lamps of this type do you have?

5	Which color light does the light source in your lamp emit?	(Tick box))
	Warm / Reddish	
	Yellowish	
	Cold / Bluish	

6	How is the lamp shielded, regarding light that radiates upwards? (Above 90 degrees)	(Tick box)

Appendix F – Example of light measurement data from the new measuring station – Anholt 2

[Excerpt of data readout from measuring station Anholt 2; from beginning of readout; intervals of 1 minute.]

```
# Light Pollution Monitoring Data Format 1.0
# URL: http://www.darksky.org/measurements
# Number of header lines: 38
# This data is released under the following license: ODbL 1.0
http://opendatacommons.org/licenses/odbl/summary/
# Device type: SQM-LU-DL-R1
# Instrument ID: SQM-LU-DL-R1
# Data supplier: DSA
# Location name: Ostebakken
# Position (lat, lon, elev(m)): 56,250000, 11,250000, 0
# Local timezone: CET
# Time Synchronization:
# Moving / Stationary position: STATIONARY
# Moving / Fixed look direction: FIXED
# Number of channels: 1
# Filters per channel:
# Measurement direction per channel:
# Field of view (degrees):
# Number of fields per line: 5
# SQM serial number: 5076
# SQM hardware identity: AB0JOGER
# SQM firmware version: 4-6-76
# SQM cover offset value:
# SQM readout test ix: i,00000004,00000006,00000076,00005076
# SQM readout test rx: r,
14.48m,0000000156Hz,0000000000c,0000000.000s, 008.0C
# SQM readout test cx: c,00000019.96m,0000118.598s,
020.3C,00000008.71m, 020.9C
# DL time difference (seconds): 37
# DL retrieved at (UTC): 2024-02-01T20:29:38.478
# Comment: 18:17
# Comment:
# Comment:
# Comment:
# Comment:
# UDM version: 1.0.0.252
# UDM setting: DL Retrieve All
# blank line
# UTC Date & Time, Local Date & Time, Temperature, Voltage, MSAS,
Record type
# YYYY-MM-DDTHH:mm:ss.fff;YYYY-MM-
DDTHH:mm:ss.fff;Celsius;Volts;mag/arcsec^2;Init/Subs
# END OF HEADER
2024-01-02T19:21:13.000;2024-01-02T20:21:13.000;3.8;4.74;21.41;0
2024-01-02T19:22:13.000;2024-01-02T20:22:13.000;3.5;4.73;22.11;1
2024-01-02T19:23:13.000;2024-01-02T20:23:13.000;3.5;4.73;22.07;1
2024-01-02T19:24:13.000;2024-01-02T20:24:13.000;3.2;4.73;22.02;1
2024-01-02T19:25:14.000;2024-01-02T20:25:14.000;2.9;4.73;22.11;1
2024-01-02T19:26:15.000;2024-01-02T20:26:15.000;2.9;4.73;22.16;1
2024-01-02T19:27:15.000;2024-01-02T20:27:15.000;2.5;4.74;22.19;1
```

