



**Benje
Patterson**
People & Places

April 2023

Economic impacts of a proposed Waimakariri dark sky sanctuary centred on Oxford



Prepared for: Enterprise North Canterbury

Prepared by: Benje Patterson

Benje Patterson | People & Places

www.benjepatterson.co.nz

April 2023

All work provided and services rendered are at the request of the client and intended for the client's purposes only. Benje Patterson Ltd and its employees do not accept any responsibility on any grounds whatsoever, including negligence, to any other person or organisation. While every effort is made by Benje Patterson Ltd to ensure that the information and analysis are accurate and reliable, Benje Patterson Ltd shall not be liable for any adverse consequences of the client's decisions made in reliance of any report provided by Benje Patterson Ltd. Furthermore, Benje Patterson Ltd make no representations or warranties of any kind as to whether any report provided by Benje Patterson Ltd will assist in the performance of the client's functions. Any reliance will be at your own risk.

1. Contents

2.	Introduction and overview	2
2.1.	Key findings	2
3.	Current economic context	4
4.	Economic impacts from potential dark sky sanctuary	5
4.1.	Potential dark sky visitor numbers in Waimakariri	5
4.2.	Potential spending by dark sky visitors in Waimakariri	6
4.3.	Employment estimates	7
4.4.	Broader regional effects along a dark sky tourism trail	7
5.	Effects of Oxford Observatory in a dark sky sanctuary	8
6.	Other potential social effects of a dark sky sanctuary	9
6.1.	Dark sky-related educational activities	9
6.2.	Locals' relationship to dark sky accreditation	9
7.	Concluding remarks	10

2. Introduction and overview

This report has been commissioned by Enterprise North Canterbury to analyse the potential economic impacts from the creation of a dark sky sanctuary in Waimakariri centred on Oxford. Within the potential impacts of a dark sky sanctuary, this report also considers the role of proposed improvements to the Oxford Observatory.

A dark sky sanctuary is a designated area, usually a protected natural area, that is specifically designated for the preservation of natural darkness and is free from light pollution. Dark sky sanctuaries can bring about several economic and social benefits. Economic benefits generally stem from increased tourism revenue from stargazing and astro-tourism, while social benefits are broader and can include opportunities for educational programs and a greater sense of community and pride among local residents for their efforts to protect the night sky.

At its heart, this report helps show:

- What could be the potential economic and employment benefits of a dark sky sanctuary in Waimakariri, centred on Oxford?
- How would activity supported by dark sky tourism compare to the existing size of the local visitor economy?
- How could potential dark sky tourism in Waimakariri complement a dark sky trail through neighbouring districts?
- What role would the improved Oxford observatory play within the overall economic impacts from a dark sky sanctuary?
- What is the potential scale of educational demand for use of the Oxford observatory and visitation to the dark sky sanctuary?
- What are some of the other potential social and intangible benefits from dark sky accreditation?

The impacts considered in this report are based around economic and social benefits stemming from additional activities that could develop following dark sky sanctuary accreditation. These benefits are based on potential demand only. To fully realise these potential benefits there will need to be investment in protecting, curating, and marketing the local area's dark sky offering in a way that appeals to target markets. The costs of these investments will need to be weighed against the potential benefits identified in this report.

2.1. Key findings

- Oxford's visitor economy is currently small, with an estimated \$3.8 million of visitor spending in the January 2023 year.
- By comparison, visitor spending across Waimakariri is about \$112 million a year.
- Almost three quarters of visitor spending in Oxford is currently by domestic travellers, mostly from Christchurch and surrounding districts.
- An Oxford-centred dark sky sanctuary has the potential to encourage as many as 50,600 additional visitor days to Waimakariri each year from visitors who have an interest in viewing the night sky. This estimate is based on a scenario where dark sky tourism in the district rises from its current incidental level to a point where it represents a similar share of the local visitor economy to Mackenzie.

