

Chapter 7

Values of Mountain Landscapes: Insights About the Blue Mountains National Park, Australia from Twitter



Catherine Pickering, Patrick Norman, and Sebastian Rossi

Significance Statement People engage with nature in a range of ways, including sharing their experiences, values and concerns about specific landscapes on social media. For instance, on Twitter, governments, news, conservation, management, tourism and other organizations, as well as individuals share short 280-character microblogs (tweets) about a range of issues. We assessed public debate on Twitter about the Blue Mountains National Park in Australia to illustrate the benefits, but also limitations and concerns with the use of this, still novel, method for public engagement. Using a quantitative analysis of the tweets-content we identified common topics and emotions, including similarities and differences between the tweets posted by Australians and those from other countries regarding this globally important and popular mountain landscapes.

Keywords Social mediapublic engagement · Sentiment analysis · Values

1 Introduction

Natural landscapes are important globally including those conserved in national parks and other types of protected areas (Worboys et al., 2015). They provide ecosystem services that are worth billions of dollars to communities, underpinning and supporting life on earth (Watson et al., 2014; Worboys et al., 2015). They also inspire people with cultural, spiritual and historical values, reflected in strong

C. Pickering (✉)

School of Environment and Science, Griffith University, Gold Coast, QLD, Australia
e-mail: c.pickering@griffith.edu.au

P. Norman

Griffith Climate Change Response Program, Griffith University, Gold Coast, QLD, Australia

S. Rossi (✉)

Instituto Argentino de Investigaciones de Zonas Áridas (IADIZA), Centro Científico Tecnológico (CCT) CONICET, Mendoza and Ceplades-Turismo, Universidad Nacional del Comahue, Neuquén, Argentina
e-mail: srossi@mendoza-conicet.gob.ar

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emotional connections to these landscapes including through a range of cultural ecosystem services (Worboys et al., 2015). Some of the ways that nature is valued are conceptualised in other frameworks such as nature's contributions to people including non-material contributions such as learning and inspiration, physical and psychological experiences (Diaz et al., 2018). Reflecting the increased interest in the social aspects of landscapes there is increasing interest in listening to people when they talk about different landscapes, including who talks, what they say and what they feel about them including for nature based tourism (Newsome et al., 2012; Veal, 2017), park management (Dovers et al., 2015), cultural ecosystem services (Calcagni et al., 2019), nature contributions to people (Diaz et al., 2018), as well as social ecological system (Jahn et al., 2009) among other frameworks and contexts. Researchers, governments, land managers and others often create the opportunity for such discussions with people expressing their views in community forums, focus groups, advisory boards, surveys and interviews among others (Dovers et al., 2015; Veal, 2017; Reed et al., 2018).

Increasingly people use social media to talk about topics that matter to them, with billions of people posting text and images each day on platforms such as Facebook, WhatsApp, WeChat and Instagram (Statista, 2020). One of the dominant platforms for publicly debate is Twitter, which is used by leaders, governments, news agencies, conservation, land managers, tourism and community organisations along with millions of individuals to discuss everything from world events to their daily lives (Orellana-Rodriguez & Keane, 2018; Leetaru, 2019; Wojcik & Hughes, 2019). Although communication on Twitter is limited to tweets of 280 characters, the content, timing and emotions expressed in tweets are used to monitor wars, elections, economies, natural disasters and pandemics (Pickering & Norman, 2020; Mangachena & Pickering, 2021). Twitter is starting to be used to assess how people relate to natural landscapes including in national parks (Teles da Mota & Pickering, 2020; Wilkins et al., 2020). It can be used to monitor visitation to national parks (Hamstead et al., 2018; Tenkanen et al., 2017) and to assess how people and organisations respond to events in parks and their management (Brown et al., 2020; Fink et al., 2020; Pickering & Norman, 2020). This includes comparing how people feel about parks, including those living close by, as well as those based further away (Pickering & Norman, 2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). Twitter is also used by news organisations, government management agencies, tourism operators and others to inform people about specific parks, with some of these accounts with millions of followers (Halpenny & Blye, 2017; Orellana-Rodriguez & Keane, 2018; Leetaru, 2019; Norman, 2020; Pickering & Norman, 2020).