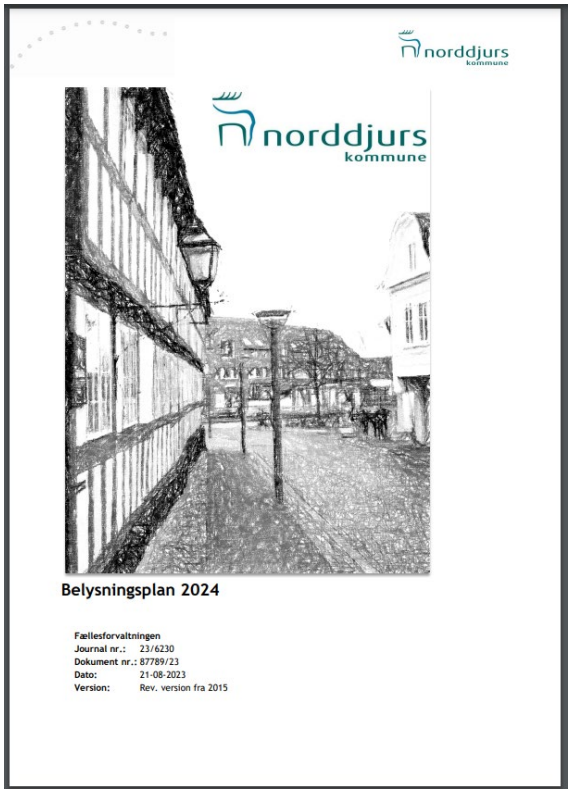
2024-01-02T19:28:16.000;2024-01-02T20:28:16.000;2.2;4.74;22.26;1
2024-01-02T19:29:15.000;2024-01-02T20:29:15.000;2.2;4.73;22.22;1
2024-01-02T19:30:13.000;2024-01-02T20:30:13.000;1.9;4.73;22.11;1
2024-01-02T19:31:12.000;2024-01-02T20:31:12.000;1.9;4.73;22.03;1
2024-01-02T19:32:14.000;2024-01-02T20:32:14.000;1.6;4.73;22.21;1
2024-01-02T19:33:16.000;2024-01-02T20:33:16.000;1.6;4.73;22.24;1
2024-01-02T19:34:12.000;2024-01-02T20:34:12.000;1.2;4.73;22.04;1
2024-01-02T19:35:12.000;2024-01-02T20:35:12.000;0.9;4.73;22.13;1
2024-01-02T19:36:13.000;2024-01-02T20:36:13.000;0.9;4.73;22.18;1
2024-01-02T19:37:14.000;2024-01-02T20:37:14.000;0.6;4.73;22.22;1
2024-01-02T19:38:15.000;2024-01-02T20:38:15.000;0.6;4.73;22.24;1
2024-01-02T19:39:13.000;2024-01-02T20:39:13.000;0.3;4.73;22.11;1
2024-01-02T19:40:13.000;2024-01-02T20:40:13.000;0.3;4.73;22.17;1
2024-01-02T19:41:13.000;2024-01-02T20:41:13.000;0.3;4.73;22.23;1
2024-01-02T19:42:12.000;2024-01-02T20:42:12.000;0.1;4.73;22.10;1
2024-01-02T19:43:13.000;2024-01-02T20:43:13.000;0.1;4.73;22.13;1
2024-01-02T19:44:11.000;2024-01-02T20:44:11.000;0.1;4.73;22.01;1
2024-01-02T19:45:12.000;2024-01-02T20:45:12.000;-0.4;4.73;22.16;1
2024-01-02T19:46:13.000;2024-01-02T20:46:13.000;-0.4;4.73;22.23;1
2024-01-02T19:47:12.000;2024-01-02T20:47:12.000;-0.4;4.73;22.09;1
2024-01-02T19:48:13.000;2024-01-02T20:48:13.000;-0.4;4.73;22.21;1
2024-01-02T19:49:16.000;2024-01-02T20:49:16.000;-0.7;4.73;22.37;1
2024-01-02T19:50:17.000;2024-01-02T20:50:17.000;-0.7;4.73;22.39;1
2024-01-02T19:51:17.000;2024-01-02T20:51:17.000;-0.7;4.73;22.38;1
2024-01-02T19:52:17.000;2024-01-02T20:52:17.000;-0.7;4.73;22.33;1
2024-01-02T19:53:17.000;2024-01-02T20:53:17.000;-0.7;4.73;22.38;1
2024-01-02T19:54:14.000;2024-01-02T20:54:14.000;-1.0;4.73;22.21;1
2024-01-02T19:55:17.000;2024-01-02T20:55:17.000;-1.0;4.73;22.44;1
2024-01-02T19:56:16.000;2024-01-02T20:56:16.000;-1.0;4.73;22.37;1
2024-01-02T19:57:18.000;2024-01-02T20:57:18.000;-1.0;4.73;22.33;1
2024-01-02T19:58:17.000;2024-01-02T20:58:17.000;-1.0;4.73;22.36;1
2024-01-02T19:59:16.000;2024-01-02T20:59:16.000;-1.0;4.73;22.33;1
2024-01-02T20:00:16.000;2024-01-02T21:00:16.000;-1.0;4.73;22.35;1
2024-01-02T20:01:16.000;2024-01-02T21:01:16.000;-1.3;4.73;22.38;1
2024-01-02T20:02:15.000;2024-01-02T21:02:15.000;-1.3;4.73;22.29;1
2024-01-02T20:03:15.000;2024-01-02T21:03:15.000;-1.3;4.73;22.31;1
2024-01-02T20:04:16.000;2024-01-02T21:04:16.000;-1.3;4.72;22.37;1
2024-01-02T20:05:16.000;2024-01-02T21:05:16.000;-1.3;4.72;22.32;1
2024-01-02T20:06:15.000;2024-01-02T21:06:15.000;-1.3;4.72;22.30;1
2024-01-02T20:07:16.000;2024-01-02T21:07:16.000;-1.3;4.72;22.34;1
2024-01-02T20:08:17.000;2024-01-02T21:08:17.000;-1.3;4.72;22.42;1
2024-01-02T20:09:17.000;2024-01-02T21:09:17.000;-1.3;4.72;22.35;1
2024-01-02T20:10:14.000;2024-01-02T21:10:14.000;-1.3;4.72;22.26;1
2024-01-02T20:11:14.000;2024-01-02T21:11:14.000;-1.7;4.72;22.23;1
2024-01-02T20:12:14.000;2024-01-02T21:12:14.000;-1.7;4.72;22.26;1
2024-01-02T20:13:16.000;2024-01-02T21:13:16.000;-1.7;4.72;22.35;1
2024-01-02T20:14:16.000;2024-01-02T21:14:16.000;-1.7;4.72;22.33;1
2024-01-02T20:15:14.000;2024-01-02T21:15:14.000;-1.7;4.72;22.22;1
2024-01-02T20:16:13.000;2024-01-02T21:16:13.000;-1.7;4.72;22.27;1
2024-01-02T20:17:13.000;2024-01-02T21:17:13.000;-1.7;4.72;22.23;1
2024-01-02T20:18:14.000;2024-01-02T21:18:14.000;-1.7;4.72;22.28;1
2024-01-02T20:19:13.000;2024-01-02T21:19:13.000;-1.7;4.72;22.19;1
2024-01-02T20:20:13.000;2024-01-02T21:20:13.000;-1.7;4.72;22.23;1