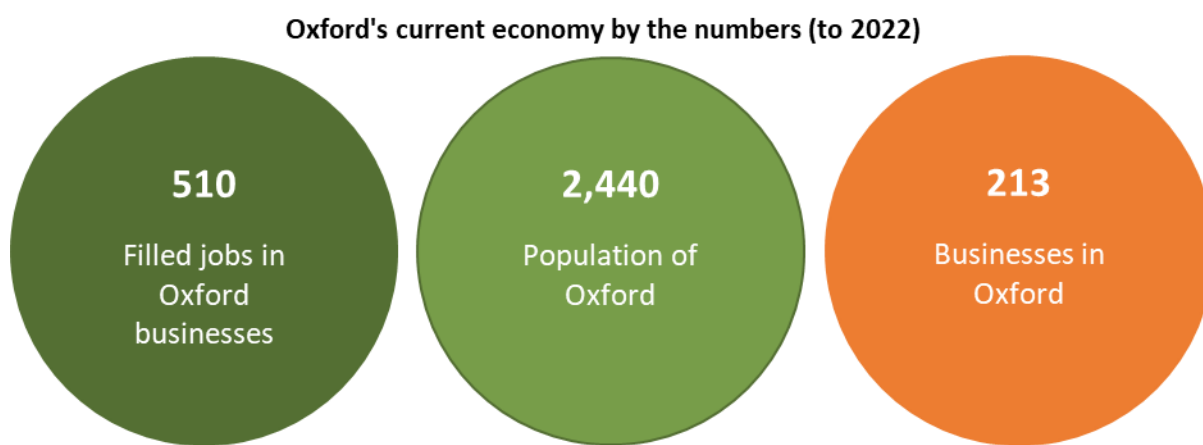
- Achieving such a level of market demand from an Oxford-centred dark sky sanctuary is not a given, and would require significant investment to market, curate, and protect the area's dark sky offering.
- Improvements to the Oxford Observatory could be one element of this investment, given that about 20% of visitors to a dark sky sanctuary also choose to participate in ticketed stargazing activities during their trip. However, there will be other investments, such as lighting upgrades and marketing that are necessary.
- The costs of these investments once identified will need to be weighed against the potential benefits identified in this report.
- If 50,600 additional astro-tourism visitor days were achieved, then this could translate into as much as \$4.6 million of spending across Waimakariri from visitors for whom the dark sky sanctuary was a crucial factor in their decision to visit.
- This level of expenditure would represent about 4.2% of Waimakariri's visitor economy and could support as many as 24 jobs.
- Only around \$0.15 million of the \$4.6 million of potential additional visitor spending would stick in Oxford, with the rest accruing to other parts of Waimakariri. For Oxford's share to creep higher, businesses would need to develop their capacity in response to increased numbers of dark sky visitors.
- There is potential for a dark sky sanctuary centred on Oxford to become part of a broader dark sky tourism trail across Canterbury. It is estimated that \$45.8 million of spending by dark sky travellers could occur along a network of dark sky sanctuaries that encompassed Oxford, Mackenzie, Methven, St James, and Kaikōura.
- But of this spending, about \$40.2 million would be from visitors who only visited one or two of the sanctuaries, while just \$5.6 million would be spent by travellers who were so motivated by dark skies as part of their holiday that they visited most or all the dark sky sanctuaries along the trail.
- Educational activities are an important component of a dark sky sanctuary. There are around 50,000 school pupils aged 10 or over (Year 5 or above) within Waimakariri and its surrounding districts (Christchurch City, Selwyn, Hurunui).
- Dark sky accreditation and efforts to protect the dark sky environment could potentially help foster a greater sense of community and pride among local residents of Oxford and more broadly across the rest of Waimakariri.
- An estimated 6.8% of Oxford locals already visit the Oxford Observatory. The 2013 Oxford Area Community Survey highlighted that the environment was the aspect that 45% of residents most value about living in Oxford.

3. Current economic context

This section provides economic and demographic context to Oxford and the rest of Waimakariri. The context can help to provide some background to the potential scale of economic impacts and demands placed on the local area by a dark sky sanctuary and improvements to the Oxford Observatory.

