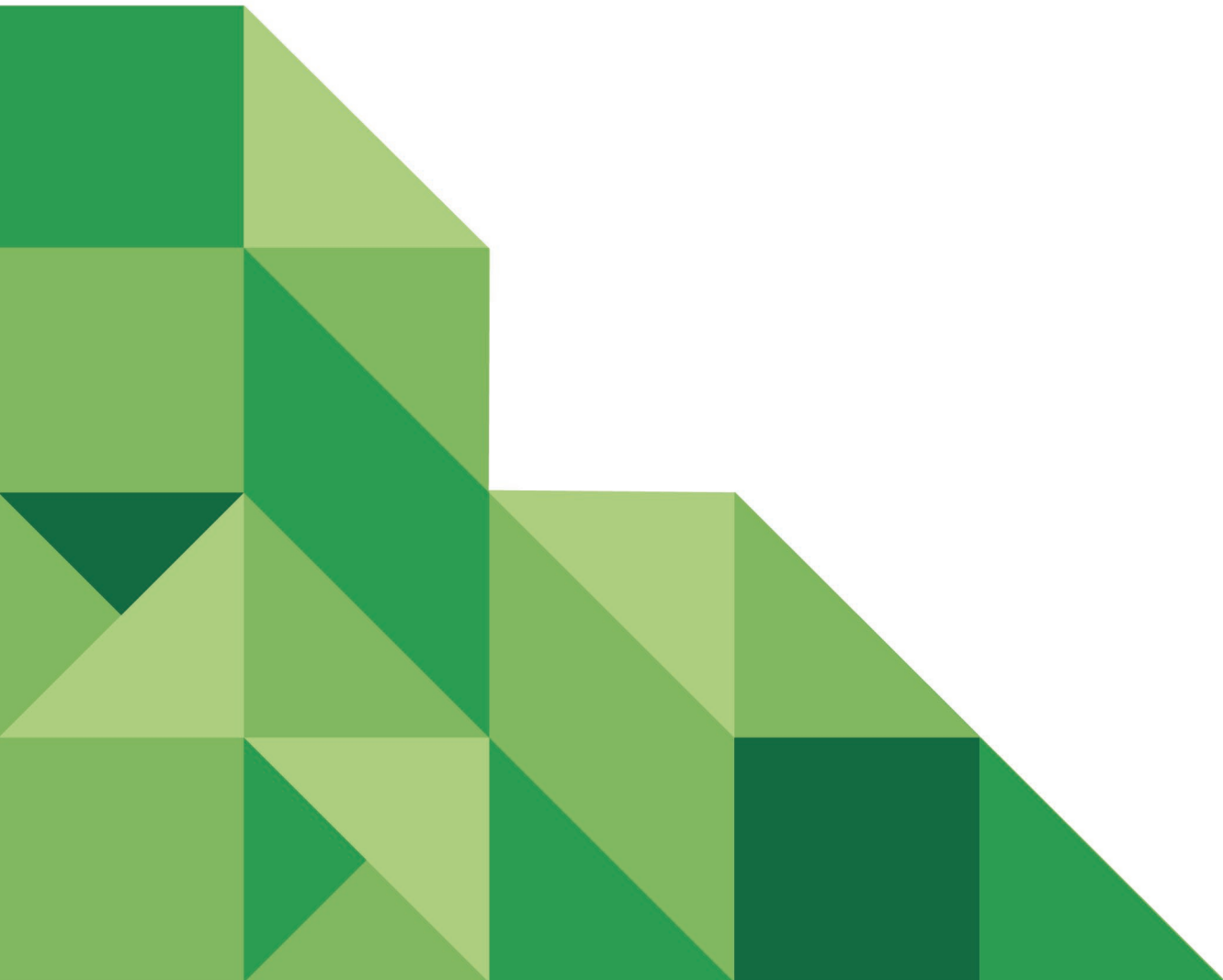


Martina Uí Dholáin & Daisy Silvennoinen

Review Paper of Current Status and Strategies with regards to Dark Sky Tourism in the Northern Periphery and Arctic Regions



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Northern Periphery and Arctic

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1 Introduction

Dark skies are an attraction that has been utilized too little in the past in Northern Periphery and Arctic (NPA) region. Areas with little or no light pollution have huge potential to enhance the tourism experience. Nightscape phenomenon and stories (incl. use of immersive technologies) can enhance tourism experiences and add value to tourism offers. At the same time, implementation of Artificial Light At Night (ALAN) projects without consideration of importance of dark nature and night sky can negatively impact tourism and societies. Poorly designed and directed outdoor artificial lights can negatively affect visitor satisfaction, especially in tourist destinations and accommodations by hindering night sky quality and ability to enjoy the nightscapes. ALAN can also impact visitor wellness, biodiversity, and human health.

This NPA GLOW2.0 Northern Periphery and Arctic project survey aimed at identifying the preservation efforts and initiatives for Dark Sky areas and light pollution in participating NPA regions. For the study, we have examined the existing strategies to Dark Sky Tourism in Ireland, Finland, Northwest Iceland, and Norway within the context of the NPA region. With a focus on regional development and policy implementation, the study investigates the unique approaches and initiatives adopted by these countries, shedding light on the workings of their respective regional landscapes. To collect the necessary information, we conducted a survey among our partners. Data collection in each region consisted of a mix of desk research and interviews/ discussions.

Country	Mode of data collection	
	Desk Research	Interviews/ discussions
Iceland	x	x
Norway	x	x
Finland	x	x
Ireland	x	x

In examining the multi-layered strategies in these distinct regions, we provide valuable insights into the active challenges and opportunities facing the NPA region. Each region has been evaluated based on the findings, and recommendations suggested accordingly. Note that direct links to pages, documents and general websites pages are also placed within the text.

2 Northwest Iceland



Photo: Pixabay

Survey results from Northwest Iceland show that there is currently an overall lack in active measures and awareness programs concerning Dark Sky preservation within the region.

2.1 Dark Sky designation

The Northwest Iceland region is not officially designated as a Dark Sky area, indicating a potential lack of formal recognition and effort in preserving the natural night sky.

2.2 Dark Sky strategies and initiatives

There is lack of Dark Sky strategies, initiatives, and community driven efforts in the Northwest Iceland region. This highlights a significant gap in active conservation practices. This lack could also be due to insufficient awareness, funding, or perceived importance of the issue among local authorities and residents.