[end of excerpt, data readout from measuring station Anholt 2]

Appendix G – Light management strategy document for the Municipality of Norddjurs – excerpts in English translation

[Exists in Danish only; available for PDF download at: https://norddjurs.dk/Media/638411629090118216/_87789-23_v1_Belysningsplan%202024.pdf]

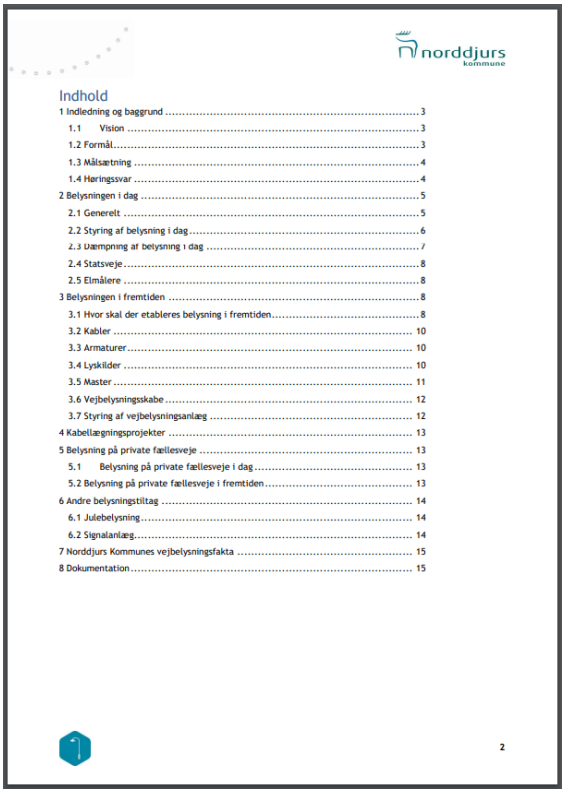
Lighting Plan 2024 – Cameo overview of cover and *Contents* pages.


norddjurs kommune

norddjurs kommune

Belysningsplan 2024

Fællesforvaltningen
Journal nr.: 23/6230
Dokument nr.: 87789/23
Dato: 21-08-2023
Version: Rev. version fra 2015


norddjurs kommune

Indhold

2

Selected excerpts, in English translation, of passages relevant to Anholt and darkness. Our special emphasis in blue text.

1 Introduction and background

The document Lighting Plan 2024 is an update of Lighting Plan 2015. [... ...]

1.1 Vision

Municipal street lighting is meant to be stable, functional, flexible, and of good quality, and be cohesive, well-functioning and responsible in terms of energy and the environment.

The street lighting must support a traffic-safe road and path network and must improve safety and security for all traffic actors and citizens. Also, old and worn-down installations must be upgraded to optimize energy consumption and operational reliability.

The aim is that over the coming years, all light fixtures will be replaced with LED light sources to achieve significant energy savings; to decrease light levels at night in all installations and all towns; and to achieve better citizen satisfaction in all areas of the Municipality of Norddjurs.