There were 2,440 residents of Oxford in 2022, with employment sitting at 510 jobs across 213 businesses.

Figure 1 – Oxford's economy at a glance, source: Statistics NZ



Oxford accounts for about 3% of Waimakariri's employment and population.

Table 1

Comparing Oxford against the rest of Waimakariri			
2022 Stats NZ data, except author estimates of visitor spend Jan-23 year from Marketview + MBIE data			
	Oxford	Waimakariri	Oxford's share (%)
Filled jobs	510	17,600	2.9%
Population	2,440	67,900	3.6%
Businesses	213	7,053	3.0%
Visitor spending (\$m)	\$3.8m	\$112m	3.4%

Jobs in Oxford are concentrated on health care and social assistance (26% of jobs) and education (17%).

The high share of health care and social assistance employment is no surprise when one considers Oxford has a large cohort of older residents. Around 26% of Oxford's population is aged 65 or older, which is well above the national average of 16%. Nevertheless, Oxford does also have a relatively large number of young families, with 20% of the population aged under 15 (compared to 19% nationally).

Most other jobs in Oxford are spread across a variety of industries that support the local population and service those in surrounding rural areas. These include construction (13% of jobs), manufacturing (8.8%), accommodation and food services (8.8%), and retail (6.9%).

Oxford's visitor economy is currently small, with an estimated \$3.8 million of visitor spending in the January 2023 year. By comparison, visitor spending across Waimakariri is about \$112 million a year.

Almost three quarters of visitor spending in Oxford is by domestic travellers, mostly from Christchurch and surrounding districts.

4. Economic impacts from potential dark sky sanctuary

This section introduces the potential economic and employment impacts from the creation of a dark sky sanctuary in Waimakariri, centred on Oxford. The analysis focusses on spending by new people who would visit Waimakariri for the purpose of dark sky tourism because their spend is fresh money into the local economy. Residents' dark sky-related spend isn't included in the core impacts as many Waimakariri residents would simply spend their budget on other things had they not participated in dark sky activities.

4.1. Potential dark sky visitor numbers in Waimakariri

The first step in estimating the economic impacts from a dark sky sanctuary is to ascertain the potential number of visitors who might come to Waimakariri for the purposes of viewing the dark skies.

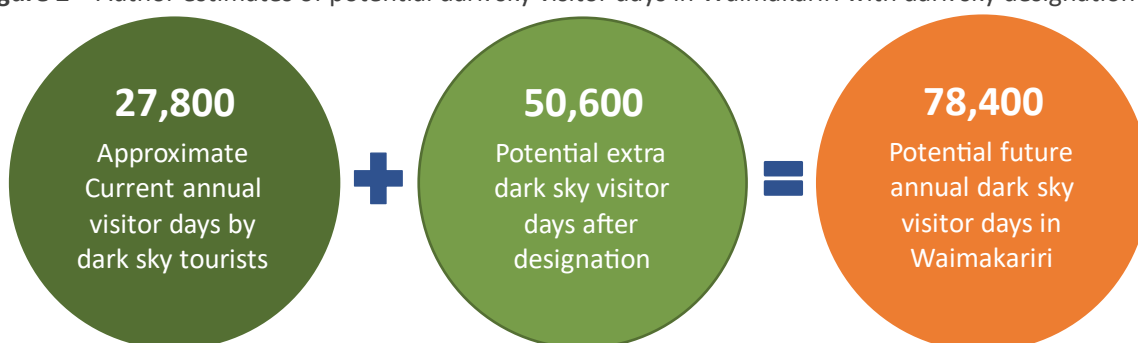
Dark sky tourism in New Zealand is currently in its relative infancy, with the most established area for dark sky tourism being the neighbouring Aoraki Mackenzie International Dark Sky Reserve. Research on visitor motivations within Mackenzie has highlighted that:

- 11.6% of all visitors to Mackenzie have an interest in dark sky tourism¹, which equates to approximately 170,000 visitor days per annum².
- Half of visitors (49%) at attractions related to the dark skies or local geo-tourism features said the attraction was the primary motivation for passing through Mackenzie³
- 85% of dark sky visitors choose to stay overnight rather than daytrip¹.