2.3 Regional infrastructure for Dark Sky Tourism

The lack of Dark Sky strategies and initiatives does reflect on the lack of regional infrastructure supporting Dark Sky tourism. There is however an emerging interest in Dark Sky Tourism, since, despite the absence of designated stargazing facilities or observatories, there is an acknowledgment of potential sites.

Thematic Events & Accommodation

The interest in identifying areas suitable for Dark Sky observation suggests a growing recognition of its value for the community, especially in tourism. The Northern Lights events and the potential of local accommodations to cater to Dark Sky tourists suggests that the region possesses a valuable, yet untouched tourism potential. It represents an existing framework upon which further Dark Sky tourism infrastructure could be developed.

2.4 Networking and Collaboration

A focus group has been formed in the aftermath of the survey which marks progress in involving the community.

2.5 Future plans

The Northwest Iceland region is in the early stages of community organisation and future plans. The suggested formation of a focus group in the aftermath of the survey marks progress in involving the community. Such joint activities are crucial for combining resources, exchanging knowledge, and securing the collective backing needed for successful projects. The reference to upcoming plans, though still in early stages, implies a recognition of the problem and an openness to starting corrective measures.

2.6 Recommendations for Iceland

- **Enhanced Community Engagement and Education:** Implementing educational programs and public awareness campaigns can significantly influence public perception and behaviour. Engaging local schools, community centres, and tourism boards in educational initiatives could foster a community that values and actively participates in preserving its natural assets.

- **Collaboration with Expert Bodies:** Partnerships with organisations like the International Dark-Sky Association (IDA) could provide the necessary guidance, resources, and support for the initiatives. These collaborations could aid official Dark Sky designations and implementing best practices for light pollution control.
- **Strategic Tourism Integration:** Develop comprehensive tourism packages centred around the region's Dark Sky assets, like the Northern Lights. This strategy not only promotes sustainable tourism but also highlights the economic benefit of preserving these natural occurrences.
- **Infrastructure and Policy Development:** The establishment of local policies on light pollution control can create a formal framework for preservation efforts. Also, investing in the necessary infrastructure, like official Dark Sky Parks or observatories, can significantly enhance regional appeal and the success of conservation initiatives.

In conclusion, while the survey indicates an emerging awareness and interest in Dark Sky initiatives within Northwest Iceland, it also reveals a significant gap in active measures and existing infrastructure.

The region stands at a key juncture where initial interest, possibly sparked by external influences, can transition into concrete action plans through strategic community engagement, collaboration, and policy advocacy.

Now that Northwest Iceland are integrated in this GLOW2.0 project, the direct involvement in this initiative highlights how other regions are emerging and evolving. By leveraging this, they can acquire knowledge and begin incorporating this niche into own tourism market structure.

3 Norway – Narvik



Photo: Pixabay

Narvik's survey results show that there is a significant gap in region's engagement with Dark Sky initiatives, preservation efforts, and associated tourism opportunities. There is an overall lack in active measures and awareness programs concerning Dark Sky preservation within the region. Below is a detailed analysis and critique of the responses provided in the survey.

3.1 Dark Sky designation

The Narvik region is not officially recognized as a Dark Sky area, which suggests a missed opportunity given the potential for astronomical tourism, especially in areas with naturally clear, unpolluted skies. Achieving such a designation also requires efforts towards light pollution control, community education, and local government engagement, which appear to be lacking.

3.2 Dark Sky strategies and initiatives

There are no known ongoing or past initiatives for Dark Sky preservation or light pollution reduction in Narvik region.

Local regulations and policies

There are no local regulations or policies supporting Dark Sky protection or tourism in Narvik. However, [one manual developed in 2012 for correct lighting](#) has been issued in the country (EU 2022).

Community-Driven Initiatives

This question was asked to local clusters who did not have any knowledge of community-driven initiatives. However, there is [one publication from The Arctic University of Norway \(UiT\)](#) focused on Northern lights tourism which deems to be related to Dark Sky tourism (Heimtun & Haug 2022).

Educational programs and projects

In the Narvik region, there are no specific courses on Dark Sky themes, except for one activity identified that can be deemed with educational effect to the public, i.e., the [International Dark Sky Places program advocacy](#). This is documented at the Dark Sky International website (Reagan 2023).

There are events that address the Dark Sky themes. UiT has a partnership with the Western Norway University of Applied Sciences in Norway, and they participated in the event "[The Global Science Opera](#)". The event invited the school community from the neighbouring cities to compose an opera addressing a theme related to science. During the event, one act was produced with light pollution as its theme. A song was composed, and a theatre performance made with the music as the background. Art and Science workshops were other activities (Dark Sky 2022).

There is a National Norwegian Research Council funded project "[DEEP IMPACT](#)" which is focusing on artificial light's effect on maritime organisms (Deep Impact 2023).

3.3 Regional infrastructure for Dark Sky Tourism

There are prominent facilities that act as regional infrastructure for Dark Sky Tourism in Narvik:

- **Solobservatoriet at Harestua** is located in the dense forest of Harestua, approximately 45 kilometers north of Oslo within the municipality of Lunner. This facility, designed by Snøhetta, houses a planetarium and a visitor center. It is Norway's largest astronomical facility and serves as the largest solar observatory North of the Alps. Situated at an elevation of 580 meters above sea level, this expanded center provides visitors with access to cutting-edge equipment and research opportunities, making it one of Northern Europe's premier astronomical research stations (Snøhetta 2023).
- **Northern Norwegian Science Center** is another key facility in the region. While further details about this center are not provided, it contributes to the region's stargazing and scientific exploration initiatives (Visit Tromsø 2023).
- **Vitensenteret Trondheim** has a planetarium which plays a significant role in promoting science and astronomy (Vitensenteret i Trondheim 2023).

These facilities collectively enhance the region's capacity for astronomical research, stargazing, and science education, making it an attractive destination for enthusiasts and learners interested in exploring the wonders of the night sky.

Thematic Events & Accommodation

Narvik lacks accommodations in the region specifically designed for Dark Sky enthusiasts. Tourists interested in astronomical phenomena like the Northern Lights tend to travel to nearby regions like Abisko, Sweden, just across the border from Narvik, or they take the gondola to the Narvikfjellet to see it, or by bus with local providers a bit outside the city center of Narvik.

3.4 Networking & Collaboration

There are no networking or collaboration efforts in Narvik for Dark Sky tourism.