Here we illustrate how Twitter can be harnessed to assess the ways that people value and relate to natural landscapes by assessing public discussions about a prominent national park in Australia: The Blue Mountains National Park in New South Wales. This large Park (2679 km²) is part of the Greater Blue Mountains World Heritage Area, close to the largest city in Australia, Sydney (Fig. 7.1). The Park is very popular with Australian and international visitors, with over five million visits per year (New South Wales Government, 2020). Specifically, we looked at the

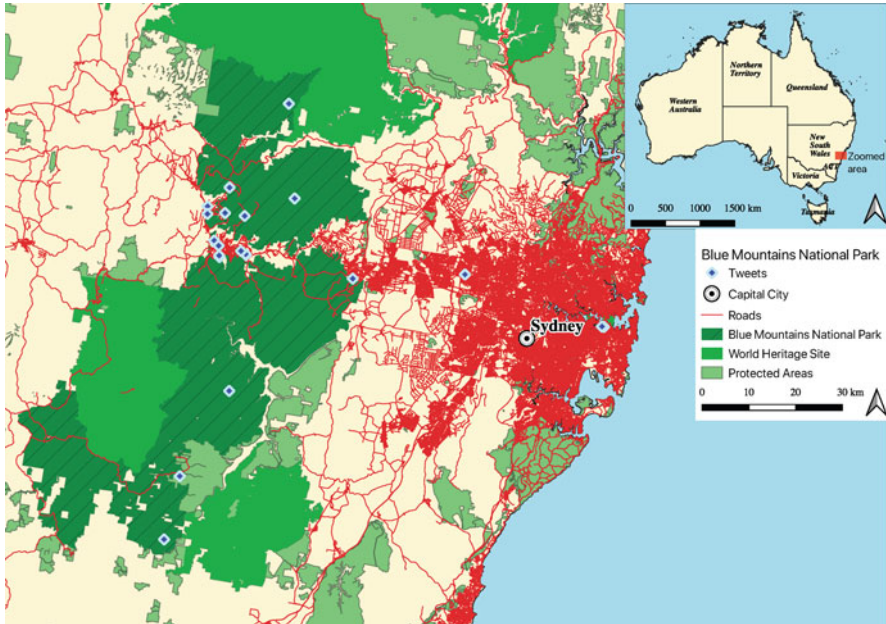


Fig. 7.1 Location of Blue Mountain National Park, including those tweets that contained geolocation information. See text for details

scale and nature of the discourse including who talked, about what, when and what emotions were expressed. This included comparing what Australians (nationals) talked about in relation to the Park compared to those living elsewhere in the world (internationals). The results illustrate some of the benefits, limitations and concerns with using Twitter to understand how people relate to natural landscapes.

2 Methods

Twitter allows people to register with the platform and then using an Automated Programming Interface, obtain metadata about a sample of tweets. A range of metadata associated with each tweet can be obtained including the text of the tweet, the user (Tweeter) identification number, the user location (text if provided), time and date of the post (given in GMT), and information on the platform used to post the tweet. To obtain this free data, a person must be registered with Twitter and abide by their policies on the use of the data. Using interactive code in the archiving Google sheet, TAGS for Twitter, it is then possible to automatically retrieve from Twitter a sample of tweets for each day the TAG is setup to run, with returns of up to 18,000 tweets per hour possible. The TAGS for Twitter can be used over long periods of time to monitor discourse as issues arise. Here it was used over several

