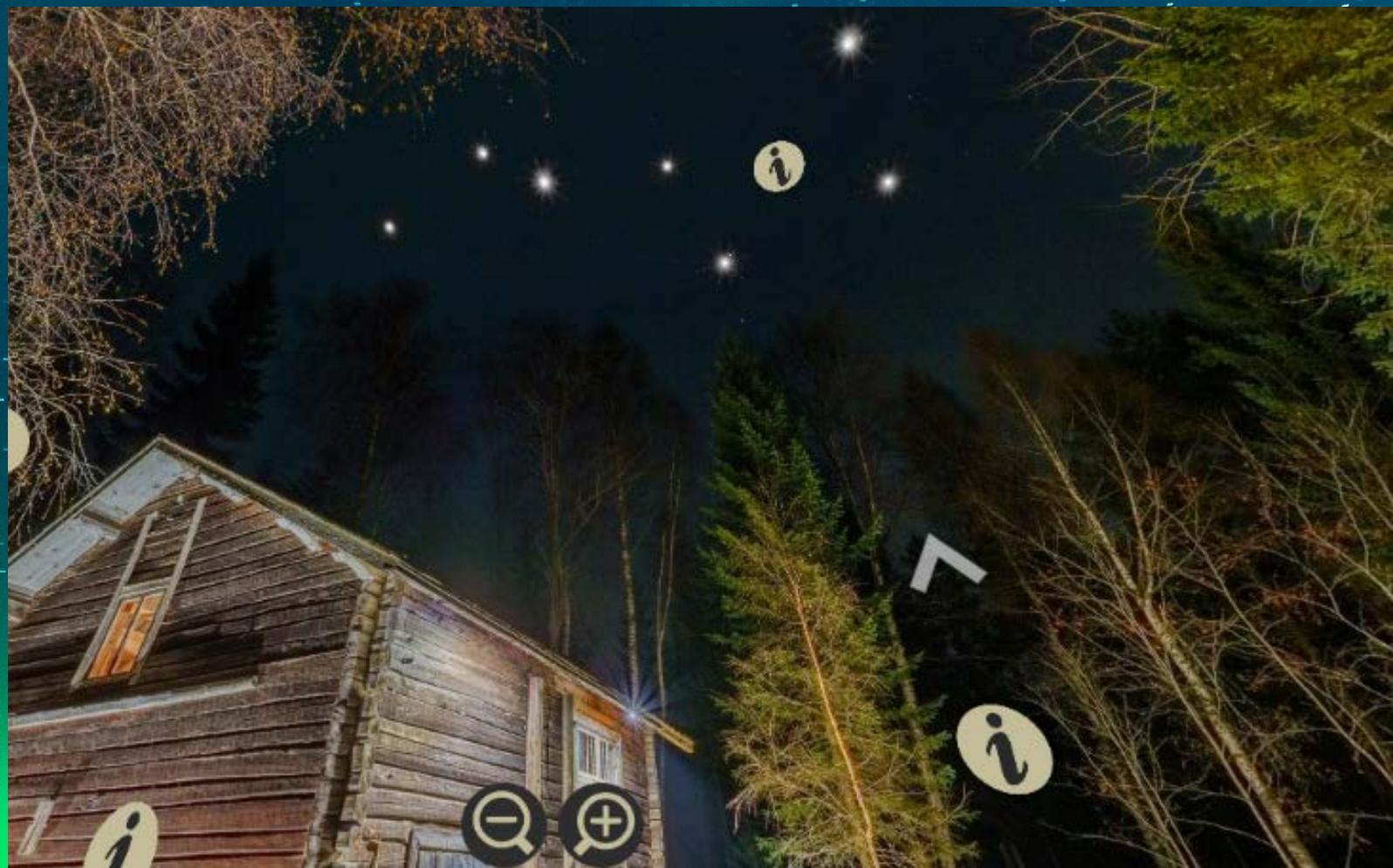


# NPA GLOW2.0 - Green energy technologies for tourism growth



Framework for Supporting Adoption of Immersive Technologies  
(Deliverable D2.4.2)