1.2 Purpose [of Lighting Plan]

The purpose of the Lighting Plan is to set out future guidelines for the lighting of public roads and paths, and of private communal roads and paths in the Municipality of Norddjurs.

These guidelines apply to the scope of lighting as well as the choice of fixtures, light sources, and lampposts for the various types of roads and paths.

[... ...]

In the longer term, the lighting is meant to change from being a static element in the street environment to becoming an active element which – through the use of control, sensors, different light sources and fixtures – emphasizes certain elements in the street environment and gives the municipality's citizens a positive experience, while also helping to reduce energy consumption. The Lighting Plan therefore provides opportunities to test new technologies, including control systems, intelligent lighting, sensors, and new light sources, within the boundaries of defined areas in the municipality. The municipal administration will apply tested intelligent technologies that have been found to be practical/functional without increasing operating costs.

2 Lighting today

2.1 In general

[... ...]
Under the current lights-on time, there are no towns where street lighting is turned off completely. Where installations in the town of Grenaa enable this, every second fixture is turned off during the period 11 p.m.– 6 a.m. All towns with LED fixtures have 50% light reduction during the darkest 8 hours. Newer LED fixtures have light reduction in the evening/night in several steps (40%–60%–40% reduction), according to current recommendations from the Danish Road Directorate and lighting consultants.

LED light sources can be ordered at various Kelvin degrees (K), as shown on the illustration below. All lights replaced in 2015–2022 are at 4000 K. From 2022, those installed on paths and small residential streets are 3000 K. Larger roads will still have 4000 K. [... ... *colour photo in document*]

2.3 Light reduction today

All new LED light fixtures are prepared for automatic light reduction. LED fixtures installed up to 2023 reduce light by 50% during the period 10 p.m.– 6 a.m. In connection with the upcoming renovations from 2023 onwards, a decision has been made to extend the light-reduction period, for light-reduction in several steps.

The light-reduction period has been extended, beginning at 8 p.m., when the first step reduces the light to 60%. The period 10 p.m.– 5 a.m. has a further reduction, to 40% light. At 5 a.m. the light level is increased to 60%, before increasing to 100% light from 6 a.m.

This new light-reduction profile can save further energy, especially in limited-traffic night hours. Introducing these further reductions will take traffic safety and citizen security into consideration.

Light reduction in special areas

The municipal administration has chosen to keep the new installation on the island of Anholt lit all night, seven days a week, with light reduction during the period 10 p.m.– 6 a.m. There is considerable distance between the lampposts, and the installation does not cover entire stretches of road with light, but merely acts as guiding-star lighting/a "guiding line" that leads citizens along their way.

The installation has been renovated with Local Action Group (LAG) funding, as the lampposts, the light control system, and the fixtures all had to be replaced. The installation elements have a special surface that makes them more robust to the saltwater fog and mist on Anholt.

3 Lighting in the future

[... ... Control of road lighting installations]

3.6.1 Remote control

The Municipality of Norddjurs has established remote control of its road lighting installations using the PROFORT control system. Remote control is enabled through "master switch consoles". These master switch consoles control a number of smaller consoles.

The system is accessible online, and therefore operating times can be changed without assistance from the operational contractor. It is the aim of the Municipality of Norddjurs to equip all road lighting consoles with this solution.

Advantages of remote control:

- Faster fault correction, and lighting of smaller areas when correcting faults.
- Focus on switch-on and switch-off times – leading to lower energy consumption.
- Uniform switch-on and switch-off for all areas in the municipality.
- Control of switch-on/-off times, thereby optimizing operations.
- Possibility to take change switch-on/-off by simple programming.
- Central communication, rather than an installer's visit to each individual switch console.

For current lighting and light-reduction profiles, see the Municipality of Norddjurs website.

3.6.2 Light reduction

With the installation of new LED fixtures, it is now possible to light-reduce individual fixtures. In general, light reduction is being introduced wherever this is possible and permitted.

[... ...]

5 Lighting of private communal roads

5.1 Lighting of private communal roads today

The Municipality of Norddjurs pays for the operation and maintenance, and renovation of street lighting on private communal roads – given that generally is is a matter of public interest and promotes the public good that road areas are illuminated (cf. the Danish law on private communal roads, Section 7, subsection 5.). The future operation and maintenance of private communal roads must take place with due reference to public interests, such as traffic safety, crime prevention, or regard for mobility and movement in the public space.

... ...

8 Documentation

All road-lighting installations are registered on the municipality's operational maps.

These are available to the public at https://webkort.norddjurs.dk/ .

// [End of translated excerpts]