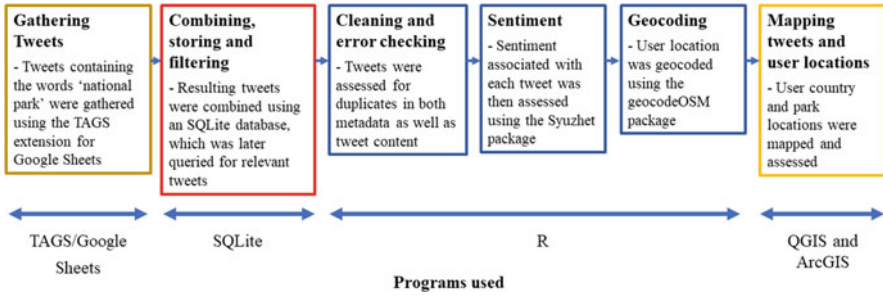


Fig. 7.2 Details of the steps and programs used to collect and analysis tweets from Twitter relating to the Blue Mountains National Park, Australia

months to accumulate a massive SQLite database of millions of tweets that used the term ‘national park’ in the text of a tweet (Norman, 2020) (Fig. 7.2).

To illustrate how Twitter could be used at the scale of a single landscape/national park we subsampled our global database to extract just those tweets using the term ‘Blue Mountains’ for tweets sent from the second July 2018 till first August 2019, using a SQLite database query (Fig. 7.2). Similar approaches have been used to assess a specific issue (horses) in a specific park (Kosciuszko National Park) during a period of intense public debate (Pickering & Norman, 2020), to compare public discourse among different types of national parks in South Africa (Mangachena & Pickering, 2021) and to assess at a country level the scale and nature of public debate about national parks in Nepal (Bhatt & Pickering, 2021). It is possible to directly use TAGS for Twitter to search for a given park, location or topic relevance by entering specific search term(s), and then monitor it over time to examine changes in responses to specific events, with the resulting metadata about the tweets available to export as csv file(s) for further analysis. To determine what people feel about a landscape its possible to code the sentiments and emotions expressed in the text of the tweets using the National Research Council of Canada’s lexicon database of sentiment and emotions associated with specific words (National Research Council Canada, 2019). For the Blue Mountains tweets we did this using the ‘nrc’ emotion lexicon in the ‘Syuzhet’ package in R (Jockers, 2017; R Core Team, 2019), but as the word ‘blue’ is itself associated with sadness in the lexicon, we removed this word from the text of the tweets prior to coding to avoid bias. Where people who sent tweet (tweeters) were from can also be coded to country-level using the R function geocodeOSM from the tmaptools package based on text location information they provided (R Core Team, 2019), and this was also done for the Blue Mountain Tweets, although for smaller datasets it is also possible to manually code tweeters to country (Pickering & Norman, 2020). To quantify the content of the tweets, the text of all the tweets can be pasted into online programs such as ‘wordcloud.com’ to generate a list of common words, to then, group common terms into categories. For the Blue Mountains tweets words were grouped if they related to tourism/visiting, the location of the Park, features within the Park, activities, management issues, conservation, safety and others, and tweets with such terms/categories using a

similar approach to other studies of tweets about Parks (Pickering & Norman, 2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). For the Blue Mountains Park the most common terms related to geographical locations and visiting the Park and individual tweets were coded if they therefore contained terms such as visit or trip, wentworth or falls, Sydney, Katoomba, three or sisters, nsw or new south wales, world heritage, or “aust” for variants on Australia (Table 7.1). Chi-square Tests were then used to compare if there were significant differences in sentiments, emotions and the content of tweets sent by accounts based in Australia (nationals) and those sent by people in other countries (internationals). The number of tweets sent by accounts based in different countries was also mapped in QGIS. Finally, for the few tweets that included geolocation data, ArcGIS was used to map where tweets were sent from in relation to the Park, road networks and the city of Sydney.

3 Results

There were 1176 original tweets that used the name of the Park sent by 723 tweeters representing at least 44 countries (Table 7.1, Fig. 7.3). Many were sent by people based in Australia (40%, nationals), while 36% of the tweets were sent by internationals and for the remaining 24% of the tweets either the tweeter did not provide location data, or the data they did provide could not be assigned to a country. The potential audience reading tweets about Parks was massive, with a theoretically reach of 2.5 million tweeters, but as there is likely to be overlaps in followers among accounts, the real reach would be considerably smaller.