**GLOW2.0**

**Interreg**



Co-funded by  
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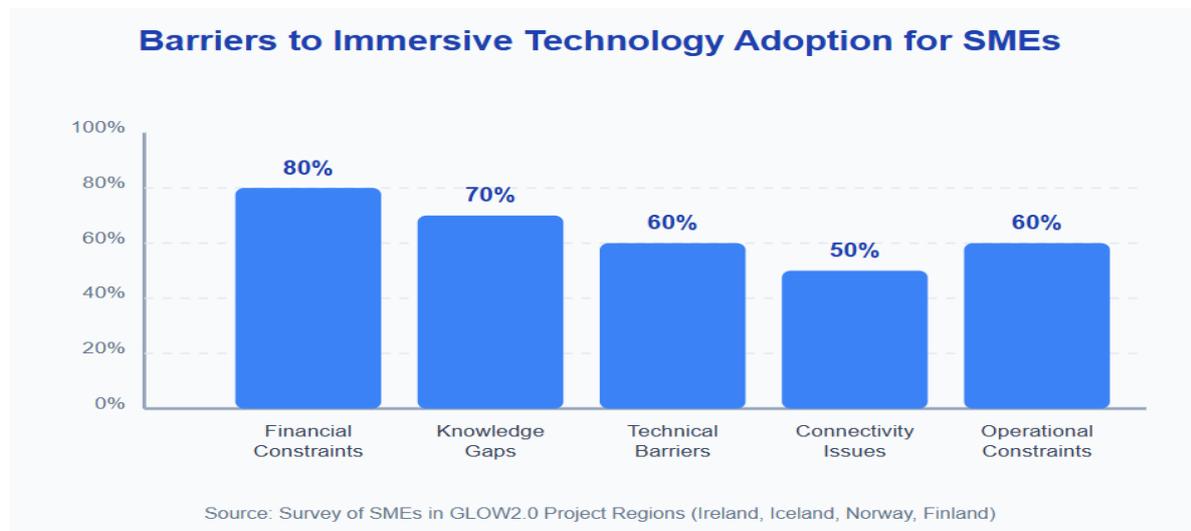
# Framework for Supporting Adoption of Immersive Technology in SMEs

## Introduction

This framework aims to support SMEs in adopting immersive technologies (e.g., VR, AR, 360° photography) to enhance tourism offerings, strengthen sustainability, and extend visitor engagement into the dark winter months. It builds on insights from the GLOW 2.0 project, which promotes cross-border collaboration between Ireland, Iceland, Norway, and Finland to develop green business models through immersive, low-impact tourism experiences.

The framework identifies barriers, opportunities, and best practices to help SMEs implement immersive technology in ways that align with national strategies for light pollution reduction, dark sky conservation, and responsible innovation. It also supports regional goals of sustainable tourism growth and digital enhancement of natural and cultural heritage.

## 1. Challenges in Adopting Immersive Technologies



- **Technical barriers:** Lack of infrastructure, software compatibility issues.
- **Financial constraints:** High investment costs for VR/AR equipment and software.
- **Knowledge gaps:** Limited expertise in implementing and maintaining immersive technology.
- **Connectivity issues:** Rural SMEs face internet bandwidth limitations.
- **Operational constraints:** SMEs struggle to allocate resources for adoption.