It is unknown how much incidental dark sky tourism already occurs in Waimakariri without an official dark sky designation. However, survey evidence from across a broader area of Christchurch, Selwyn, and Waimakariri suggests that 4.7% of existing visitors to the area like to view the dark sky even without dark sky designations¹. Applying this proportion to Waimakariri's current visitor numbers (600,000 visitor days⁴) suggests the district may already have around 27,800 visitor days by dark sky tourists each year.

There is the potential for Waimakariri to attract as many as 50,600 extra visitor days by dark sky tourists each year. This would be under a scenario where an Oxford-centred dark sky designation leads to the district raising its share of dark sky visitors from its current incidental level to a point where it represents a similar proportion of its visitor economy to Mackenzie. But Waimakariri's potential market size for dark sky tourism isn't a given, and to achieve it would require an Oxford-centred sanctuary to market, curate, and protect its dark sky offering in a way that proved to be relatively as popular to visitors as Mackenzie.

Figure 2 – Author estimates of potential dark sky visitor days in Waimakariri with dark sky designation



¹ Source: Tourism New Zealand's DGiT tool, available here: <https://www.dgit.nz/>

² Author calculations.

³ Source: Waitaki/Mackenzie Visitor Survey 2020, Lincoln University.

⁴ Waimakariri has around 600,000 visitor days per year compared to 1.5 million across Mackenzie. Total visitor estimates are based off the March 2023 year using mobile phone data from Data Ventures.

4.2. Potential spending by dark sky visitors in Waimakariri

The next step in estimating the potential economic impacts from a dark sky designation is to calculate how much the additional dark sky visitors might spend during their stay.

The average visitor to Waimakariri is estimated to spend \$186 per day⁵.

Combining this daily spend estimate with the potential additional visitor days across Waimakariri following a dark sky designation suggests that spending in Waimakariri could rise by up to \$9.4 million per annum. Now it wouldn't be fair to causally attribute all this potential additional visitor spend to dark sky tourism because for some people stargazing will just be something they do and not a crucial factor in their decision to visit.

If we only factor in additional dark sky visitors for whom a crucial factor in their decision to visit is to view the dark sky sanctuary⁶, then these visitors could potentially add \$4.6 million a year to Waimakariri's visitor economy.

Table 2

Potential additional spending by visitors to Waimakariri from having a dark sky sanctuary <i>Author calculations of potential extra annual spend by visitors from dark sky designation</i>	
	Total spend (\$ million)
A reason for visiting is to view a dark sky sanctuary	\$4.6m
Visiting dark sky sanctuary is one of many reasons for visit	\$4.8m
Total potential extra spending following dark sky designation	\$9.4m

Total expenditure by the additional dark sky visitors is the gross revenue that could flow into the tills of Waimakariri businesses during dark sky visitors' time in the district.

The \$4.6 million of potential additional annual visitor spending motivated by a dark sky sanctuary is equivalent to approximately 4.2% of current annual spending across Waimakariri's tourism industry (estimated at \$112 million)⁷.

Even though the dark sky sanctuary would be centred on Oxford, most of the spending would spill over into other parts of Waimakariri. This is because Oxford has a relatively small amount of visitor-related amenities compared to the rest of Waimakariri. Using an apportionment based on the current capacity of Oxford's visitor sector would suggest that only around \$0.15 million of the \$4.6 million of potential additional visitor spending primarily motivated by the dark sky sanctuary would stick within Oxford, with the rest spread across the rest of Waimakariri. Oxford's share of this spending could creep higher than this estimate, but this would require more businesses within the town to develop their capacity to capture potential demand from dark sky visitors.

⁵ This figure is estimated from total visitor days and spending.

⁶ The Waitaki/Mackenzie Visitor Survey 2020 showed 49% of visitors at attractions related to the dark skies or local geographical features said the attraction was a motivating factor for passing through Mackenzie. A similar proportion has been assumed in the Waimakariri context.