Although 37% of the tweets contained geolocation data (Fig. 7.1), this only represented 21 different locations, as nearly all were reposted images from Instagram (96%). Instagram relies on people manually coding their images by place names using text, and so many images often have the same general geolocation data. In this case, nearly all these tweets were associated with Instagram images from a few places in the Park, and 237 of them had the same geolocation in Katoomba, a popular tourism town in the middle of the Park.

There were clear themes in what people talked about in relation to the Park based on the most common words used in the tweets. This included talking about the geographical location of the Park (Australia, Sydney, New South Wales), its status (World Heritage Area), prominent places in the Park (Three Sisters, Katoomba, Wentworth Falls), visits to the Park (trip, visit etc), and what the Park meant to people (stunning, inspiring, awe, amazing and adventure). Many of the Park tweets were positive, with more positive (38%) than negative sentiments (7%) expressed, although most (55%) were neutral in tone.

Although there were some common themes and emotions in the tweets, there were also differences depending on where people were from (Table 7.1). Australians were far more likely to talk about how the Park is a World Heritage Area (10% Australians vs 1% internationals), about their visit (10% vs 7%), and about one of the prominent destinations in the Park: Wentworth Falls (8.2% vs 1%). In contrast

Table 7.1 Details of tweets about the Blue Mountains National Parks including the number of tweets and tweeters, and the percentage expressing specific sentiments, emotions and topics, sent by accounts based in Australia (national) or other countries (international)

Counts		All	National	International	
	Tweets	1176	475	421	
	Tweeters	723	227	292	
	Geolocation	439	142	187	
	Instagram	606	207	241	
	Facebook	110	67	26	
	Reach (thousands)	2,521.6	366.9	1,281.6	
Percentage of tweets		All	National	International	Tests
Sentiments and emotions	Positive	38.3	47.4	30.6	<0.001
	Neutral	55	42.5	65.1	
	Negative	6.7	10.1	4.3	
	Anger	8.2	11.4	4.5	<0.001
	Anticipation	44.1	50.5	40.9	0.020
	Disgust	5.3	6.7	2.6	0.006
	Fear	15.6	23.2	9.7	<0.001
	Joy	32.7	38.3	28.3	0.008
	Sadness	9.7	13.1	6.4	0.001
	Surprise	13.7	19.4	9.7	<0.001
	Trust	33.2	50.9	16.9	<0.001
Topics	Visit/trip	7.1	9.7	9.0	0.012
	New South Wales	19.6	20.4	17.8	0.361
	Falls	6.5	10.9	3.6	<0.001
	Wentworth (Falls)	3.7	8.2	1	<0.001
	Sydney	20.2	23.6	19.7	0.102
	Katoomba	6.7	4.8	8.3	0.043
	Three Sisters	7.5	5.3	9.0	0.035
	World Heritage Area	5.7	9.9	1.4	<0.001
	Australia	30.5	24.4	34.7	0.004

Values are colour coded by size, with higher values in red. P values for Chi-square tests comparing national and international tweets are provided, with those in Bold significant. Reach = sum of the number of followers for all tweeters