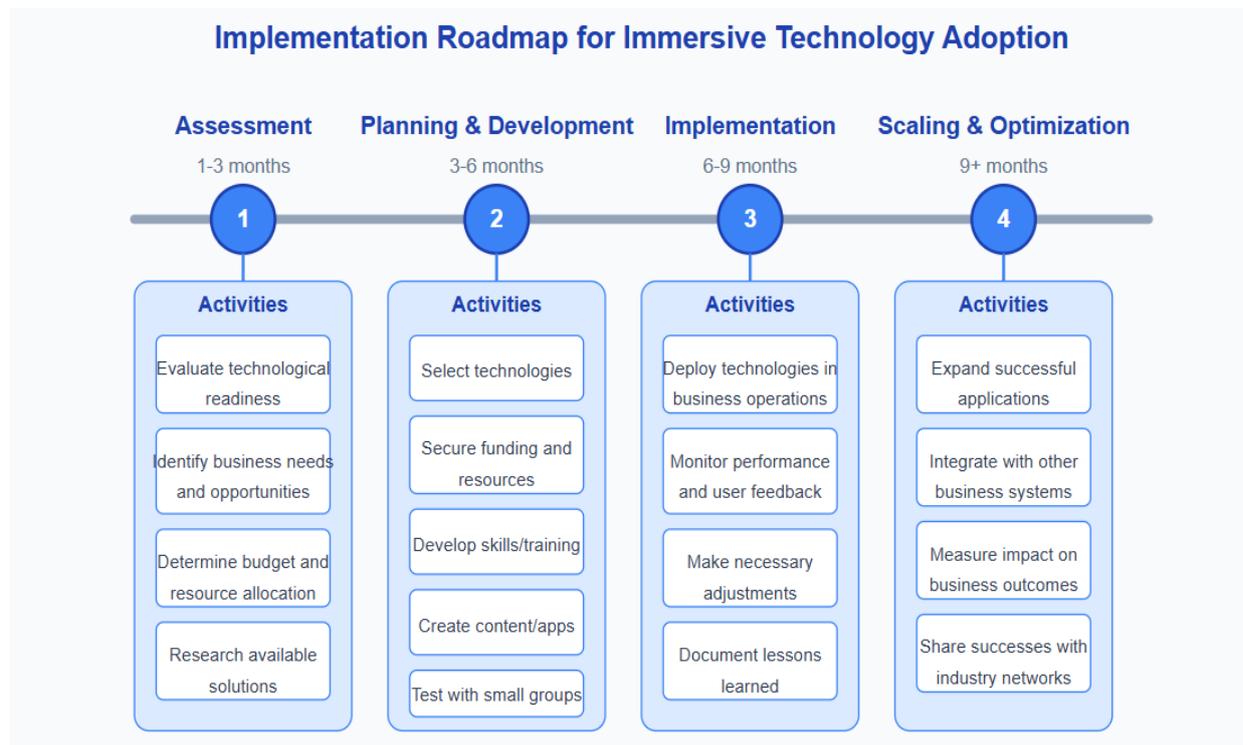
## 2. Best Practices for Adoption

- **Pilot Testing:** Engage SMEs in small-scale immersive technology trials that are specifically designed for low-light or off-season tourism scenarios. Examples include VR simulations of dark sky experiences or AR apps for night-time trails.
- **Financial Support:** Leverage public and private funding for technology investments, prioritise solutions that promote sustainability and environmental education.
- **Training & Mentorship:** Provide structured training programs not just on the tech itself, but also on sustainable implementation and light pollution sensitivity.
- **Collaboration & Networking:** Foster public-private partnerships involving technology providers, universities, and tourism authorities. Emphasise initiatives that co-develop green and conservation-aligned immersive content.
- **Integration with Dark Sky Tourism:** Use immersive tech to enhance storytelling around celestial events, local myths, and environmental protection during dark winter months.
- **Compliance with Official Lighting Guidelines:** SMEs should align their immersive experiences with Dark Sky Ireland's official lighting guide to ensure sustainability and policy alignment.

## 3. Implementation Strategies

Implement a phased adoption model (e.g., Awareness → Pilot → Scale) to align with public funding cycles and SME capacity building.

- **Infrastructure Readiness:** Ensure high-speed internet and appropriate hardware. Prioritise low-energy, portable, or solar-compatible immersive tech suitable for remote/off-grid use.
- **Content Development:** Focus on interactive storytelling, simulations, and gamification.
- **Customer Experience Design:** Prioritise user-friendly interfaces and accessibility.
- **Impact Measurement:** Use key performance indicators (KPIs) such as customer engagement rates, revenue growth, and user feedback. In addition, integrate sustainability KPIs like energy consumption, awareness of light pollution reduction, and digital experience carbon footprint. This helps assess not just business impact but alignment with GLOW 2.0's environmental goals.
- **Dark Sky-Friendly Applications:** Develop VR/AR content that educates visitors on light pollution reduction, stargazing, and conservation awareness.



#### 4. Case Studies & Regional Examples

- **Ireland:** Virtual Planetarium, VR team-building sessions with SMEs; Dark Sky Tourism toolkit.
- **Iceland:** VR-enhanced storytelling in cultural and tourism sectors.
- **Norway:** Dark sky immersive experiences and northern lights simulations.
- **Finland:** Virtual Planetarium and seasonal light variation experiences

#### 5. Recommendations for Policymakers & Stakeholders

- Support digital readiness programs for SMEs.
- Facilitate cross-border collaborations for immersive tech adoption.
- Offer grants and subsidies for SMEs integrating immersive technologies.
- Align funding initiatives with regional light pollution policies to support responsible innovation in immersive tourism.
- Develop regional centres of excellence for immersive technology training and demonstration.