⁷ Author estimates, using scaling of MBIE's tourism electronic card transactions data to capture different propensities for domestic and international visitors to spend on card, cash and make prepayments.

4.3. Employment estimates

A number of jobs in Waimakariri could potentially be supported by the spending of people who visit for the purpose of viewing a dark sky sanctuary centred on Oxford.

It is estimated that as many as 24 filled jobs in Waimakariri could be supported by the potential \$4.6 million of spending by travellers for whom an Oxford dark sky sanctuary was a motivation to visit the district⁸.

It is important to note that this estimate is the theoretical maximum number of jobs which could be supported by the spending which is attracted to the area. Actual employment outcomes may differ depending on individual businesses' hiring behaviour.

To put the potential jobs that could be supported by additional dark sky visitors' spending in perspective, it is estimated that there are currently a total of 626 jobs across Waimakariri's visitor economy.

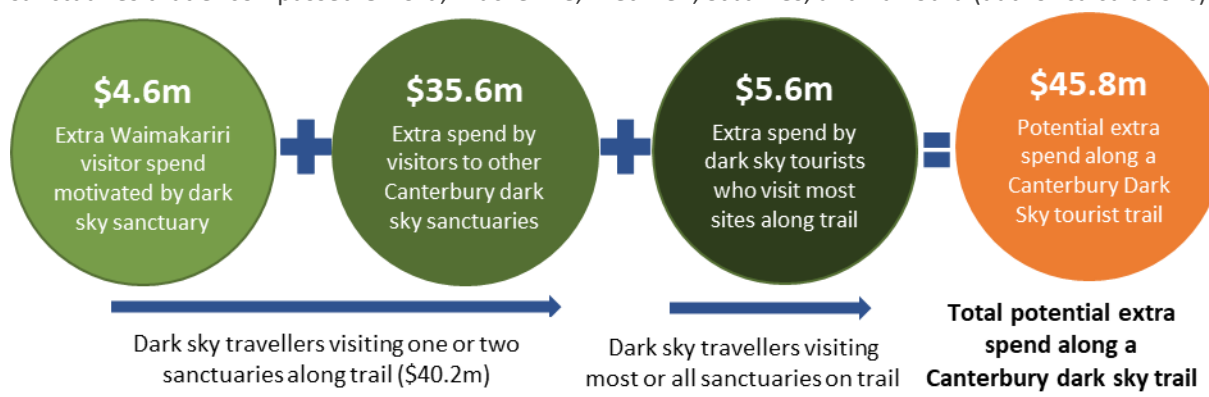
4.4. Broader regional effects along a dark sky tourism trail

There is potential for a dark sky sanctuary centred on Oxford to become part of a broader dark sky tourism trail across Canterbury. This dark sky tourism trail could include the existing International Dark Sky Reserve in Mackenzie, alongside the potential Oxford centred dark sky sanctuary, and proposed dark sky sanctuaries in nearby Methven (Ashburton District), St James (Hurunui), and Kaikōura.

Many dark sky tourists would only visit one or two dark sky sanctuaries on their holiday, and only a small subset of visitors would be so enthusiastic they would visit multiple dark sky sanctuaries. This subset of travellers visiting multiple sanctuaries is likely to be in the order of one in 15 to 20 dark sky travellers⁹.

Using similar methods to those employed in sections 4.1 and 4.2, it is estimated that \$45.8 million of spending by dark sky travellers could occur along a network of dark sky sanctuaries that encompassed Oxford, Mackenzie, Methven, St James, and Kaikōura. But of this spending, about \$40.2 million would be from visitors who only visited one or two of the sanctuaries, while just \$5.6 million would be spent by travellers who were so motivated by dark skies as part of their holiday that they visited most or all the dark sky sanctuaries along the trail. These extra \$5.6 million from visitors who traverse most of the dark sky trail would represent the benefits of closely agglomerating multiple dark sky attractions.

Figure 3 – Potential spending that could be driven by dark sky travel along a network of dark sky sanctuaries that encompassed Oxford, Mackenzie, Methven, St James, and Kaikōura (author calculations)



⁸ A multiplier of tourism spending to jobs was used (calculated from Statistics NZ's tourism satellite account).