3.5 Future plans

There are no current plans or projects leveraging Dark Sky themes for tourism development. This indicates a potential area for strategic planning and development.

There are no current or future plans in the region to reduce light pollution, a critical aspect for environmental and Dark Sky preservation efforts.

There are no current or future plans to designate specific areas for Dark Sky protection. This is another significant gap, as designated areas can help in both preservation and tourism.

3.6 Recommendations for Norway

- **Develop Dark Sky Thematic Events:** the region has prominent facilities that act as regional infrastructure for Dark Sky Tourism. Initiating astronomy-related events and activities could enhance awareness of importance of the Dark Sky and protection of the night sky, engage the community, and attract tourists.
- **Create Dark Sky-Focused Accommodations:** Developing accommodations catering specifically to Dark Sky enthusiasts could fill a market gap and boost tourism.
- **Establish Collaborative Networks:** Form partnerships between infrastructure providers, tourism boards and local businesses to expand service offers, and with education institutions and environmental groups to promote Dark Sky initiatives. UiT has an AI and Robotics Lab at Campus Narvik that can be utilized for the promotion of Tourism.
- **Strategic Planning for Dark Sky Tourism:** Develop comprehensive plans to leverage the region's potential for Dark Sky tourism, utilizing existing natural attractions like the Northern Lights.
- **Policy Development for Light Pollution Reduction:** Advocate for the formulation of policies aimed at reducing light pollution for example for renovation and future lighting projects.
- **Designate Dark Sky Areas:** Work towards designating specific areas for Dark Sky protection to facilitate both environmental preservation, light pollution education and advocacy, and tourism.

Overall, while Norway has some foundational elements and natural advantages for Dark Sky initiatives, there is a substantial need for structured planning, policy development, and community engagement to fully realize the potential in this area.

4 Finland



Photo: Sami Niemeläinen

The survey results reflect a significant development in Finland engagement with Dark Sky initiatives, preservation efforts, and associated tourism opportunities. Below is a detailed analysis of the responses provided in the survey.

4.1 Dark Sky designation

Currently, Finland does not have any officially designated Dark Sky areas. Nonetheless, certain organisations and businesses from the Lapland and North Karelia regions of the NPA have expressed Dark Sky designation interest in this concept. In Lapland, a [master thesis describes this need](#) (Lapin AMK 2022), and in North Karelia, an entrepreneur of Syrjävaara Goodnight Oy has stated interest in applying for the status via the NPA GLOW2.0 project partner Karelia University of Applied Sciences (GLOW 2023).

4.2 Dark Sky strategies and initiatives

Local regulations and policies

GLOW2.0 project partners from Karelia contacted Visit Finland to inquire if actions such as preserving Dark Sky or using Dark Sky as added value to tourism offers are considered in their strategy or programmes.

According to Visit Finland, similarly to many public tourism operators, their activities are largely guided by Finland's tourism strategy, and there seem to be no mention of light pollution, nor the development possibilities for tourism that can be brought by use of nightscapes or darkness of nature and related phenomenon. However, the natural phenomenon, which for them is largely based on natural light phenomena, aurora borealis, are identified in their strategy as an attraction factor. [Finland Tourism Strategy 2022-2028 & Actions Plan 2022-2023](#):

- Emphasises Finnish nature and cultural experiences as primary drivers of its tourism sector and highlights the significance of nature, culture, food, and event tourism as focal points in regional action plans and broader tourism strategies;
- Highlights various challenges within the industry, including the necessity to encourage longer tourist stays, foster repeat visits, and promote all-year-round tourism, while acknowledging a shortfall in diversified and innovative offerings that could enhance the attractiveness of Finland as a tourism destination and extend tourists' duration of stay;
- Commits to a tourism vision of making economically, environmentally, socially, and culturally responsible decisions that foster sustainable growth by guiding industry practices to minimise adverse effects and ensure that companies offering sustainable tourism products gain preferential access to distribution and sales channels, especially for nature-based tourism offerings;
- Aims at smart destination development actions by sponsors for the development of "smart destinations" and all-year-round offerings that influence regional thematic strengths.

The strategic points brought up in the strategy (Ministry of Economic Affairs and Employment 2022) illustrate Finland's forward-thinking approach to tourism, combining sustainability, cultural richness, and technological integration.

However, they also highlight areas needing more attention and development, particularly regarding emerging opportunities like Dark Sky tourism and more comprehensive policies on light pollution and its impacts. There is a recognised lack of nationwide data on light pollution's effects, which hampers policy development. Currently in Finland, designers do not have the responsibility to create lighting that is aesthetic, functional and fitting in the area that it's installed (Lindroos 2008). Technically, an electrical engineer knows the technical side, and the architect understands the aesthetic side but a way of bridging these two for better lighting solutions such as consideration of light pollution is missing (Ibid).

Community-Driven Initiatives

There are no formally organised initiatives specifically aimed at supporting Dark Sky Tourism in Finland. Most of the initiatives related to this theme start unintentionally, often triggered by media coverage or public discussions.

For example, a [news article about light pollution in the City of Oulu](#), within the Northern Periphery and Arctic (NPA) geographical area and fifth largest in Finland, garnered significant attention and sparked a discussion with around 300 comments (Kaleva 2018). A group of politicians in Tampere, third largest city, also initiated a municipal effort to reduce light pollution, leading to the city updating its lighting policy (City of Tampere 2022a). This [policy revision](#) addressed the impacts of light pollution, such as trespass from advertisement boards and skyglow from outdoor city lighting (City of Tampere 2022b).

Therefore, there has been community-driven initiatives to reduce light pollution, primarily in larger cities. However, these efforts have been driven by concerns over human health and biodiversity rather than support the tourism industry. Residents in these larger cities have been actively voicing opinions and initiating motions for better lighting practices and reduction of light pollution.

While no specific initiatives have started in the Eastern Finland region, the impacts of light pollution and the need to address them early enough have been topics of discussion during project events and with stakeholders. Concerns have been raised about light pollution from nearby towns or cities affecting other regions. For example, a discussion with entrepreneur from Kaavi municipality stated impacts from Polvijärvi municipality, and discussion with entrepreneurs from Ilomantsi municipality stated impacts from City of Joensuu.