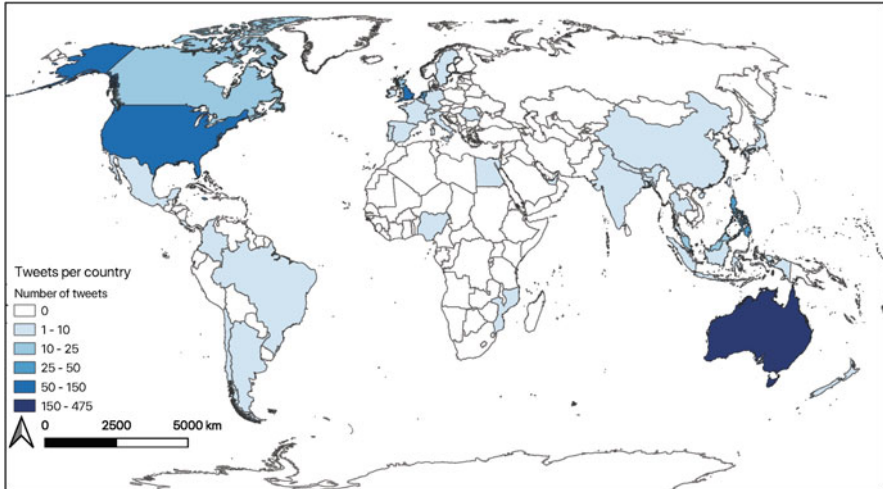


Fig. 7.3 Number of tweets per country about the Blue Mountain National Park. Data based on information provided by some tweeters about where they are from and does not indicate geolocation where the tweet was sent from

internationals were more likely to talk about the Park in reference to Australia (35% internationals vs 24% Australians), about two other prominent tourism destinations that are easy to access and close to each other: the town of Katoomba (8% vs 5%), and the nearby Three Sisters lookout (9% vs 5%). They also differed in overall sentiment and the specific emotions expressed, with Australians far more likely to express positive and negative sentiments when tweeting about the Park as well as emotions such as anger, anticipation, disgust, fear, joy, sadness, surprise and trust, while internationals tended more often to be neutral when tweeting about the Park (65%).

4 Discussion

There are benefits in using Twitter to listen to public debate(s) about nature (Table 7.2), including, as illustrated here, for the Blue Mountains. Twitter is popular with millions of people posting about diverse issues relating to natural landscapes, including national parks with more than a million tweets sent about more than 140 parks over a few months globally (Norman, 2020). This includes people from a range of countries that are interested in, and engaged with specific landscape. Here people from 44 countries talked about the Blue Mountains during the sampling period while globally tweets about parks were sent by accounts from more than 180 countries (Norman, 2020). The size and nature of the discourse varies dramatically among continents, regions, parks and people (Brown et al., 2020; Norman,

Table 7.2 Benefits, limitations, and challenges of using Twitter as a source of data for research into how people value landscapes

Benefits
Scale: Large numbers of tweets are sent daily Large numbers of people are tweeting about diverse topics. Large number of people reading tweets with some accounts with millions of followers. Provides insights into the views of people locals, visitors as well as those from other regions and countries.
Relevance: For parks and other natural landscapes people tweet about their visit, activities, access, safety, natural features, biodiversity and conservation and other topics.
Timing: Tweets are a rapid form of communication and hence can be used to communicate with people and see how people respond to specific decisions/events.
Emotions: People often express emotions and sentiments in tweets and so they can be used to monitor how people feel about specific places, events, and issues.
Access and analysis of data: Its relatively easy to access data using the Twitter API and Google TAGS and its usually free. Data can be analysed and visualised using a range of programs and levels of complexity as required.
Who: Some information is available about who sends tweets but see limitations and concerns People who use social media platforms such as twitter include those who can be hard to access via more traditional methods of engagement such as surveys, focus groups and stakeholder workshops.
Limitations and challenges
Peoples interest in issues on Twitter can be strong and rapid, but also ephemeral and not all issues and places are talked about.
There are important ethical and privacy issues with the use of data from social media including from Twitter.
The amount of information in tweets is limited, and the meaning of tweets can be ambiguous including identifying satire and irony, it can be hard to identify relevant tweets based on search words with different meaning, and responses are often ephemeral.
Access to social media data including Twitter changes including in response to privacy concerns but also for commercial reasons. As a result, detailed geolocation data is no longer available about where tweets were sent from.
Twitter is more likely to reflect the views of English speakers, people from countries such as the USA, men, those who are wealthier and better educated.