⁹ The Waitaki/Mackenzie Visitor Survey 2020 showed 6% of visitors (one in every 17 visitors) to dark sky and geo-tourism attractions said they only travelled for the purpose of visiting such attractions. It's assumed this represents an approximate subset of dark sky tourists who might visit multiple dark sky sites while on holiday.

5. Effects of Oxford Observatory in a dark sky sanctuary

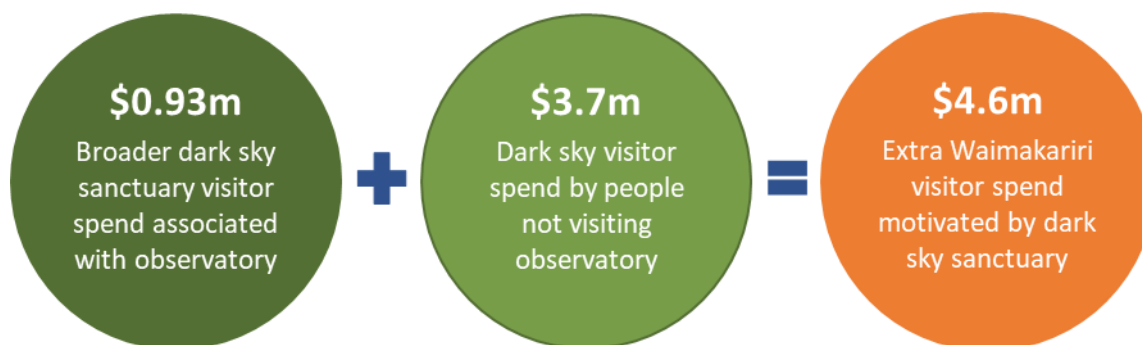
This section considers the role which an improved Oxford Observatory could play within the overall economic impacts from a dark sky sanctuary centred on Oxford. The potential economic impacts from improvements to the Oxford Observatory should be treated as indicative only and are related to the broader dark sky sanctuary context. This is because many potential visitors to the Oxford Observatory will be encouraged to visit as part of a wider package of dark sky related activities and experiences.

Surveys have highlighted that approximately one in three visitors to a dark sky sanctuary would also have an interest in visiting an observatory¹⁰.

In an applied environment before Covid-19, Ngāi Tahu's Dark Sky Project attracted 40,000 visits a year for ticketed stargazing activities, which represented around 20% of dark sky visitor days to Mackenzie.

If the Oxford Observatory achieved a market penetration where observatory visits were equivalent to 20% of Waimakariri's potential extra dark sky sanctuary visitor days, then this would imply visitor spending by travellers who visit an improved observatory could be \$0.93 million across Waimakariri¹¹.

Figure 4 – Potential extra dark sky visitor spending split into those who do/don't visit Oxford Observatory



Such a market penetration for the Oxford Observatory would be the equivalent of around 5,000 annual visits to the observatory by people coming from outside Waimakariri District. Given that the observatory currently hosts about 500 visits per year¹², this would require at least a 10-fold lift in Oxford Observatory capacity above and beyond that needed to service local demand from Waimakariri residents.

The flow-on effect of this spending by observatory visitors from outside of the district during their stay in Waimakariri could be as many as 5 jobs depending on the hiring decisions of individual businesses in response to higher activity.

On top of these economic and employment effects, the observatory may also have broader social impacts. The next section will consider the broader social impact from dark sky accreditation in Oxford – this will consider both educational use of the observatory, as well as the potential for dark sky accreditation more generally to influence locals' sense of place and pride in the community.

¹⁰ Source: DGiT for visitors to Mackenzie.

¹¹ Note: this implied visitor spending share that is induced by activities of the observatory is based on total spending by a dark sky visitor during their time in Waimakariri. As such it also includes any spending on non-observatory activities as well as on other things such as accommodation and hospitality.

¹² Source: Oxford Area School Observatory Business Plan (February 2023).