Educational programs and projects

There are clubs and associations in Lapland and Eastern Finland (North Karelia) that offer their members educational courses and trips related to the universe and astronomy. These clubs provide access to stargazing equipment, help in viewing celestial phenomena, and offer photography courses of these phenomena, often for a fee. These are:

- Seulaset Association (Eastern Finland): [Link to site](#)
- Kuopion Saturnus (Eastern Finland): [Link to site](#)
- Sodankylä Geophysical Observatory (Lapland): [Link to site](#)
- Kajaanin planeetta ry (Lapland): [Link to site](#)
- Ohcejoga Utsjoen Ursa ry (Lapland): [Link to site](#)
- Corona Borealis (Lapland): [Link to site](#)

Despite the availability of general astronomy-related education, there are no specific educational programs dedicated to promoting awareness about Dark Sky protection. There has however been earlier [a project by Finnish Environment Institute](#) that focused on impacts of light pollution and artificial lighting. It is the first and only known nationwide research in Finland, receiving responses from 2053 individuals across 226 Finnish municipalities (Lyytimäki & Rinne 2013). Most of the respondents were highly educated and resided in larger cities. According to the survey results, the main sources of light pollution identified were streetlights, illuminated advertisements, city lighting, and garden lighting (Finnish Environment Institute 2013).

There are currently no projects in North Karelia where the GLOW2.0 project operates that focus exclusively on Dark Sky Protection. However, GLOW2.0 has been actively engaging with regional infrastructure providers and tourism organizations, like Park and Wildlife Finland Metsähallitus and Syrjävaara Goodnight Oy, to discuss potential initiatives related to Dark Sky themes. GLOW2.0 also explores the impact of artificial light on the dark sky tourism economy and the potential of immersive technologies to enhance dark sky experiences. One project, HAMA Tourism, also aims to support sustainable tourism development, including the utilization of dark skies as an attractive feature.

4.3 Regional infrastructure for Dark Sky Tourism

Seulaset association located in North Karelia region of the NPA offers custom courses on stars and photographing of night sky phenomenon to any interested groups or companies by order. This means tourism companies can also order these services (Seulaset 2023).

Finland has over 40 National Parks and Wildlife Services. Koli National Park in our region of Eastern Finland is a national landscape. The Koli Nature Centre Ukko promotes visitor environmental awareness and programmes such as responsible hiking and works with companies to advance responsible business practices. However, Dark Sky awareness is lacking.

Thematic Events & Accommodation

Currently, there are no accommodation facilities specifically designed to cater to Dark Sky enthusiasts in the region. There is a growing interest among some enterprises to develop offers within the Dark Sky thematic area. This was highlighted by the involvement of enterprises in the GLOW2.0 project. GLOW2.0 plans to assist interested enterprises in integrating Dark Sky themes into their products through a capacity training program.

Festivals are key tourism offers in Finland. There has been for example light festivals, and other with dark sky themes, even though Dark Sky has not been the intentional focus. The HAMA project has tested and developed concepts as part of a **Dark moon festival experience in mid-September 2023** (Hiilineutraali Pohjois-Savo 2023).

4.4 Networking and Collaboration

Before GLOW2.0 and HAMA project there were no collaborations or partnerships in the North Karelia region working towards Dark Sky preservation, development of relevant skills or related tourism experiences.

GLOW2.0 has been collaborating with the HAMA project, which is focused on Dark Sky utilisation in responsible tourism development in three municipalities in Eastern Finland. This area is part of the Northern Periphery and Arctic (NPA) region.

The HAMA project operated between February and September 2023. It was aimed at mapping sustainable tourism opportunities, including identifying optimal viewing points for the night sky by Bortle scale criteria. The HAMA project created [a guidebook that lists the best spots for dark sky watching and companies offering products or services near these locations](#) (ISSUU 2023). While specific dark sky themed products and services are not mentioned in the guidebook, its collaborative creation implies a shared interest in developing Dark Sky experiences.

4.5 Plans for the Region

Dark Sky phenomena such as northern lights are key attraction and featured in Finland's tourism strategy. However, light pollution and responsible artificial lighting at night (ALAN) is not considered in national and regional tourism plans, despite emphasizing sustainable and responsible tourism development. There are currently no active plans to prevent, minimise or counter light pollution. However, with the assistance of GLOW2.0 there are plans to increase awareness and discussions about the importance of Dark Sky.

When considering Dark Sky certification, there is interest in both Lapland and Eastern Finland regions of the NPA. In Lapland, the Pyhä-Luosto National Park has shown interest for developing an International Dark Sky Park and they have support from the local stakeholders. In North Karelia, Glow2.0 is assisting as needed the entrepreneur Syrjävaara Goodnight Oy with the application process. The target group joined the 2023 Glow2.0 learning journey in Ireland to learn from other destinations with further advancements in this area.

4.6 Recommendations for Finland

- **Promote Official Dark Sky Designations:** Encourage regions like Lapland and North Karelia to pursue official Dark Sky area designations, enhancing their appeal as unique tourism destinations. They could also act as forerunners showing possibilities for other regions.
- **Presenting light pollution impacts and effects in relatable, understandable, and quantifiable terms:** Researchers have attempted to bring research data to the public discussion forum. However, these have been mainly in connection to biodiversity. There is a need to present the possibilities of dark nature and night sky

protection including why it is important for the societies as a whole in easily understandable and quantifiable way so the public and decision makers can see these in terms of energy saving, health and wellbeing, biodiversity benefits, including regional economic potential for tourism. This gap indicates a crucial area for advocacy, research, and potential integration into broader tourism strategies and sustainability goals.

- **Integrate Dark Sky Themes into National Tourism Strategies:** Dark Sky enhances both natural and cultural heritage which are main facets for Finland's tourism. Dark sky appreciation and protection can offer extended and new economic possibilities for Finland:
 - integrating Dark Sky Themes into National Tourism Strategies is best way of creating awareness and encouraging action.
 - developing smart destinations with Dark Sky focus, leveraging the concept of 'smart destinations' in Finland's tourism strategy to include Dark Sky tourism. Currently, 'smart destinations' is used primarily referring to advancements like booking platforms; it could include possibilities of immersive technologies use in tourism.
- **Establish Education and Awareness Programs:** Develop specific educational programs and awareness campaigns dedicated to Dark Sky protection. This could involve collaborations with astronomy clubs, associations, and regional infrastructure providers to promote light pollution awareness and the importance of preserving the night sky. Finland has several National Parks and regional cultural centres advocating responsible tourism. Such venues with already existing values that foster environmental responsibility could be used for advancing Dark Sky awareness and appreciation.
- **Strengthen Community Engagement & Collaborations:** Advance community-driven initiatives in larger cities for light pollution reduction and encourage community-driven initiatives in remote areas for light pollution prevention. Encourage collaborations between projects like GLOW2.0 and HAMA to develop sustainable Dark Sky tourism offerings in remote areas. Develop smart destinations collaborations with Dark Sky focus to include Dark Sky tourism.
- **Enhance Infrastructure and Policy Frameworks:** Outdoor lighting design and light as add-on to tourism does not necessarily incorporate considerations of aesthetics, functionality, and environmental impact, indicating a need for integrated approaches. Address gaps in outdoor lighting design and policy frameworks to support Dark Sky initiatives. This includes bridging the expertise gap

between technical and aesthetic aspects of lighting design and advocating for policies that regulate light pollution, similarly to noise and air pollution.