## Technology Selection Guide for SMEs

This guide offers starting points for each business type, but SMEs should evaluate these recommendations against their specific objectives and visitor needs. Begin with the suggested entry-point technology to build experience before advancing to more complex solutions.

Success depends not just on selecting the right technology, but also on creating compelling content and measuring results. Public bodies can use this guide when providing tailored support to tourism businesses at different stages of technology adoption.



SME Type	Recommended Entry Point	Next Stage Technology	Resource Requirement
<b>Micro-businesses</b>	Smartphone-based AR; 360° photography	Simple VR experiences	Low-Medium
<b>Accommodation providers</b>	Virtual tours; AR location guides	Interactive room experiences	Medium
<b>Activity providers</b>	Weather-independent VR experiences	Custom AR applications	Medium-High
<b>Cultural attractions</b>	AR historical overlays	Immersive storytelling	Medium

## Key Elements of Dark Sky Tourism & Technology Integration

The table below demonstrates how specific immersive technologies—many of which are low-cost or off-the-shelf—can enhance dark sky tourism experiences while supporting sustainability and business resilience. By strategically pairing elements of dark sky tourism with appropriate technologies, even micro-enterprises can create compelling visitor experiences. More complex or custom AR/VR applications may be developed through collaborations with universities, public innovation labs, or funded pilot projects.

Public bodies should also consider offering shared tools (e.g., community VR kits), co-developing content templates (e.g., interactive star maps), or providing financial support to ensure equitable access to immersive experiences across rural and under-resourced regions.

Applications like Star Walk and Stellarium serve as successful models of how technology can enhance stargazing, while custom AR experiences can bring cultural connections to astronomical phenomena to life. These pairings represent opportunities for SMEs to develop distinctive offerings that extend their season, diversify their product range, and contribute positively to dark sky preservation efforts.

Dark Sky Tourism Element	Technology Application	Business Benefit	Sustainability Impact
<b>Stargazing</b>	AR star maps: Star Walk, SkyView; Virtual planetariums (e.g., Stellarium, SkySafari)	Extended season; Weather-independent offerings	Reduced physical impact on sensitive sites
<b>Astronomical Events</b>	VR simulations; Time-lapse experiences	Product diversification; Enhanced interpretation	Promotes appreciation of dark skies
<b>Wildlife Observation</b>	Night vision AR; Interactive tracking	Unique selling proposition; Higher value experiences	Minimised wildlife disturbance
<b>Cultural Heritage</b>	Immersive storytelling; AR historical overlays Preservation of intangible heritage	Extended visitor engagement; Deeper cultural connections	Preservation of intangible heritage
<b>Light Pollution Education</b>	Interactive light modelling; Before/after photographs	Corporate social responsibility credentials; Educational value	Increase awareness; Behaviour change

Established apps like Star Walk and SkyView demonstrate successful integration of immersive technology with dark sky tourism through AR star identification, while Stellarium displays virtual planetarium experiences. These models illustrate how digital solutions enhance visitor experiences while supporting sustainability through reduced physical infrastructure needs.

## Conclusion

By integrating immersive technology with dark sky tourism, this framework supports SMEs in creating distinctive, policy-aligned tourism experiences that promote both business growth and environmental responsibility. The phased implementation approach enables businesses of all sizes to begin their immersive technology journey in a manageable, scalable way. Sector-specific recommendations offer targeted guidance that respects the varied capacities of tourism enterprises.

To ensure widespread and sustainable adoption, public bodies must play a central role. This includes:

- Providing strategic funding for accessible, low-impact immersive technology projects.
- Offering training, templates, and shared digital infrastructure for SMEs.
- Embedding immersive tech goals into regional tourism development strategies and environmental policies.
- Supporting regulation and certification for responsible use of technology in dark sky areas.

Through coordinated public-private action, immersive technology can become a promoter for green tourism, deeper visitor engagement, and the protection of our shared natural heritage. By integrating immersive technology with dark sky tourism, this framework supports SMEs in creating unique, policy-aligned tourism experiences that promote both business growth and environmental responsibility. The phased implementation approach allows businesses of all sizes to begin their immersive technology journey with appropriate solutions that match their capabilities and resources, while the sector-specific recommendations provide targeted guidance for different types of tourism enterprises.

## FURTHER INFORMATION

GLOW2.0 - Green Energy Technologies for Tourism Project has been funded by Interreg Northern Periphery and Arctic Programme.

Link to project website: [NPA GLOW](#)

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