6. Other potential social effects of a dark sky sanctuary

This section focusses on broader social benefits from dark sky accreditation and improvements to the Oxford Observatory. Key considerations within this section are potential demand for dark sky-related educational activities, and the effects which dark sky accreditation may have on locals' relationship to the night skies.

6.1. Dark sky-related educational activities

Educational activities are an important component of a dark sky sanctuary. In the Oxford context, the Oxford Observatory is already situated on the grounds of Oxford Area School.

There is potential to deliver dark sky-related educational activities to a much broader audience beyond the immediate Oxford area. There are around 50,000 school pupils aged 10 or over (Year 5 or above) within Waimakariri and its surrounding districts (Christchurch City, Selwyn, Hurunui).

Even if just a 1% share of pupils in the Year 5 and above school catchment from surrounding districts were interested in participating in dark sky-related educational activities then this would equate to 500 visits each year. Such a level of educational demand would be equivalent to the total visits that the Oxford Observatory currently gets from all sources of visitation. Most pupils within this catchment of surrounding districts reside within one hour by vehicle from Oxford, so the area is easily accessible for evening educational activities, particularly within the winter months.

Table 3

School enrolments within Waimakariri schools and those in surrounding areas <i>2022 school enrolment data from Ministry of Education</i>			
	Waimakariri	Christchurch/Selwyn/ Hurunui	Total students
Years 1-4	2,895	16,993	19,888
Years 5-8	3,101	19,262	22,363
Year 9-13	3,013	24,526	27,539
Total students	9,009	60,781	69,790

6.2. Locals' relationship to dark sky accreditation

Dark sky accreditation could potentially help foster a greater sense of community and pride among local residents of Oxford and more broadly across the rest of Waimakariri.

Oxford locals are already enthusiastic users of the Oxford Observatory. Evidence from the Oxford Area School Observatory Business Plan (February 2023) shows that there are approximately 165 Oxford residents each year who use the observatory, which on current population estimates (2,440) represents approximately 6.8% of the local population. Even if just 3% of people from other parts Waimakariri (65,460) were interested in visiting the observatory as part of an Oxford-centred dark sky reserve then this could represent a further 2,000 additional visits from people living within other parts of Waimakariri.

A greater awareness of the benefits of protecting the dark sky environment could also foster community pride. Although not directly dark sky-related, the 2013 Oxford Area Community Survey highlighted that the environment was the aspect that 45% of residents most value about living in Oxford.

7. Concluding remarks

This report has helped to highlight a potential scenario of visitor demand for stargazing from a dark sky sanctuary centred on Oxford. It has also shown the scale of visitor spending and the number of jobs that could be supported by this astro-tourism demand.

An Oxford-centred dark sky sanctuary has the potential to encourage as many as 50,600 additional visitor days to Waimakariri each year from visitors who have an interest in viewing the night sky. This estimate has been formed under the assumption that astro-tourism in the district can ultimately achieve a similar market penetration to neighbouring Mackenzie (11.6% of visitors).

If 50,600 additional astro-tourism visitor days were achieved, then this could translate into as much as \$4.6 million of spending across Waimakariri from visitors for whom the dark sky sanctuary was a crucial factor in their decision to visit. This level of expenditure would represent about 4.2% of Waimakariri's visitor economy and could support as many as 24 jobs. Most of this spending would accrue to parts of Waimakariri outside of Oxford, but there is potential for Oxford's share to creep higher as businesses develop their capacity in response to higher numbers of dark sky visitors.

Achieving such a level of market demand from an Oxford-centred dark sky sanctuary is not a given, and would require significant investment to market, curate, and protect the area's dark sky offering in a way that proved to be relatively as popular to visitors as Mackenzie. Improvements to the Oxford Observatory could be one element of this investment, given that about 20% of visitors to a dark sky sanctuary also choose to participate in ticketed stargazing activities during their trip. However, there will be other investments, such as lighting upgrades and marketing that are necessary. The costs of these investments once identified will need to be weighed against the potential benefits identified in this report.



**Benje
Patterson**
People & Places