- **Bridge the expertise gap in lighting projects:** The gap between the technical knowledge of electrical engineers and the aesthetic understanding of architects hinders the development of effective lighting solutions that consider light pollution. Bridging the gap could prove beneficial when planning and implementing new lighting related projects, or when adjusting and replacing current poorly directed or designed outdoor lighting.

5 Ireland



Photo: Ireland Content Pool

Ireland has embraced the importance of dark sky preservation and has successfully established itself as a forerunner in dark sky initiatives. With three official designated Dark Sky areas and numerous projects and policies in place to minimise light pollution, the nation is committed to protecting the nocturnal environment. Ireland's results reflect a significant development in the Ireland Region's engagement with Dark Sky initiatives, preservation efforts, and associated tourism opportunities.

5.1 Dark Sky designation

Ireland has three Designated Dark Sky locations:

- **Kerry International Dark-Sky Reserve:** Located on the Iveragh Peninsula in County Kerry, it was the first region in the Northern Hemisphere to receive Gold Tier International Dark-Sky Reserve status by the International Dark-Sky Association (IDA), recognising not only the exceptional quality of the night sky but also the area's commitment to dark sky preservation and education.
- **Mayo Dark Sky Park:** Wild Nephin National Park in Ballycroy, County Mayo have been granted the status of a Gold Tier International Dark Sky Park. This Park

provides educational and public outreach programs alongside its preservation efforts.

- **OM Dark Sky Park and Observatory:** In Northern Ireland, the Davagh Forest in County Tyrone has been designated as an International Dark Sky Park. It has a visitor centre, provides guided tours and is known for its relatively low light pollution and clear night skies, offering a unique stargazing experience.

These areas have established a strong commitment to preserving the quality of the night sky through education and community engagement.

5.2 Dark Sky strategies and initiatives

Local regulations and policies

Our Living Islands Action Plan 2023–2026: This is the Government’s national islands policy. This Action Plan outlines specific measures that will be taken to achieve its five high level Strategic Objectives. The Strategic Objectives 2: Diversify Island Economies states the following: Point 2.13 Investigates the opportunity for Dark Skies accreditation and astro-tourism for the Island (Government of Ireland 2023a).

Project Ireland 2040 National Planning Framework: This project takes an important change from previous approaches to long-term planning and investment by Government. It is an approach that joins up motivation for improvement across different areas of our lives, bringing various government departments, agencies, state owned enterprises and local authorities together. The options of Dark Skies Tourism as an offer in rural areas is discussed on page 77 (Government of Ireland 2023b).

Ireland's first Dark Sky Ireland Strategic Plan 2023–2027: This comprehensive Dark Sky Plan was launched on the 6th of October 2023 by Dark Sky Ireland (DSI). This strategic document indicates a significant advancement for Dark Sky Ireland and outlines the organisation's future commitment to safeguarding the nocturnal environment across Ireland, encompassing both urban and rural areas. The strategy aims to benefit all living creatures by preserving natural nightscapes and mitigating the impacts of light pollution (Dark Sky Ireland 2023a).

The collaboration between Leave No Trace Ireland and Dark Sky Ireland now involves ongoing Continuous Personal Development (CPD) for their Trainers. As part of this pilot educational program, they are conducting a module focused on the impact of light pollution (Dark Sky Ireland 2023b).

Mayo County Council are working with Mayo Dark Sky Park to develop a Light Pollution Policy. The “Light & Lighting Pollution Presentation” was submitted to the council (Mayo Country Council 2023a).

Mayo County Council Draft Climate Action plan 2024–2029 is in consultation stage at present, it references under 5.4.2 Strategic Priority 2 Actions 14. Convert all Public Lighting (where feasible) to LED lighting in a Dark Sky friendly manner (Mayo Country Council 2023b).

Community-Driven Initiatives

Dark Sky Reserves and Parks: The creation of Dark Sky Reserves like the Kerry International Dark-Sky Reserve, Mayo Dark Sky Park and OM Dark Sky Park and Observatory are major initiatives. These designations have come with a commitment to protect the night sky from light pollution through various measures, including community engagement and regulatory frameworks.

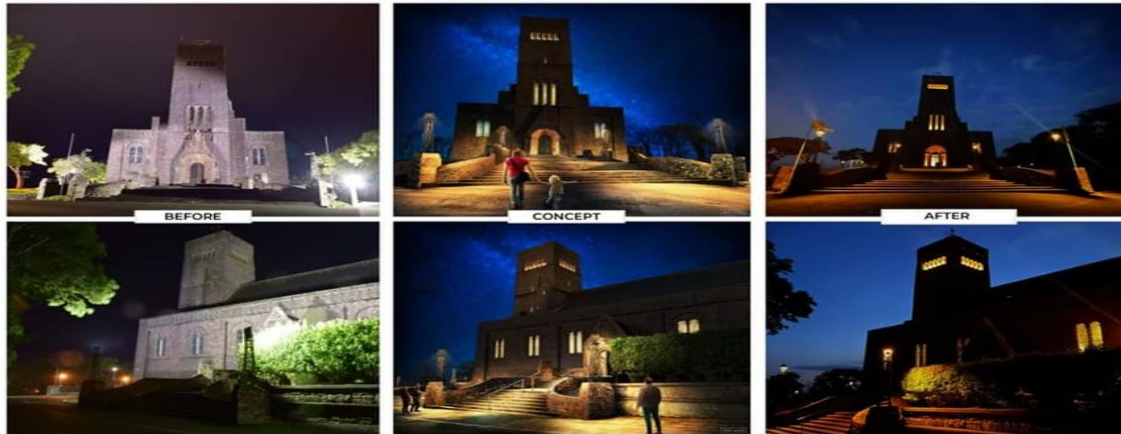
Public Lighting Schemes: Various local authorities in Ireland have implemented public lighting schemes that aim to reduce light pollution. This includes using LED lights that minimise light spill and glare while improving energy efficiency. One example of this is in Newport Co Mayo, which is on the boundary of Mayo Dark Sky Park. They collaborated with local community groups and government officials to launch a **lighting master plan for the town** (Mayo Dark Sky Park 2021).