2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). For the Blue Mountains, lots of the people tweeting about the Park were Australians, and this appears to be common, with nationals often tweeting about parks in their own country (Hamstead et al., 2018; Norman, 2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). Tweets about national parks cover a range of issues including geographical location (such as country, region, nearest city), visitation, landscape features and/or biodiversity within the Park, access and facilities, as

well as safety and conservation (Norman, 2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). For the Blue Mountains the tweets were mostly about visiting, features within the Park and where the Park is located.

It's possible to use Twitter to not only assess what people talk about, but how they feel about landscapes. For the Blue Mountains most of the discourse was positive, and similar often positive emotional responses can be seen in tweets about other parks (Pickering & Norman, 2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). This may reflect the positive way in which parks are seen by many local communities, although specific issues relating to national parks can trigger strong and rapid negative reactions including animal welfare issues or restricting access (Fink et al., 2020; Bhatt & Pickering, 2021; Mangachena & Pickering, 2021).

Twitter data can be obtained rapidly, with some websites and organizations continuously monitoring Twitter (Healey, 2019). The use of the Twitter API and options such as the Google TAGS and others is making it easier to access the data and analysis of the metadata can be fairly straight forward. Also, common database packages such as Excel and R, as done for the Blue Mountain tweets, can then be used to process the tweets. Therefore Twitter can provide an additional avenue of information that can complement others, such as surveys and hence additional insights into who, what and how people feel about landscapes (Ilieva & McPhearson, 2018; Calcagni et al., 2019; Ghermandi & Sinclair, 2019; Teles Da Mota & Pickering, 2020).

There are important limitations and challenges in using Twitter for assessing public discourse including about specific landscapes and land uses (Ilieva & McPhearson, 2018; Ghermandi & Sinclair, 2019; Teles Da Mota & Pickering, 2020; Pickering & Norman, 2020). First, only some issues are discussed on Twitter, and topics and responses can be fleeting. As a result, there may not be much discourse about some issues, and/or it may pass rapidly and hence be hard to obtain for past events and issues (Bhatt & Pickering, 2021; Mangachena & Pickering, 2021). In the past there were greater limits on the time periods when tweets could be accessed, but this changed in 2021, and may change again. Privacy and ethics are important when using social media, just as they are for other engagement data such as surveys and focus groups (Veal, 2017; Pickering & Norman, 2020). Also, information about those sending the tweets can be limited, and reflecting privacy and ethical considerations, often must remain restricted including minimizing access and use of data (Di Minin et al., 2021). There can be challenges in interpreting the content of tweets, as tweets, by their very nature, are short strings of text, and hence they do not provide the opportunity to understand in detail the context and reasons behind the views expressed (Orellana-Rodriguez & Keane, 2018; Pickering & Norman, 2020). There can also be complications in interpreting the meaning of tweets including when coding uses a literal meaning approach as taken here and in other studies (Ladle et al., 2016; Orellana-Rodriguez & Keane, 2018). For instance, literal coding does not address the metaphoric meaning of the tweets among those posting and reading them, or easily identifying irony, sarcasm or satire. Furthermore, issues can arise in fully understanding the meaning of hashtags, abbreviations and emoticons that are a characteristic of this short form of communication (Leetaru,

2019; Toivonen et al., 2019). Most importantly, Twitter only represents some people's views, and more often those who are wealthy, well educated people, particularly from some countries (Leetaru, 2019; Wojcik & Hughes, 2019), and only a very small proportion of people visiting a park will tweet about it (Wilkins et al., 2018; Toivonen et al., 2019; Pickering & Norman, 2020). Therefore, Twitter will remain a complementary method to those traditionally used to understand the multiple values people ascribe to specific landscapes including in national parks.

5 Conclusion

Twitter is increasingly used globally in public discourse, and, as shown here can be used to provide insights into how people engage with specific landscapes including in mountain national parks. However, as with many types of social data there are important considerations about biases and the accuracy, types of data that can be obtained and how representative it may be of who, how, when and why people engage and value landscapes. What is clear is that with the increasing centrality of social media in peoples lives and the level of influence and engagement with platforms such as Twitter, further research exploring these mediums of communication and exchange and how they can be used to understand people nature interactions will be required.

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