LAUNCH NIGHT

Newport Church Lighting Launch Event 16th October 2023

The Friends of Mayo Dark Skies Community Group will be officially launching the Lighting project following a reception in Hotel Newport. Duncan Stewart will officially **Switch On** the Newport Church Lighting Scheme at 8pm



Source: <https://www.mayodarkskypark.ie/what-s-on/mdsp-admin/newport-lighting-phases>

Fáilte Ireland, the National Tourism Development Authority, is dedicated to strengthening the tourism industry in Ireland and ensuring that Ireland maintains its status as a primary and competitive destination for tourists. Fáilte Ireland issued the "Clew Bay Destination & Experience Development Plan (2021)" which outlines a strategy to "Enhance the visitor experience at Wild Nephin National Park. This includes the completion of the Western Way project and the development of a planetarium and observatory to make the most of the park's dark sky accreditation (Fáilte Ireland 2023a).

Educational programs and projects

Educational Outreach: There have been efforts to educate the public about the importance of dark skies through festivals, events, workshops, and collaborations with schools and universities to integrate dark sky preservation into educational programs:

- Mayo Dark Sky Park run Champion and Ambassador training courses. They recently held an ambassador training program. They shared an app called **Nachtlicht-buehne** (Nachtlicht 2023). **This app** provides training on how to carry out a light pollution assessment in your local communities and areas. They have emailed all their ambassadors to ask if they will carry out assessment in their local communities to get a more accurate rate of light pollution and help extend

their dark sky park possibly even further within the region or establish a reserve. This is a great way to collect relevant data.

- Collaboration with Astronomers: Connemara Astronomy club and Newport Astronomy Club run events and workshops during the winter season to advocate for dark sky preservation and provide expertise on how to achieve it.
- Blackrock Castle Observatory: Have an Educational Course on offer with Tours of the Castle, Workshops and School Visits. They also run educational programs for Teachers.
- The Kerry International Dark-Sky Reserve also host educational programs that include talks, workshops, and stargazing events aimed at both locals and visitors. They often engage with schools and youth groups to educate the next generation about the importance of preserving dark skies.

5.3 Regional Infrastructure for Dark Sky Tourism

Designated Dark Sky Areas & Stargazing facilities

Ireland & Northern Ireland have multiple stargazing facilities and observatories, including:

- Mayo Dark Sky Park
- Kerry International Dark-Sky Reserve
- OM Dark Sky Park and Observatory

OM Dark Sky Park and Observatory: they have a visitor centre, tours, advanced telescopes, outdoor Odessey Screenings.

Blackrock Castle Observatory: this is a 16th century castle that is home to a Science Centre and Observatory.

Dublin Institute of Advanced Studies: Dunsink Observatory: they are a research centre; they are only open to visitors during special events.

University College Cork: Crawford Observatory is a working research observatory; they have tours available for the public.

Birr Castle Demsne: this is a research centre, they have I-Lofar Education Centre, they hold events for the public during the year.

Thematic Events & Accommodation

There are festivals managed by all designated Dark Sky Parks & Reserves in Ireland.

- **Mayo Dark Sky Park.**
- The Kerry International Dark-Sky Reserve – Skellig Coast Dark Sky Festival (view [here](#) the 2022 & [here](#) the 2023 events).

Sperrin View Glamping located in Northern Ireland is one of the main facilities designated to cater for Dark Sky enthusiasts. It is located beside OM Dark Sky Park. The pods are in a great location for stargazing, and they don't interrupt the natural beauty of the area.

Glow2.0 project is collaborating with the accommodation sector to provide them with guidance on how to modify their current operations to accommodate Dark Sky enthusiasts.

5.4 Networking and Collaboration

There are strong partnerships enhancing Dark Sky preservation, such as Mayo Dark Sky Park at Wild Nephin National Park. Mayo Dark Sky Park is an example of a collaborative project between Communities, National Parks & Wildlife Service, Coillte, ATU Mayo Campus, South West Mayo Development and Mayo County Council.

A responsible lighting plan for the Mayo Dark Sky Park is in place. They also have collaborations with the Wild Atlantic Way (Fáilte Ireland) and The Heritage Council.

The Wild Atlantic Way is Ireland's first defined touring route along the Atlantic Coast, they have a full list of resources and toolkits to help design and grow business in this area (Fáilte Ireland 2023b).

5.5 Plans in the Region

Currently Lár Chomhairle Paróiste Ghleann Cholm Cille are in the process of applying for an International Dark Sky Community in Glencolmcille, County Donegal.

Connemara Dark Skies has formed a group with possibility of developing a Dark Sky Area.

This is not an exhaustive list as there are applications ongoing in other areas.

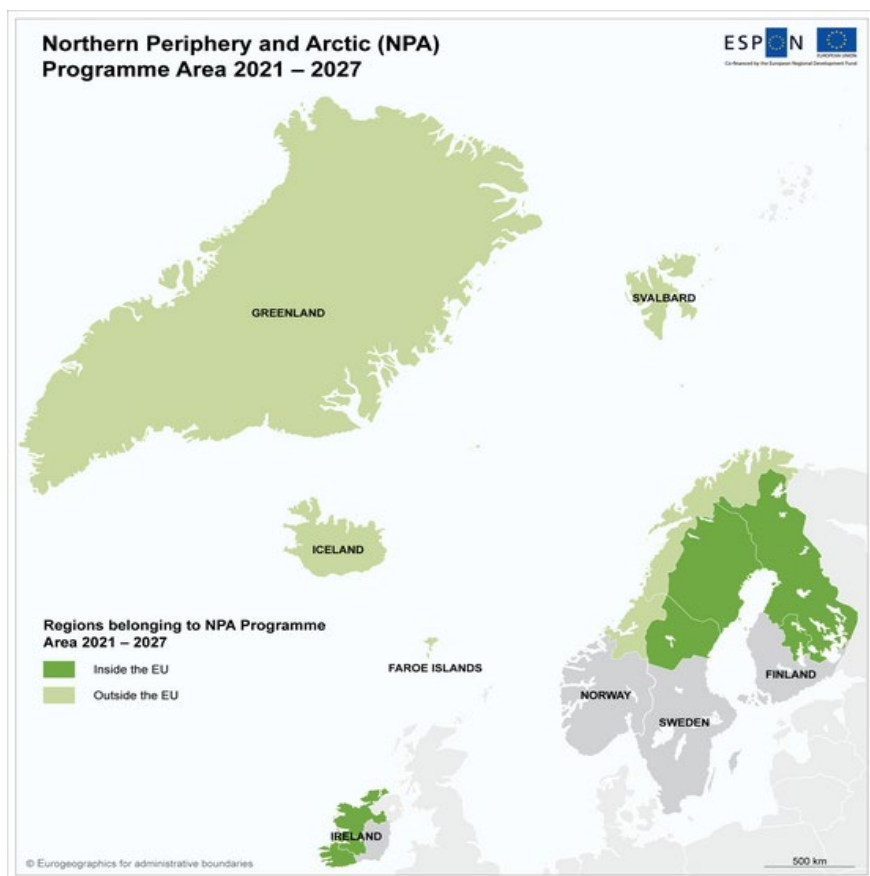
The international, **Artificial Light At Night (ALAN) Conference** will be held in Mayo in 2025 after a joint successful bid this year between Mayo Dark Sky Park and Dark Sky Ireland. This conference will examine all aspect of artificial light at night, consequences of excessive light on our natural world, including on human health. To view themes and topics covered click [here](#) (ALAN 2023).

5.6 Recommendations for Ireland

- **Economic Impact Studies:** Conduct studies to quantify the economic impact of Dark Sky initiatives on tourism and local businesses.
- **Awareness Campaigns:** Develop nationwide campaigns to raise awareness about the benefits of Dark Sky preservation.
- **International Collaboration:** Seek partnerships with global Dark Sky organizations to share best practices and innovations.
- **Policy Development:** Advocate for more robust national policies on light pollution control.
- **Community Engagement:** Introduce additional programs to enhance the involvement of the local community across various locations. Furthermore, provide support and guidance to increase participation in existing programs.
- **Sustainable Practices:** Encourage accommodation providers to adopt sustainable practices that align with Dark Sky principles.
- **Networking:** Collaborations with Astronomy Clubs and local SMEs, to gain more knowledge.
- **Approaching policy makers and key stakeholders:** Reaching key players and stakeholders when it come to the development of Dark Skies Tourism, for example:
 - Local Authorities & Development Agencies: plan a key role in instigating & facilitating the development, with a Sustainable agenda.
 - State Landowners: Coillte & NPWS play an especially significant role in developing their sites.
 - Fáilte Ireland, Tourism Heritage Council, Údarás Na Gaeltachta all have a role to play in developing dark sky tourism.

6 Recommendations & Strategies to Strengthen and Elevate Dark Sky Tourism in Northern Periphery and Arctic Regions

Dark skies are an attraction that has been utilized too little in the past in our regions. Areas with little or no light pollution have huge potential to enhance the tourism experience. Nightscape phenomenon and stories (incl. use of immersive technologies) can enhance tourism experiences and add value to tourism offers. At the same time, implementation of Artificial Light At Night (ALAN) projects without consideration of importance of dark nature and night sky can negatively impact human health, wellbeing and has led to biodiversity loss.



Source: <https://www.interreg-npa.eu/interreg-npa-2021-2027/programme-area/>

Below, we offer recommendations for tourism companies, organisations, or regions located within the Northern Periphery and Arctic area that are interested in Dark Sky tourism or light pollution prevention and protection.

6.1 Dark Sky designation

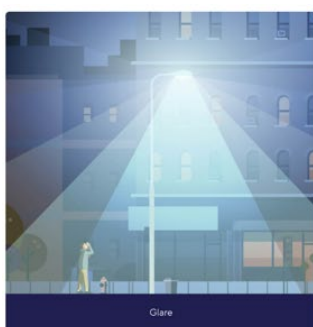
Works Towards Expanding Designation Areas:



Photos: Pixabay

- Encourage and support more regions to pursue Dark Sky designations by providing them with a clear pathway, resources, and assistance in the application process.
- Work with communities close to existing Dark Sky parks to expand the areas of designation.

Policy and Regulatory Frameworks:



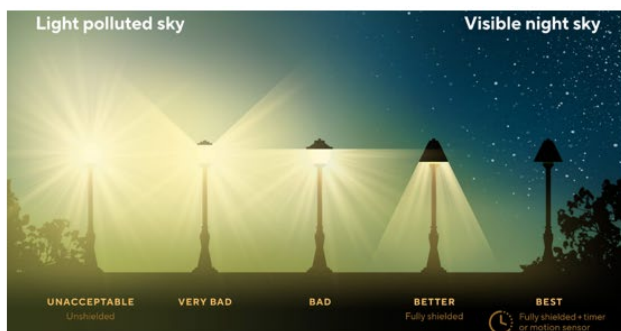
Types of light pollution:

Glare: Excessive brightness that causes visual discomfort.

Sky glow: Brightening of the night sky over inhabited areas.

Light trespass: Light falling where it is not intended or needed.

Clutter: Bright, confusing, and excessive groupings of light sources.



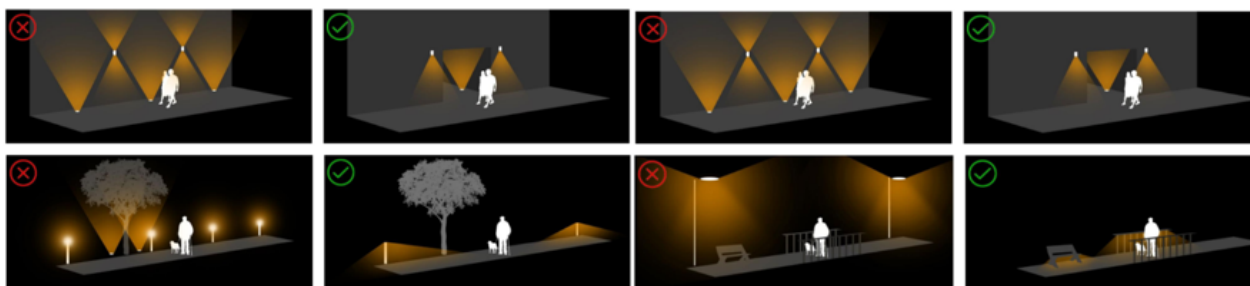
Illustrations: <https://darksky.org>

- Advocate for the inclusion of dark sky preservation within broader environmental policies and land-use planning frameworks.

- Approach key players and stakeholders when it comes to the development of Dark Skies Tourism.
- Address gaps in outdoor lighting design projects by considerations of not only aesthetics, but also light pollution impacts.

6.2 Dark Sky strategies and initiatives

Strengthen Public Lighting Policies:



Good Lighting Technical Advice Note (Source: https://issuu.com/friendsofthelakedistrictpublic/docs/cumbria_-_good_lighting_tan?fr=sYzU0MjY3Njg2NjY)

- Develop and implement nationwide lighting guidelines to further reduce light pollution.
- Promote the adoption of best practices in lighting design for municipalities, such as shielding lights and using lights with a color temperature of 3000K or less to minimize skyglow.

Invest in Research and Technology:

- Support research on the economic, environmental, and social benefits of dark sky preservation to strengthen the case for investment and expansion.
- Invest in innovative technologies for light pollution monitoring and control.
- Encourage and support initiatives and projects that steer peer-to-peer learning and sharing of experiences within regions and across countries.

Educate and Engage the Public:



Awareness of Dark Sky protection benefits at Mayo Dark Sky Park, Ireland (Photos: NPA GLOW2.0)

- Increase public awareness campaigns about the value of dark skies and the impact of light pollution on both the environment and human health.
- Integrate dark sky preservation and astronomy into school curricula to build long-term awareness.

Support Economic Development:



Photos: Kayaking; Pixabay, the rest; GLOW2.0

- Explore economic incentives for businesses that adopt dark sky practices.
- Develop packages and itineraries that include dark sky experiences combined with other local attractions to diversify the offerings.

Develop and Promote Events:

- Create a calendar of dark sky events throughout the year to attract visitors in different seasons.
- Use thematic and cultural festivals to promote dark sky awareness and bring in tourists.

6.3 Regional infrastructure for Dark Sky Tourism

Enhance Tourism Infrastructure:



- Improve the infrastructure around designated Dark Sky areas to support tourists, such as accommodations, transport links, and local amenities, while ensuring these developments are sustainable and dark sky compliant.

Sustainability Measures:

- Ensure that all developments within Dark Sky areas adhere to strict sustainability principles to protect the environment and the integrity of the dark skies.

Monitoring and Evaluation:

- Implement a system for monitoring the effectiveness of dark sky preservation measures and the growth of dark sky tourism.
- Regularly assess the progress and economic impact of dark sky initiatives to adapt strategies accordingly.
- Post parameters for quantitative/ qualitative assessment of economic impacts (tourism income generation from Dark Sky tourism, energy savings/ efficiency), environmental impacts (region's biodiversity, emission, awareness).

6.4 Networking and collaboration

Adopt Collaboration:



Photos: NPA GLOW2.0

- Strengthen existing partnerships and form new ones between local communities, businesses, and international dark sky associations to share best practices and resources.

Market and Branding:

- Develop a strong brand identity for dark sky tourism.
- Engage in targeted marketing campaigns highlighting the unique experiences offered by dark skies.
- Collaborating with existing high profile tourism agencies in the respective regions to leverage their existing audience and promote dark skies tourism offerings.
- Regional and transnational cooperation for similar offers.

Train and Develop Local Expertise:

- Offer training for local guides and hospitality staff on stargazing and nocturnal wildlife, enhancing the visitor experience.
- Certify local businesses as 'Dark Sky Friendly' to promote responsible practices and provide a network of endorsed services.

By focusing on these strategic areas, we do not only preserve our Dark Sky natural and cultural heritage but also enhance NPA position as a prime destination for dark sky tourism.

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Annex I. Regional Survey

3.2 Regional Survey

Your Region: _____

Section 1: Methods to Obtain Information

1.1. How do you plan to gather information in your region about Dark Sky initiatives and preservation efforts? (Please select which ones you plan to use)

- Desk research
- Interviews and discussions in the region
- Both desk research and interviews/discussions
- Other (please specify): _____

Section 2: Dark Sky Designation

2.1. Is your region officially designated as a Dark Sky area by organizations like the IDA foundation? (Yes/No)

If yes, please give details and links: _____

Section 3: Initiatives and Strategies

3.1. Are there any ongoing or past initiatives or strategies in your region to preserve Dark Sky or reduce light pollution? (Yes/No)

If yes, please describe these initiatives or strategies: _____

3.2. Are there any local community-driven initiatives supporting Dark Sky tourism in your region? (Yes/No)

If yes, please describe these initiatives: _____

3.3. Are there educational programs in your region that promote awareness or offer content related to Dark Sky protection? (Yes/No)

If yes, please describe these programs: _____

3.4. Are there any local regulations or policies in place to reduce light pollution and support Dark Sky initiatives in your region? (Yes/No)

If yes, please provide information on regulations or policies:

Section 4: Regional Infrastructure

4.1. Does your region have any stargazing facilities, observatories, or designated Dark Sky areas? (Yes/No)

If yes, please give details and links to these facilities: _____

4.2. Are there Dark Sky thematic events such as stargazing or astronomy-related activities in your region? (Yes/No)

If yes, please describe these events: _____

4.3. Are there accommodation options in your region designed to cater to Dark Sky enthusiasts? (Yes/No)

If yes, please provide information: _____

Section 5: Networking and Collaboration

5.1. Are there any collaborations or partnerships in your region working to enhance Dark Sky preservation or Dark Sky Tourism Experience? (Yes/No)

If yes, please describe these facilities / Experiences: _____

Section 6: Plans in the Region

6.1. Are there any current plans or projects in your region leveraging Dark Sky themes for tourism development? (Yes/No)

6.2. Are there any current or future plans in your region to reduce light pollution? (Yes/No)

6.3. Are there any current or future plans in your region to designate specific areas for Dark Sky protection? (Yes/No)

If yes, please share any future plans: _____

Please provide any additional Suggestions or Recommendations:

