

The distribution of climate and weather information for tourism in New Zealand

The screenshot shows the Northland's official tourism website. The header includes the 'NEW ZEALAND'S FIRST NORTHLAND' logo, the tagline 'Northland's official tourism website', and the slogan 'VISIT LIVE WORK'. A navigation menu lists categories like 'About Northland', 'Things to see & do', 'Destinations', 'Accommodation', 'Conferences & Meetings', and 'Getting There & Around'. The main content area is titled 'CLIMATE' and features a sub-header: 'Okay, yes it rains sometimes, but you get that in a subtropical climate, and that rain helps beautiful fruit and produce to grow.' Below this, it states 'We don't do snow or sub-zero temperatures, so you won't need to pack your full-length winter coat.' The text is divided into seasonal sections: 'SUMMER - DECEMBER TO FEBRUARY.' and 'AUTUMN - MARCH TO MAY.' A featured image shows a sailboat on a lake. A 'Key Facts' sidebar lists: 'New Zealand's warmest and only subtropical region', '2000 sunshine hours on average each year', 'Hottest months January and February', 'Sun protection is highly recommended all year and is essential in summer', 'Typical annual rainfall for Northland is 1500 - 2000mm', 'Winters are mild', and 'Daylight saving in effect October to March'. A 'FEATURED' section highlights 'DIVE! TUTUKAKA >>' as the largest dive charter operator in New Zealand.

Jude Wilson

LEaP Research Paper No. 3

June 2011

Land Environment & People



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ABSTRACT

This report examines the distribution of climate and weather information for tourism in New Zealand with a particular focus on tourists and tourism operators as end users. The report draws on data collected via a number of empirical research projects undertaken as part of a larger research project investigating climate change and tourism in New Zealand. These include: tourist surveys; archive analysis of media reports on climate/weather and tourism; analysis of internet weather resources; and interview data from case studies undertaken in the Southern Lakes region and Northland. The report is structured around a model of weather information provision which includes weather information providers, intermediaries, end users of weather information and the transfer of information between these.

In New Zealand, the MetService is the primary provider of weather data, forecasting services and weather information. MetService data are also used by other New Zealand-based and international weather information providers. Overall, there is a wealth of weather information freely accessible via general weather websites, weather portal sites and specialist weather websites. While weather information can increasingly be accessed directly by end users (i.e. from the internet or via other mobile technologies) a considerable amount of weather information is still delivered to end users via intermediaries such as the media, and to a lesser extent the tourism industry and other agencies and community support organisations.

The primary (and traditional) weather intermediary is the popular media (i.e. television, newspaper and radio) who publish/broadcast daily weather data and forecasts. Climate and weather information also periodically appears in news articles covering a wide range of weather-related topics. Tourism operators and support services, such as the i-SITE and the Department of Conservation (DOC) Visitor Centre networks, often act as intermediaries in the distribution of climate and weather information. Many accommodation providers also display weather forecasts for their guests. Most travel guidebooks and travel websites provide some climate information. A review of climate and weather information on Regional Tourism Organisation (RTO) websites, however, found that, overall, the information provided was limited.

End users of weather information include international tourists, domestic tourists and the local population (some of whom work in the tourism industry), and tourism operators. Tourism operators' awareness and knowledge of weather information sources reflects the importance of the weather to their operations. There are a number of issues in respect of the transfer of information between the three components of the weather distribution system. Between weather information providers and intermediaries, the quality and type of available weather information is a key issue. Between intermediaries and end users, there are issues surrounding the interpretation of weather data and, in particular, intermediaries' willingness to take responsibility for passing on information in the event of severe weather events. Between weather information providers and end users, there are concerns about how well weather information sources and weather data are understood by tourists. While the tourism industry is reasonably weather 'savvy' in respect of their own weather needs, there is a need to better convey weather information to tourists as end users.

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INTRODUCTION

“There has been limited evaluation of what sources of climate information tourists and tourism operators utilize, or the effectiveness of different communication pathways and formats” (Scott & Lemieux, 2009, p iii, in *Weather and Climate Information for Tourism*).

This report examines the distribution of climate and weather information in New Zealand with a particular focus on tourists and tourism operators as end users. The primary focus is on weather information as this is accessed and used on a more immediate basis than is more generic climate information. The report is part of a larger project on “Preparing the tourism sector for climate change”, which seeks to identify which parts of the tourism industry are most vulnerable to climate variability and change, and what adaptation measures could be put in place to reduce vulnerability. The distribution system for climate and weather information featured a number of times in individual research projects within the larger project. In particular, the use of weather information is inconsistent across the tourism industry. There also appear to be issues surrounding tourists’ access to, and understanding of, what climate and weather information is available¹.

IMPORTANCE OF CLIMATE AND WEATHER INFORMATION FOR TOURISM

Why is climate and weather information important for tourism?

- Quality and availability of climate and weather information
 - Climate data and weather information important as part of destination image
Accurate pre-trip climate and weather information contributes to greater tourist satisfaction
 - The quality of weather data is important as it feeds into climate data
- For destinations
 - Impacts on visitor numbers and visitor patterns
 - Climate information is a primary and initial determinant of holiday timing
 - Weather forecasts (in the shorter and more immediate term) sometimes impact significantly on visitor numbers
- For tourism operators
 - Informs tourism operators in respect of the equipment they need, their likely operating conditions and the number of guests/clients they can expect
- For tourists
 - Weather forecasts are used to plan travel routes, timing and activities
 - Climate and weather information help prepare tourists with regard to bringing/wearing appropriate clothing
 - Poor/limited weather information held by tourists leads to safety issues

¹ Climate and weather information includes specific and measurable ‘data’ (of weather variables) and ‘forecasting’; throughout this report the more generic ‘information’ is also used to denote general facts about the climate and weather.

DATA SOURCES

Data for this report is drawn from an internet examination of weather and climate data sources, interviews with key informants involved in the provision of weather information in New Zealand and data collected as part of a number of empirical research projects (references denote original and more detailed analysis of these research data). Specifically, these include:

1. Interviews with tourism operators, tourism stakeholders, institutional stakeholders and infrastructure providers in two case study areas: Southern Lakes (Queenstown and Wanaka) and Northland.
2. Interviews with key weather information providers and weather information intermediaries, including: Mike Hall, the television presenter responsible for the TV3 weather presentation; Bob McDavitt, the weather ambassador for the New Zealand MetService; MetService staff; and Tony Trewinnard, Blue Skies Weather and Climate Services.
3. Survey data collected via two primary research projects: (1) a survey of international tourists and the impact of weather on their trip (Becken, Wilson & Reisinger, 2010); (2) a survey which looked at the ways in which international and domestic tourists inform themselves about severe weather (Jeuring, 2011).
4. Desktop and archive research of weather and climate information sources including: analysis of media articles on weather information and forecasting (Becken et al., 2010); review and content analysis of climate and weather information on RTO websites (Wilson & Becken, 2011); internet search and review of weather and information resources and websites; internet search for climate information resources for tourists.

Figure 1 shows a basic weather information model of the relationship between weather information providers, intermediaries and end users, and the connections between these; more detail of each component is shown in Figures 2, 3 and 4. This paper is structured similarly and begins with a description of weather information providers, intermediaries and end users, before looking at the transfer of information between these. A similar model applies to the distribution of climate information and, where relevant, this is included in the discussion.

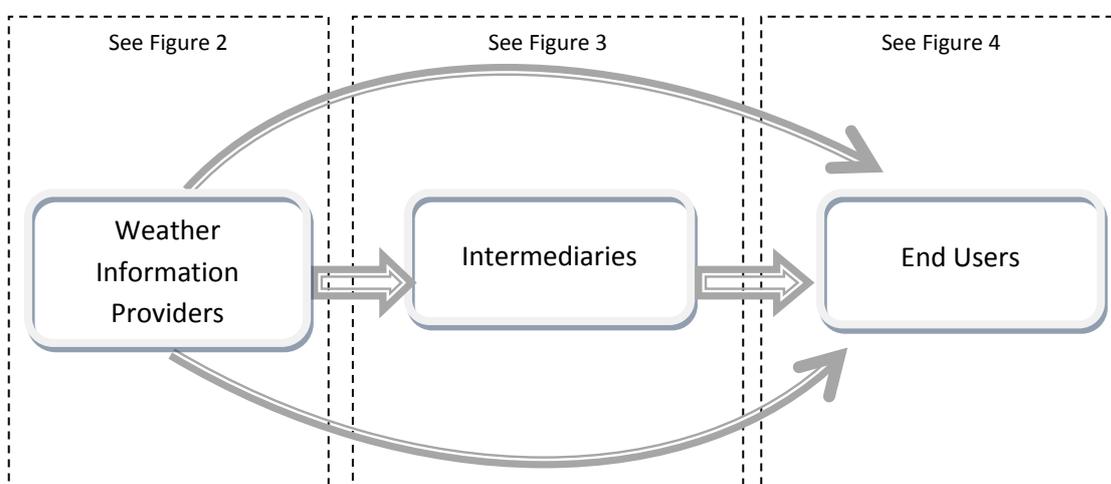


Figure 1 Basic model of weather information provision

WEATHER INFORMATION PROVIDERS

Weather data are collected and provided internationally by National Meteorological Services (NMS) and governmental agencies, and by private sector climate service providers of both general weather data/forecasts and more specialist services (e.g. surf, snow forecasts). In New Zealand the official collection of weather data is the responsibility of the New Zealand MetService; these data are archived by the National Institute of Water and Atmospheric Research (NIWA) and made available to the public through climate summaries (Figure 2). The New Zealand MetService also provides weather data to a myriad of other New Zealand, and internationally-based, weather information providers, a sample of which are shown in Figure 2. Although based on MetService data, many of these weather providers either present these data in different formats, or they apply their own climate and weather forecasting models to the data. The majority of the climate and weather information described below is freely available via the internet.

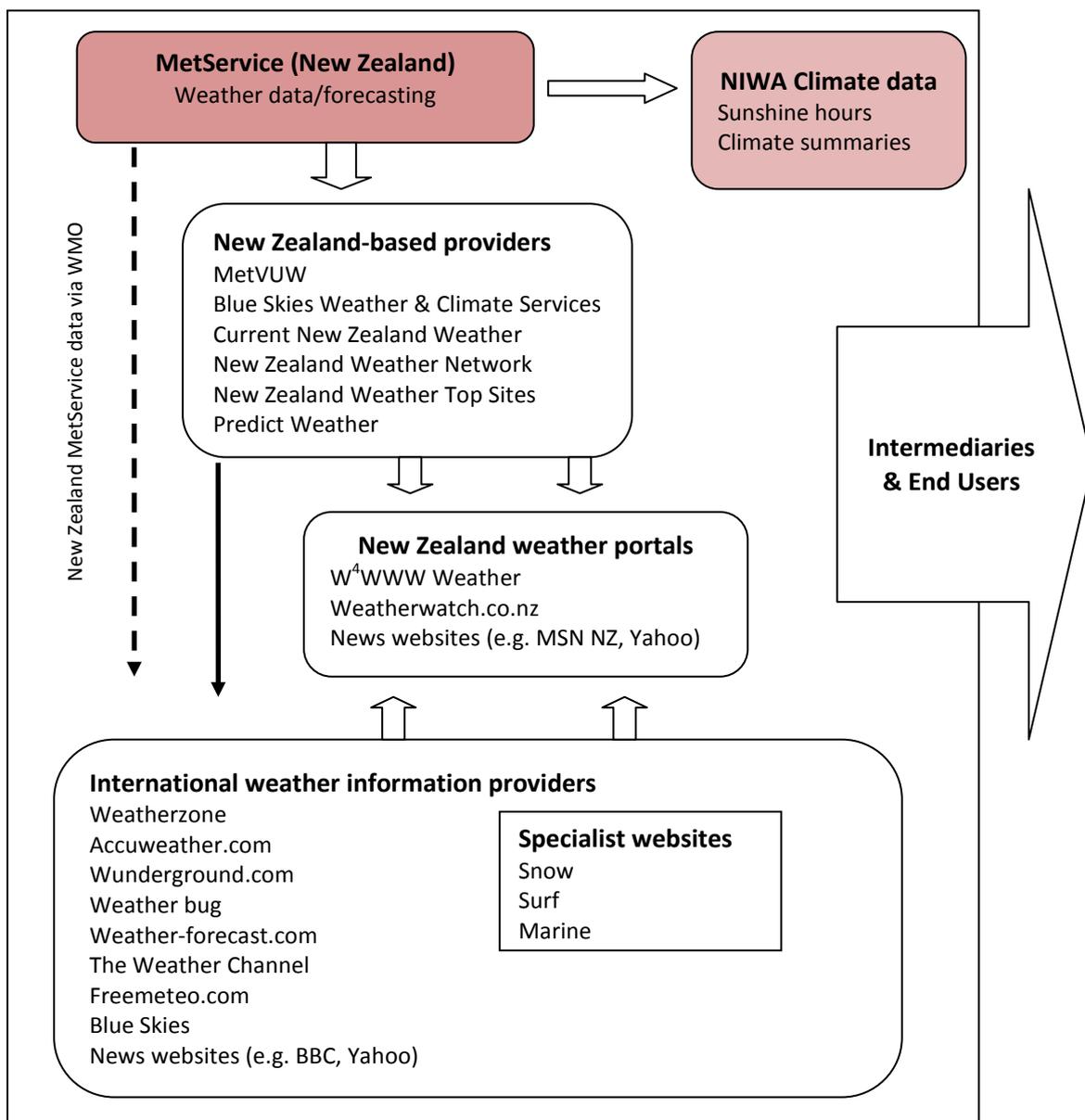


Figure 2 Weather information providers

NEW ZEALAND METSERVICE

In New Zealand the MetService has the government mandate to provide official weather information. In terms of legislated responsibility for issuing meteorological information, “the Minister of Transport, under the Meteorological Services Act 1990, is responsible for ensuring the provision of meteorological warnings and forecasts for New Zealand and the collection of data to support these services. Furthermore, the Minister is required to designate an organisation that shall provide the authorized warning service in New Zealand” (WMO 2009, quoted in Scott & Lemieux, 2009). New Zealand weather data is distributed via the WMO to some international weather providers (Figure 2).

The MetService has its own weather stations. These were traditionally located at airports, but over the last few years some have been either repositioned, or new stations have been established to better reflect temperatures/conditions in populated areas. Weather stations have also been installed along main roads as part of a new initiative with the New Zealand Transport Agency (NZTA). Some of these weather stations provide thermal maps to help measure temperatures on roads prone to ice in winter; others measure extreme heat in summer and other local conditions of importance, such as wind speeds on the Auckland harbour bridge.

The weather data collected (air temperatures, precipitation, and wind) are used to report current conditions, assist with forecast modelling and are then archived by NIWA. NIWA maintains the national climate database for New Zealand and operates hundreds of climate monitoring stations across New Zealand; NIWA is also responsible for the collection of data on sunshine hours. The temporal dividing line between NIWA and the MetService is 6 weeks, i.e. NIWA put out a 3-month seasonal forecast and the MetService provides a 6-week regional outlook.

Weather data are available to the public and to business end users free via the MetService website; users can also register to receive weather updates on demand, via mobile phones and fax. The MetService has contracted services with, amongst others, the Department of Conservation (DOC), NZTA, Airways (who operate New Zealand airports), the Interislander and WeatherTrek (who display on OOH – out-of-home television screens – in i-SITES and transport terminals) (Photo 1). The MetService also provides swell warnings to councils and port authorities.



Photo 1 WeatherTrek screen, Paihia i-SITE (J.Wilson)

OTHER NEW ZEALAND-BASED WEATHER INFORMATION PROVIDERS

The MetService provides weather data for distribution via newspapers, radio and television, and provides data for other weather websites (e.g. MetVUW) and web portals. These portals (some of which are weather/climate specific), along with a multitude of other websites, have electronic links to the MetService website.

MetVUW weather and climate service is a meteorological service operated by Victoria University. Much of the material they provide is available free via their website (<http://www.metvuw.com/>) and includes: satellite imagery (data from MetService, and MTSAT data courtesy of Japanese Meteorological Agency); weather radar (data from MetService, image enhancement by MetVUW); forecast charts (generated by software written by MetService, based on data from United States National Weather Service); current New Zealand weather; and ocean weather.

Blue Skies Weather and Climate Services Ltd have been providing customised weather services to a variety of industry segments for 25 years. The company offers weather forecasting based on a data from a range of sources including the MetService. Blue Skies do not offer any free weather services (i.e. they have no free, publically available website) and have limited specific involvement with the tourism sector. They do, however, have considerable public presence and are often approached by media to provide weather comments and longer-term forecasts (e.g. pre-holiday periods).

There are also a number of internet weather sites that link to a network of private weather stations around New Zealand. Some weather stations appear on multiple sites, as well as providing data to international weather providers such as Weather Underground (<http://www.wunderground.com>) (see Table 2). A sample of these websites, their data sources and other weather website links are shown in Table 1.

Table 1 New Zealand-based weather information providers

Current New Zealand weather (http://homepages.paradise.net.nz/tmcgavin/current_nzweather.html)	
	Provides electronic links to real-time “on-the-web” weather stations and to other New Zealand weather websites (including MetService, MetVUW), and to New Zealand data displayed on The Weather Channel (http://www.weather.com/).
The New Zealand Weather Network (NZWN) (http://www.nzweather.net/)	
	Pulls data from users of Weather Display, Cumulus, WeatherLink and Virtual Weather Station.
New Zealand Weather Top Sites (http://www.computecnetworks.com/topsites/)	
	A catalogue of 31 personal weather stations from around New Zealand with electronic links to weather data, rankings of each station (provided by site users), and a weather forum.

Predict Weather (<http://www.predictweather.com/>) uses historical trends and cycles of moon orbits to forecast future weather. They can forecast for one day or a year ahead and offer customised reports for any named location in New Zealand. Readouts list daily information on rain, sun/cloud, temperatures and wind information (where such data in historical databanks are available). There is a charge for this service. An almanac and isobaric maps for all of New Zealand is also published annually; the thirteenth edition, published by Random House, offered “essential weather predictions for fishermen, farmers, skiers, gardeners and all Kiwis” (Ring, 2010). The owner of Predict Weather,

Ken Ring, is popularly known as “the Moon Man”, and receives considerable media exposure for both weather and earthquake predications.

WEATHER PORTALS

In addition to the specific weather information providers described above, a number of weather portal sites provide links to a range of weather websites in New Zealand and internationally. W⁴ world.wide.web weather (<http://weather.noble.gen.nz/>), for example, is a New Zealand-focused weather information portal featuring New Zealand and global links to weather observations, forecasts, news and information websites. The author of the site is a meteorologist employed by the MetService.

Weather Watch (<http://www.weatherwatch.co.nz/>) is privately owned by The Radio Network and provides real-time weather information (collected by up to 30 ‘official’ weather watchers based in main cities and towns around New Zealand), links to breaking weather news from across New Zealand and the latest big weather stories from around the world. They provide long-range (10-day) forecasts for Auckland and display the New Zealand satellite image from The Weather Channel (see Table 2). The company are working with private forecasting organisations in New Zealand and America and plan to eventually extend their forecasting services nationwide. Weather Watch often provide media weather news and forecasts (e.g. prospects of weather for Christmas/New Year period that features in newspapers immediately prior to the holidays) and have a close relationship with the New Zealand Herald. Weather Watch forecasting was also published before Cyclone Wilma hit Northland at the end of January 2011 (with a much more extreme – and accurate – forecast than that provided by the MetService). A disclaimer on their website states that their forecasts are 100% independent of the MetService.

A number of news websites also provide New Zealand weather information. MSN, for example, has a New Zealand-based news and information website which displays weather information based on MetService data (<http://news.msn.co.nz/weather/>) with electronic links to the MetService website. The New Zealand Yahoo weather service (<http://nz.weather.yahoo.com>) is provided by Xtra through the Telecom network and also uses MetService data.

INTERNATIONAL WEATHER INFORMATION PROVIDERS

There are a considerable number of both general and specialist international weather information providers which provide data for New Zealand locations. These providers display data provided by their own weather stations, NMS providers (i.e. they use MetService data via the WMO) or the network of backyard stations (see Figure 2). Often this data is tailored to specific users. In Australia, for example, The Weather Company converts information supplied by the Bureau of Meteorology (BoM) into computer ready data, specialised forecasts, TV or web ready graphics and scripts. The material is distributed through <http://www.weatherzone.com.au>. According to their website, The Weather Company is recognized as Australia’s leading commercial weather information provider to media and internet organisations. They also offer a weather iPhone App, a number of weather related widgets that can be downloaded to personal computers and a Facebook App. For Australian

subscribers, a number of mobile phone, text, and weather alert services are available. New Zealand forecasts are produced by weatherzone based on data from the New Zealand MetService.

The majority of other international weather providers appear to be USA based, although as noted above, many provide data for New Zealand locations. A selection of these is shown in Table 2.

Table 2 International weather information providers

AccuWeather (http://www.accuweather.com)	Provides the weather for over two million locations worldwide.
Weather underground (http://www.wunderground.com)	According to their website, has developed the world's largest network of personal weather stations with almost 19,000 stations in the US and more than 13,000 across the rest of the world.
WeatherBug (http://weather.weatherbug.com)	Part of the Earth Networks organisation, integrates data from sources such as the National Weather Service (NWS) and World Meteorological Organization (WMO). They provide users access to the largest network of professional weather stations in the U.S. and to more than 35,000 weather station locations around the world.
Weather-forecast.com (http://www.weather-forecast.com)	Provides long range city weather forecasts for thousands of locations around the world and is published by the Meteo365.com company (http://www.meteo365.com/) who also provide surf, mountain and tide forecasts for international locations.
The Weather Channel (http://www.weather.com)	Began as a television network devoted entirely to weather and now has a website which features current conditions and forecasts for over 98,000 locations worldwide, along with local and regional radars.

Many of these weather information providers engage with multiple distribution mechanisms and technologies for weather information distribution. The Weather Channel group, for example, have partnered with leading internet, wireless, and mobile companies to allow consumers to access weather content. They supply weather information on their own website and to providers such as Yahoo (<http://weather.yahoo.com>). The New Zealand weather information provided on the international Yahoo website uses data from the Weather Channel group whereas, as noted above, the New Zealand Yahoo site uses MetService data. There are no New Zealand locations included on the international MSN website; a search for New Zealand weather leads to web listings of other weather sites.

The Weather Channel group also operates Weather Services International which, through Intellicast (<http://www.intellicast.com>), provides weather maps and data to companies for their own websites. A similar service is provided by Freemeteo (<http://freemeteo.com>) and, as Table 3 shows, is used by the Far North District Council on their i-SITE websites. An Australian-based subscriber service (which was previously free), Blues Skies Unlimited Weather Views (<http://www.views.com.au/>) offers live weather feeds for websites and customised weather stations in a range of electronic formats; a number of New Zealand weather data sites are available in their suite of global weather station locations.

SPECIALIST WEBSITES

More specialist weather websites are available to marine users. Maritime New Zealand suggests the two most convenient sources of marine weather are their own maritime radio service and Metphone (both based on MetService data). The latter service links to mobile phones. In addition to these forecasts, the Coastguard NowCasting service provides automatic weather (wind and sea condition) updates to boat users via the Coastguard VHF network. This NowCasting weather information is automatically generated using data from the MetService and from their own Coastguard Automated Weather Stations strategically placed around the country (<http://www.coastguard.co.nz/index.php?page=weather>).

Other New Zealand-based websites include Marineweather (<http://www.marineweather.co.nz>), which provides forecasts and weather charts based on the raw wave model data used by swell forecasting websites. The same swell forecasting data are used by international providers such as Buoyweather (<http://www.buoyweather.com>) who also provide long range marine forecasts for New Zealand locations.

A number of specialist weather providers catering to participants of snow and surf sports provide weather data and information (including some forecasting) for New Zealand and international locations. These include:

- New Zealand snow and ski websites such as <http://www.snowreports.co.nz> who provide their own snow forecasts for skifields/ski areas along with weather links to MetVUW, BoM and snow-forecast.com (<http://www.snowforecast.com>);
- <http://www.snow.co.nz> provide snow cams and weather forecasts (based on weather data from <http://www.weathermap.co.nz>, which is, in turn, provided by Met Ocean Solutions Ltd <http://www.metocean.co.nz>) for New Zealand ski areas;
- www.nzski.com presents MetService data and live skifield webcams;
- International ski websites, such as <http://www.snowforecast.com> (part of the Meteo365.com network), also provide New Zealand skifield weather reports and forecasts;
- SURF2SURF (<http://www.surf2surf.com>) and Swellmap (<http://www.swellmap.com>) (both New Zealand-based surf sites);
- <http://www.surf.co.nz> (who use data from <http://www.weathermap.co.nz>);
- <http://www.surf-forecast.com> provides swell and wind data for surfing, windsurfing and kitesurfing sites around the world;
- <http://www.windsurf.co.nz> provides live webcams and weather/wind data for a number of New Zealand locations. This site also has links to New Zealand providers such as MetService and MetVUW and to international providers such as PredictWind (<http://www.predictwind.com>), which collects data from 20,000 specific locations within 520 forecast areas globally.

The WeatherMap company, provides high tolerance weather data to the offshore and marine industry in New Zealand and internationally. They use “the latest atmospheric and oceanographic numerical models, and a large computing facility, to produce forecasts which are updated 4 times per day. All the weather information is made in New Zealand and is presented without human interpretation” (<http://www.weathermap.co.nz/info/about>). In addition to marine forecasts (for

surfing and boating) they also offer specialised activity (for golf, gardening, drying, pet walking and hair frizz factor) and commercial (for roads, airports, shopping and farming) forecasts.

There are also a number of sports sites, such as The Boating Info Centre (<http://www.boating.co.nz>), which offer links to a variety of weather and tidal information websites. In addition to the MetService, for example, they recommend (and comment on the services provided by):

- TVNZ Weather (“excellent coverage of all cities and towns in New Zealand”);
- Stuff Weather (“A wealth of weather information” including tides, actual and predicted wind strengths and five day forecasts);
- Intellicast (“much improved service” with a large amount of wind information);
- MetVUW (“excellent satellite and radar images, upper air data, forecast charts, current and ocean weather for all of New Zealand not just Wellington”); and,
- Yahoo!Xtra (“nicely presented MetService derived weather information”) (<http://www.boating.co.nz/nzweather.html>).

With the exception of Intellicast, these all present weather information based primarily on MetService data. MetVUW, for example, offers forecasting models based on a variety of data sources, (including the MetService).

INTERMEDIARIES

While increasingly, weather information can be accessed directly by end users (i.e. from the internet or via other mobile technologies) a considerable amount of weather information is still delivered to end users via intermediaries such as the media, and to a lesser extent the tourism industry and other agencies and community support organisations. Some of these intermediaries also display their weather information via the internet, but as intermediaries they differ from specialist weather information providers (such as, for example, nzski.com) because the provision of weather information is not one of their primary services. There are also varying degrees of information sharing and transfer between these groups (Figure 3).

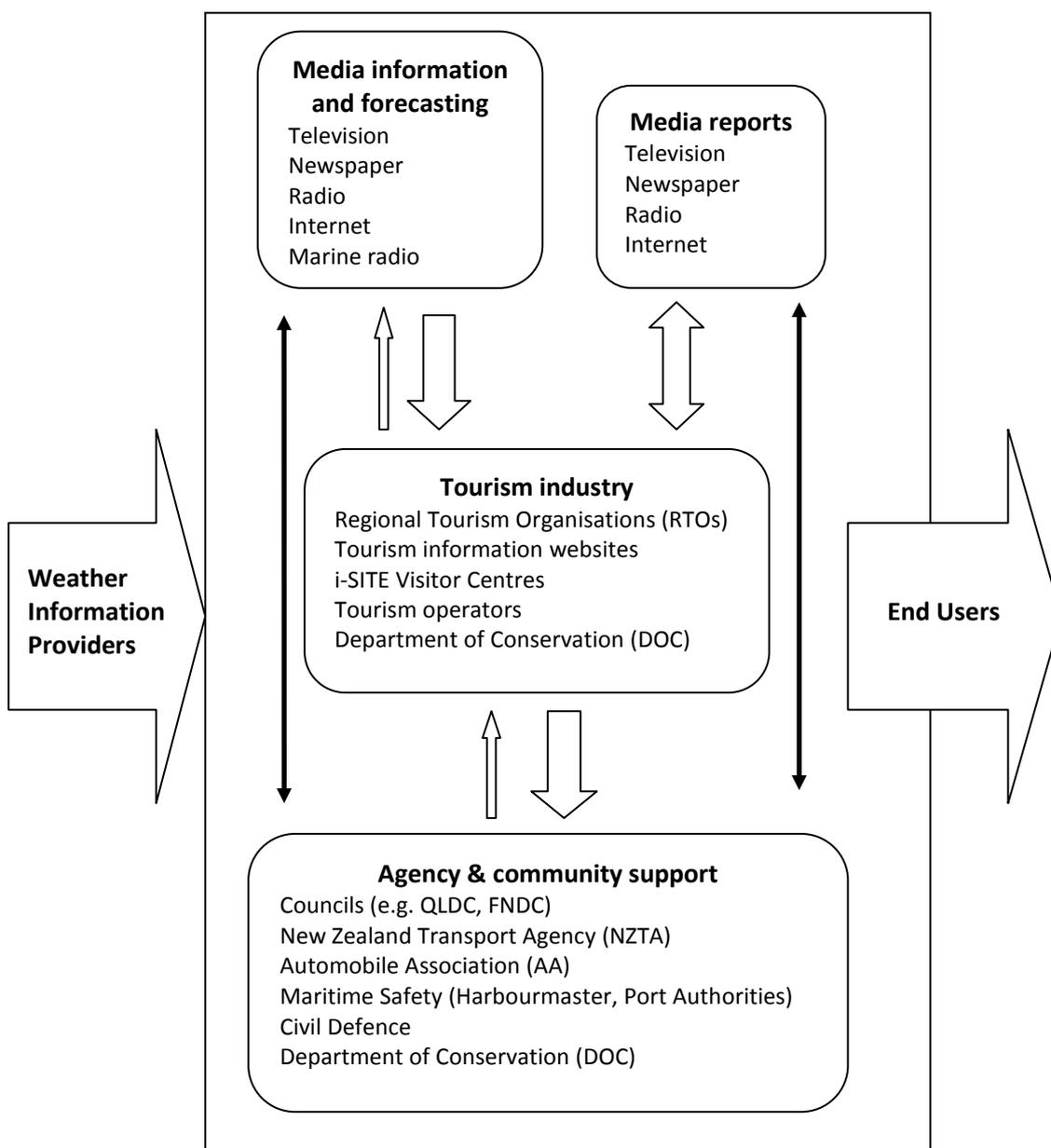


Figure 3 Intermediaries for weather information provision

MEDIA INFORMATION AND FORECASTING

The primary (and traditional) weather intermediary is the popular media (i.e. television, newspaper and radio), with most information and forecasting based on New Zealand MetService data. Local, regional and national forecasts along with New Zealand and international weather data are published in daily newspapers. National, regional and local weather forecasts are also broadcast by radio stations. Marine weather information and forecasts are distributed via VHF radio services and mobile telephone networks.

The two main television channels (TV1 and TV3) each include a 4-5 minute weather segment at the end of their early evening hour-long news broadcasts. These weather segments present daily temperatures and a general weather summary for the main cities and a selection of regional centres across the country. There are a few minor, but tourism relevant, differences in which centres are shown on each television channel's weather map – TV1, for example, includes both Paihia and Milford Sound on their 'forecast' map, whereas TV3 only includes these in the daily weather data. When Milford Sound was added to the TV1 weather forecast map in 2009, it was reported in the media both as a "benefit to the 470,000 visitors to the area each year" and as "an effective promotional tool" ("Milford Sound", 2009). When Paihia was added to the weather map it was reported in *The Northern Advocate* (2009) that "Paihia's no longer under the weather".

Both television channels also provide a more detailed forecast for the following day (e.g. with expected high and low temperatures, precipitation and wind conditions) and general country-wide forecasts (featuring weather graphics only) for up to four days. They also pass on any severe weather warnings issued by the MetService. While most media articles which address the quality of weather material presented on television focus on the inclusion or exclusion of particular destinations (as noted above), occasionally quality issues with the display of the weather material itself arise. In 2009, for example, there was concern expressed (by residents and by Tourism Bay of Plenty) over the quality of the images being broadcast by a new TVNZ weather camera in Tauranga. TVNZ camera's "blurred and out of focus" images, compared badly with the "perfect" images captured by the TV3 camera (Proverbs & Irvine, 2009).

Weather forecasts and current weather data are also distributed by traditional media sources via the internet with radio stations (or their parent media companies) and television channel websites displaying some weather content. These forecasts are usually more detailed than those presented on television and all three media (television, newspaper and radio) provide electronic links to weather information (usually the MetService) from their own websites.

In addition, the various specialised news websites also include weather data and forecasts. Stuff, the online publication of Fairfax media, uses MetService data, as do Yahoo telecom. The Sky Weather Channel (Digital 98) provides forecasts for 27 cities based on MetService data.

MEDIA REPORTS

Climate and weather information also periodically appears in news articles covering a wide range of weather-related topics. The MetService and NIWA seasonal forecasts are published (particularly pre-

summer) or in advance of long holiday breaks such as Christmas and New Year or Easter. Key information from NIWA's monthly and annual climate summaries is also published in the media or reported on television and via radio news bulletins. These weather and climate statistics are of interest to Regional Tourism Organisations (RTOs) as they provide evidence for promotional claims to be the 'hottest', 'sunniest', ('wettest') locations New Zealand. In an analysis of over 200 media articles which addressed the interaction between weather and tourism, for example, Wilson and Becken (2011) found more than 50 articles which focused on weather information and forecasting. The main issues, usually expressed by either the local RTO or selected tourism operators (i.e. quoted in the media), surrounded the impact of poor forecasting on visitor numbers and the challenges, in respect of regional promotion, presented by the measurement and publication of poor (or erroneous) weather and climate data. On occasion, these complaints (i.e. about the MetService's data collection) have resulted in the relocation of weather stations (see, for example, "Weather site shift", 1995; Zatorski, 1995; Spence, 2005; "New weather station", 2005). Closer investigation of this issue with some tourism operators in Northland, however, indicated that the majority accept that the available weather data and forecasting is usually correct; rather the problems lie with ineffective marketing by the tourism industry (e.g. one of the tourism operators interviewed noted that while it does get colder in winter, Northland is still warmer than many other parts of New Zealand and there is scope to make more of the "winterless north" in marketing the region).

Media stories about the weather also tend to focus on negative weather events; in Northland for example, there are complaints from tourism operators that, while photographs of flooding around attractions such as the Stone House at Kerikeri make great media shots, it is these that people often remember. Northland tourism operators also blame the media for extending weather event and impact stories well beyond the time span of actual occurrence or impact. A number of tourism operators interviewed in the Southern Lakes case study also reported challenges (in respect of maintaining operations) associated with inaccurate media representation of extreme events (e.g. flooding) both during and after the event.

Generally it appears that media reports which focus on negative weather events reinforce particular weather 'images', for a destination and it is relatively easy for a destination to get a reputation for being 'wet' or exposed to extreme events, whereas it can take a lot longer to counter this with positive weather stories and events. Overall, however, regions and destinations do have some control over what news is made publically available and often have a proactive relationship with local media to ensure that severe weather events are reported accurately. Some of the tourism operators interviewed in the Southern Lakes case study, however, noted that they had limited control over non-local media, or visitors to the region, who are able to post stories and images freely on the internet. The increasing accessibility of images of severe weather events via the internet will potentially increase the impact of negative news stories.

TOURISM INDUSTRY

Tourism operators and support services, such as the i-SITE visitor network, often act as intermediaries in the distribution of climate and weather information (as well as being end users of weather information in respect of their own operations). While the MetService appears to be the

most common provider of weather information to the New Zealand tourism industry, a number of RTOs and i-SITEs use data from international providers for their own climate and weather information (see Table 3 for examples); some also provide electronic links to international weather sites (rather than to the New Zealand MetService).

Table 3 International weather websites used by New Zealand RTOs and i-SITEs (February 2011)

Weather websites	Used by RTOs/i-SITEs
Weatherzone.com.au	Lake Wanaka Tourism
Accuweather.com	Central South Island
Wunderground.com	Nelson Tasman Tourism
Msn.weather	Nature Coast
Weather bug	Tourism Auckland?
Freemeteo.com	Paihia i-SITE (Far North District Council)
The Weather Channel	Destination Lake Taupo
Yahoo	i-SITE network websites (Tourism New Zealand)

A review of climate and weather information on RTO websites found that, overall, the information provided was limited. Also, very few RTOs provide tailored information for specific tourist locations or recreational activities (Wilson & Becken, 2011). Few RTOs appeared to take full advantage of their climate advantages; neither Destination Marlborough nor Tourism Bay of Plenty, for example, published their actual sunshine hours, although they did promote themselves as the ‘sunniest’ places in New Zealand. Wilson and Becken (2011) also found that many RTOs are selective in the information they do provide; perhaps in response to their own region’s climatic limitations. Often this contributes to the presentation to tourists of less than realistic weather conditions, a picture further reinforced by a ‘blue sky’ bias in marketing. This has greater potential to cause problems for international rather than domestic tourists; the latter are assumed (by tourism operators interviewed in both case study areas) to have a more realistic understanding of New Zealand weather conditions.

Climate information is also provided in most travel guidebooks and the Tourism New Zealand website displays detailed pages with information on New Zealand’s climate, weather, temperature and seasons, including recommended clothing (<http://www.newzealand.com/travel/about-nz/nature/nature-climate-and-weather.cfm>). This has links to the MetService website for current weather information and forecasts and to the NIWA website (www.niwa.co.nz) for climate information. A number of other tourism websites also display climate and weather information. A sample of these is shown in Table 4.

Table 4 Tourism websites displaying climate and weather information for tourists

The New Zealand Tourism Guide (http://www.tourism.net.nz/weather/forecast-and-weather-map/)	Electronic link to the MetService
The New Zealand Travel Guide (http://www.tourism.org.nz/climate.html)	Electronic link to the MetService
Four Corners (http://www.fourcorners.co.nz/new-zealand/regionalweather/)	Data and links to the NIWA website and weather links to the MetService, MetVUW, several online newspaper websites, snowreports.co.nz, and Rosies weather (http://met.net.nz/) “a personal site with all the weather links you will ever need”
Experience New Zealand Travel (http://www.experiencenz.com/climate.cfm)	Electronic link to the MetService

International travel websites, such as Lonely Planet, also display New Zealand climate and weather information (<http://www.lonelyplanet.com/new-zealand/weather>). The information provided by Lonely Planet, however, is limited to an explanation of the influence of the wind on New Zealand weather systems (with the predominant wind direction erroneously given as easterly) and a brief outline of which months fall in each season. For visitors planning to go tramping, Lonely Planet suggests getting detailed weather information from the New Zealand Mountain Safety Council, and that this information is available through Department of Conservation (DOC) Visitor Centres nationwide.

Commonly, i-SITES display weather forecasts – either cut out from local newspapers, printouts from the MetService website or via onscreen displays of WeatherTrek data (see Photo 1). Often, i-SITE staff show tourists the relevant forecast on the MetService website and some i-SITES also display weather-related road conditions (Photo 2). Many accommodation providers display the latest local weather forecast for their guests. The electronic display in Photo 3, for example, shows the Auckland forecast, based on MetService data, distributed via a TV3 newsfeed.



Photo 2 Road information sign outside Wanaka i-SITE (J. Wilson)

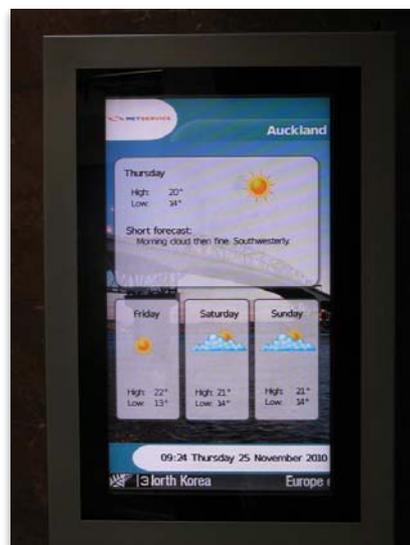


Photo 3 Electronic weather display in Rendezvous Hotel, Auckland (J. Wilson)

While many outdoor activity providers have weather information on their websites (usually in relation to the equipment required or provided) the weather more often features on their FAQ web pages (and particularly with respect to the effect of wet weather on operations). There is, however, some discrepancy between these responses and marketing material; rafting operators, for example, claim that rain makes no difference to a rafting experience (and, may in fact, improve the experience through increased water flow) while at the same time showing only images of sunshine. Some activity operators also display weather forecasts and clothing requirements (or recommendations) on-site, an example is the Shotover Jet signboard shown in Photo 4.

There is also some exchange of weather information between activity providers, e.g. if an operator has been in an area they may report localised weather conditions and weather impacts to other tourism operators, to DOC or to agencies responsible such as the local or regional council or NZTA. In Queenstown, transport operators (and particularly those driving into and around the region)

commonly report on weather-related road conditions to the local i-SITE, other tourism operators and responsible agencies.



Photo 4 Shotover Jet signboard showing weather forecast (J. Wilson)

DOC also displays weather information in their Visitor Centres, most of which are located in National Parks. In areas such as Northland, where there is no formal DOC Visitor Centre, some generic weather and river information is provided on pamphlets and, occasionally, if particularly bad weather is forecast DOC staff will warn people booking huts in the region. The Queenstown DOC Visitor Centre has a dedicated weather corner displaying information on the normal weather conditions for various tracks (Photo 5) and more detailed notice boards with current weather conditions and forecasts printed from the MetService web pages (Photo 6).

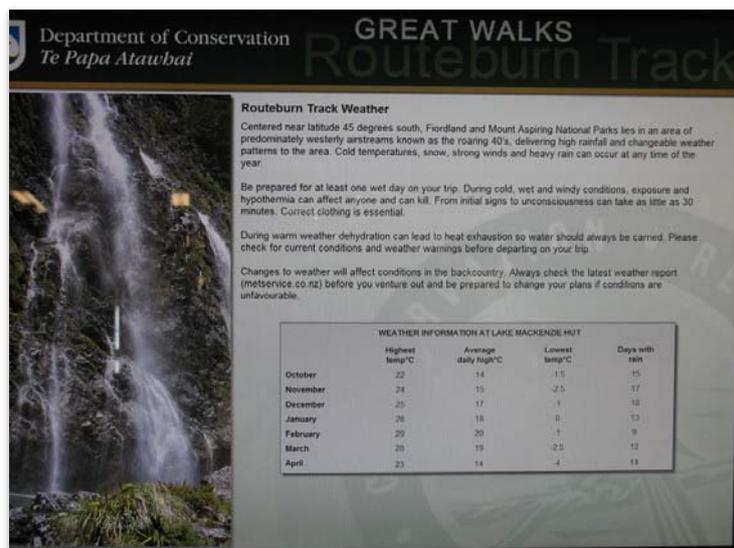


Photo 5 Weather information for RouteburnTrack, DOC Queenstown visitor centre (J. Wilson)



Photo 6 Current weather information displayed at DOC Queenstown visitor centre (J. Wilson)

Because of the nature of their responsibilities as both a tourism operator/facilitator in their own right, and in respect of the management of the conservation estate and facilities on that estate, DOC are also well connected to many other agencies with an interest in the weather. When there are storms forecast in the Southern Lakes region, for example, DOC receives weather faxes from the MetService and the Regional Council. They also regularly tap into the Regional Council's river flow data. An electronic display in the Queenstown Visitor Centre shows the range of weather information providers and support agencies DOC work with (Photo 7). While DOC does not operate their own weather stations, they do monitor avalanche danger on the Milford Road and display Milford Road information from the NZTA website (Photo 8). They also pass on severe weather warnings to hut wardens.

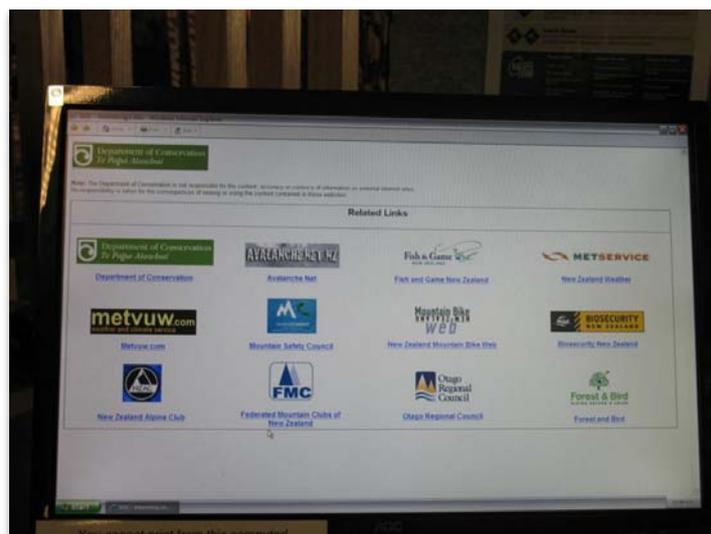


Photo 7 Electronic DOC display of weather and support agencies, DOC Queenstown (J. Wilson)



Photo 8 Milford Road information on display, DOC Queenstown Visitor Centre (J. Wilson)

AGENCY AND COMMUNITY SUPPORT

A variety of agencies responsible for infrastructure and community support also act as intermediaries in the weather information system in a number of ways. They may, for example, collect their own data (e.g. Regional or District Councils collect river and lake level data) which they pass onto other agencies (such as DOC). Alternatively, councils or other support agencies might review these data (in association with MetService weather forecasts) and issue public warnings themselves, e.g. in severe weather events the likelihood of flooding in particular locations may increase and an associated public warning might be posted on the relevant agency website, or released through the media. Information on the use and transfer of weather information by these agencies was explored in both the Northland and Southern Lakes case studies.

In the Southern Lakes, the weather is closely monitored by the Queenstown Lakes District Council (QLDC) Emergency Management office in respect of potential impacts on the local population. Also, while the QLDC takes steps to be prepared themselves, they also have a responsibility to prepare the public for severe weather events, which they do through public awareness campaigns. In summer, for example, the Harbourmaster (who has a delegation from Maritime Safety) runs major water safety promotions. They also employ additional staff over summer to monitor lakes and activities, particularly in Wanaka where there are a lot of domestic holidaymakers with boats. For international tourists, who are more likely to undertake activities commercially, it is assumed that tourism operators have enough 'local knowledge' not to go out in certain conditions.

In popular tourist areas, these agencies also sometimes communicate directly with the local i-SITE Visitor Centres to ensure that visitors to the area are adequately warned in the event of forecast bad weather. Often, however, it appears more common for i-SITE staff to check the various agency

websites themselves for updated information. Staff in the Queenstown i-SITE, for example, receive faxes about the road conditions from NZTA and also check the Automobile Association (AA) website. As was shown in Photo 8, the Milford Road has its own dedicated page on the NZTA website. As noted earlier, the Queenstown i-SITE has a close relationship with many tourism operators, especially transport companies, and they have contact with bus drivers with regard to the state of the alpine passes. NZTA and the AA maintain on-site road signs which reflect current road status and driving conditions on roads which are subject to weather-related problems (Photo 9).



Photo 9 On-site road information at northern end of Crown Range Road (J. Wilson)

In particularly severe weather events, the operational responsibilities and actions of many of these agencies are coordinated under the umbrella of Civil Defence Emergency Management (CDEM). In Northland, with the exception of a direct phone call from the local CDEM coordinator to the Paihia i-SITE, however, there is currently limited formal involvement with Civil Defence by the tourism sector. For a more detailed description of the Civil Defence operational structure, and of the role of tourism operators in disaster management in Northland, see Becken, Wilson and Hughey (2011). In many areas of New Zealand DOC are closely involved with Civil Defence.

In addition to posting hazard and warning information on their own websites, councils and other agencies also distribute information to the public via the media. Often warnings of potential flooding of rivers and lakes, predicted high ocean swells, road closures due to heavy snowfalls and landslips are combined with weather forecast information from the MetService or other weather information providers and published by the media. In May 2011, for example, a New Zealand Herald article reported on a storm that had hit Auckland and was forecast to move onto the Bay of Plenty region. The article had input from the Bay of Plenty Regional Council, NZTA, the Fire Service, the Police, a MetService spokesperson, and a Weather Watch analyst; the impacts of the storm on flights from Auckland airport, and on ferry trips in Auckland harbour were reported, and potential impacts on Tongariro National Park were noted (Davison, 2011).

END USERS

End users of weather information include international tourists, domestic tourists and the local population (some of whom work in the tourism industry) and tourism operators (who use weather information to inform their own operations). For end users, weather information may come directly from the weather information providers or it may be accessed via intermediaries (Figure 4).

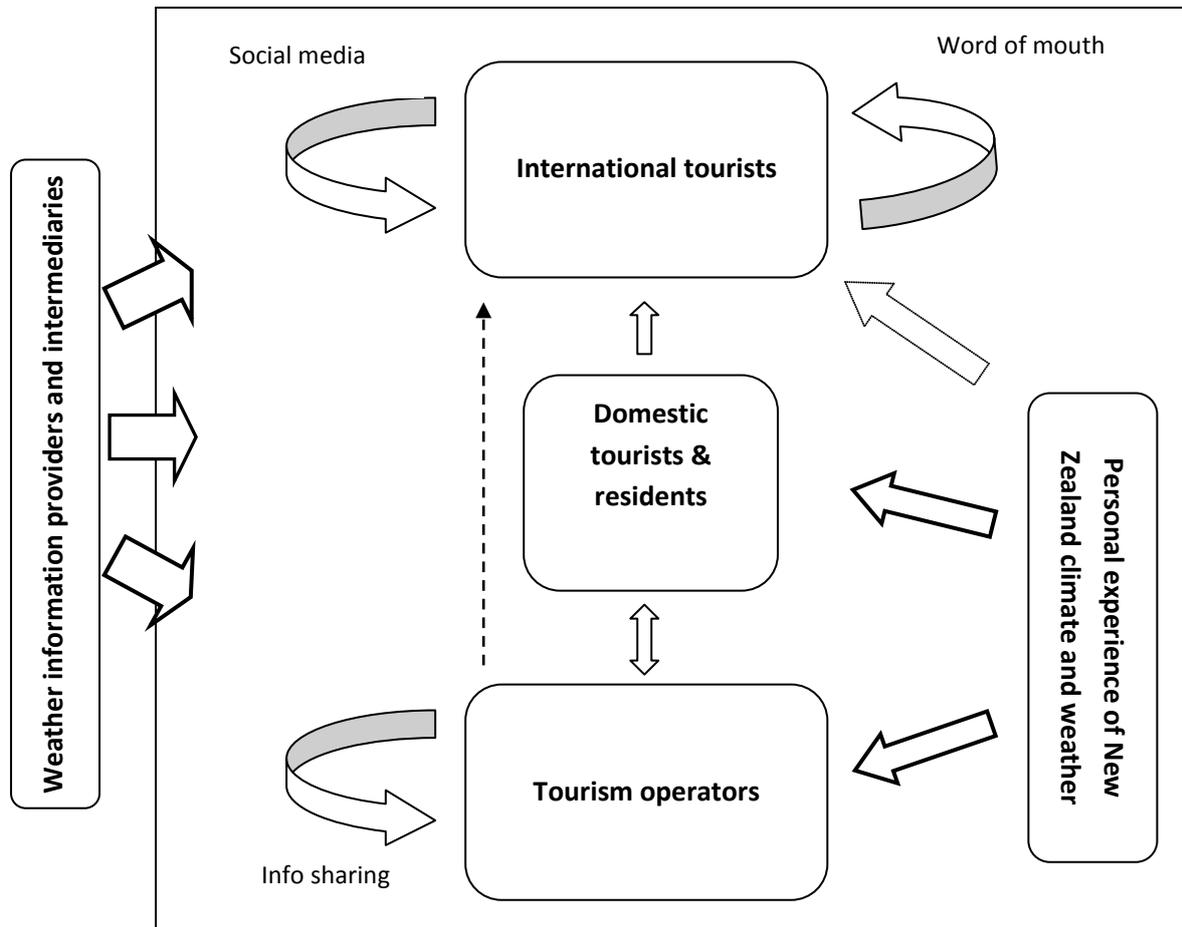


Figure 4 End users of weather information

Personal experience of the weather is important and there is a continuum of awareness and understanding of New Zealand weather, with the local population, i.e. both domestic tourists and residents and tourism operators (the most informed) and international tourists (the least informed), at either extreme. There are, however, some anomalies in this. International tourists, for example, may have experience of New Zealand's weather from previous visits, whereas there may be many recent arrivals to a particular area (or to New Zealand) within the local population. In Queenstown, for example, a considerable number of people employed in the tourism industry are recent arrivals (sometimes from elsewhere in New Zealand, but more commonly from overseas) and are not familiar with the local weather patterns. Also, domestic tourists may travel to areas with weather conditions they are not familiar with; some domestic tourists, for example, are less informed than others in respect of the unfamiliar mountain environments represented by the Queenstown DOC estate.

This section reports data on the end users of weather information from a number of sources. The section on international tourists, for example, draws on empirical data collected in the two surveys: (1) the impact of weather on international tourists New Zealand trips (see Becken et al., 2010) and (2) the ways in which international (and domestic) tourists inform themselves about severe weather (see Jeuring, 2011). Data collected from the sub-sample of domestic tourists in the second of these surveys informs the section on domestic tourists. The data on tourism operators, as end users of weather information, is drawn from interviews conducted as part of the two case studies; these interview data also informed the international and domestic tourist sections to some degree. Where relevant, material from the media archive analysis is also introduced.

INTERNATIONAL TOURISTS

Different types of climate and weather information are required at different stages of a tourist’s trip. As Figure 5 shows, for example, climatic information is useful in advance of the trip and helps determine destination choice, the timing of travel as well as some activity planning. Once at a destination, however, tourists find actual weather forecasts more important than climatic averages. Weather forecasts (and the weather tourists actually encounter) help determine on-site behaviour and activity choices, their spending and may impact significantly on their satisfaction (Scott & Lemieux, 2009).

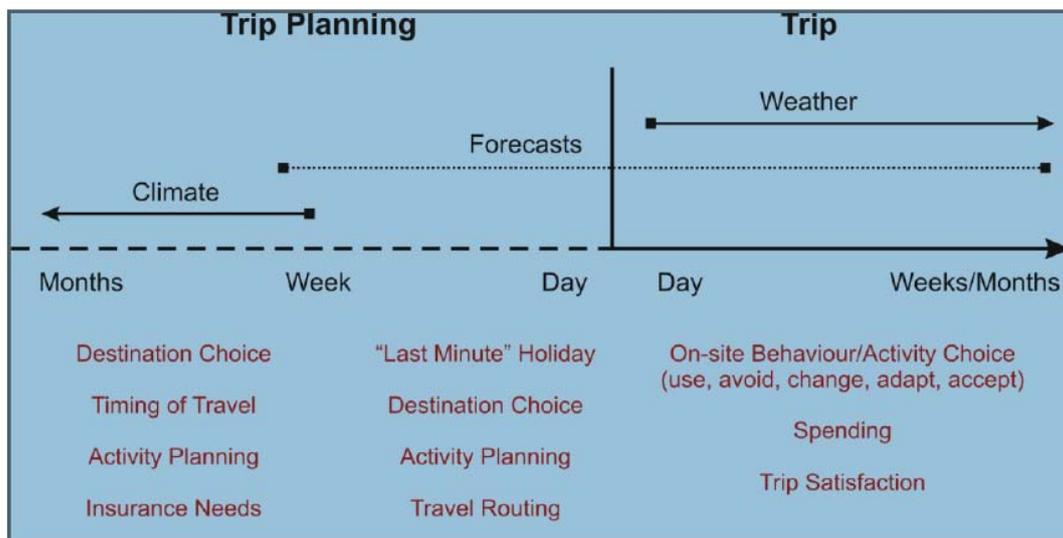


Figure 5 Weather-climate information for tourist decision-making (Scott & Lemieux, 2009, p.30)

Becken et al. (2010) examined the pre- and during-trip use of climate and weather information by 436 international tourists to New Zealand over the 2009/10 summer. Altogether, 409 (94%) of the survey respondents had looked at some climate and weather information pre-trip, with the internet most popular source of information (Table 5).

Table 5 Pre-trip information sources (Source: Becken et al., 2010)

Pre-trip information source*	Number	%
Internet	273	62.6
Guidebook	193	44.3
Word of mouth	138	31.6
Been before	58	13.3
Other	21	4.8
No information	27	6.1

*(N=436) Multiple answers possible

The most common weather information collected was the temperature (N=345, 79%) followed by rainfall (N=210, 48%) and sunshine hours (N=147, 34%). Respondents were also asked what they expected the weather would be like and if the weather they had experienced was different to what they expected. Altogether, 256 respondents (59%) reported that the weather was different to what they expected: of these 29% found the weather better than expected, 45% found it worse than expected and 20% reported that the weather was either unexpected or different (i.e. they expressed no judgement).

Respondents were asked if they looked at weather information whilst travelling in New Zealand: slightly more than three quarters of all respondents got some weather information (51% occasionally, 25% regularly) while 24% did not collect any. Those travelling on tours were the least likely to get weather information whilst in New Zealand. Many of those surveyed used multiple sources of weather information, but the most common source was the internet, followed by newspaper and television (Table 6).

Table 6 During-trip information sources (Source: Becken et al., 2010)

During-trip information source*	Number	%
Internet	121	37.0
Newspaper	54	16.5
Television	48	14.6
i-SITE	41	12.5
Accommodation provider	36	11.0
DOC	19	5.8
Locals	16	4.8
Radio	12	3.6
Other tourists	6	1.8
Tour guides	3	0.9
Activity/transport providers	3	0.9

*(N=327) Multiple answers possible, total number of times mentioned

The exact source and type of data collected from the internet is not known for either the pre-trip or during-trip weather information search, however. 'Internet' sources, for example, might include the internet sites of weather providers, the myriad media and tourism information websites that act as intermediaries in the provision of weather information as well as social media and travel blog sites.

Internet sources of weather information were explored in slightly more detail in Jeuring's (2011) survey which looked at how tourists inform themselves about severe weather, and the possible risks associated with this, during their New Zealand holidays. As Table 7 shows, the most popular sources of information about severe weather for the international tourists surveyed were locals, followed by i-SITE Visitor Centres and television. Altogether, however, slightly more than a third of respondents (N=141, 36%) reported getting severe weather information from their tourist guidebooks which are

more commonly a source of generic climate information, rather than a source of current weather data and forecasts.

Table 7 Severe weather information sources (Source: Jeuring, 2011)

Information source*	Number	Information source*	Number
Locals	197	Other tourists	94
i-SITE Visitor Centre	197	Tourism New Zealand website	72
Television	177	DOC New Zealand website	70
My tourist guidebook	141	Family and friends	50
DOC Visitor Centre	128	NZ Mountain Safety Council website	19
Radio	118	Mountain Radio Service	10
MetService website	117	Police	9
i-SITE website	106	Automobile Association (AA)	7
Newspaper	104	Land Transport New Zealand (NZTA) website	7

* (N=388) Multiple responses possible

Becken et al. (2010) also asked the tourists surveyed what weather information would have been useful to have had advance of their trip. Of the 144 suggestions made, slightly more than a third (N=53) related to general information about the climate and weather (i.e. standard weather variables such as temperature, rain, wind) and the particular nature of the New Zealand climate (i.e. the temperature fall at night, and the overall propensity for the weather to be changeable, unpredictable and variable). A further third (N=48) were about the type of weather information available, the quality and accuracy of weather forecasts and the general availability of weather information. Of the remaining suggestions, only two – that the weather was irrelevant (N=20) and clothing requirements (N=10) – were made by more than ten respondents.

The Becken et al. (2010) survey also confirmed the importance of word of mouth information transfer between international tourists, with the majority of those surveyed reporting that they would pass on information about the New Zealand climate and weather when they returned home. As noted above, however, it is not known by which means they would do this (i.e. in personal conversation and correspondence, or via social media). Generally these word of mouth comments were either neutral (i.e. were non-judgemental descriptions of the weather encountered) or were positive. The few negative comments made were given a positive spin (e.g. heavy rain was a novelty, temperatures were low but the sun was strong, and so on). The negative impact of word of mouth information, however, was noted by one of the activity operators in the Southern Lakes region. A ‘bad’ (as a result of the weather) climbing season, for example, helped to foster and promote a reputation for fierce stormy weather that could deter climbers from coming to New Zealand.

Some of these survey findings are supported by comments made by the tourism operators in the two case study areas. In Queenstown, for example, DOC staff have found that international tourists are not always prepared for how quickly the weather in New Zealand can change. In Northland, it was suggested that international tourists’ understanding of New Zealand weather conditions varies considerably as they tend to visit Northland either at the very beginning, or at the end of their New Zealand trips. While there is some potential for tourists to learn more about ‘reading’ the weather over time this may, in fact, reinforce the vagaries of the weather. The Becken et al. (2010) survey found, for example, that the longer tourists stayed in New Zealand the more likely they were to find the weather different to what they had expected pre-trip. The Northland i- SITE manager also

thought that domestic tourists probably “*understand*” the weather forecast differently from international tourists.

DOMESTIC TOURISTS

While New Zealand residents (who are domestic tourists when away from their homes) might not actively seek climate and weather information about other places in New Zealand in the same way as international tourists, they are constantly exposed to weather information via the media. The weather segment on the television news broadcasts, for example, provides current weather data and forecasting for destinations all over New Zealand which viewers may absorb without any specific desire for that information. Also, as noted in the discussion of media reports as intermediaries, the regularity with which images and reports of severe weather events are published potentially reinforces people’s preconceived ideas and images of certain destinations. Tasci and Gartner (2007) suggest that these autonomous materials (i.e. from news articles, educational materials, movies and popular culture) are more influential on image formation than destination-originated information (i.e. targeted marketing material) because they have higher credibility and ability to reach mass crowds. Also, it is thought that this impact is even greater when the autonomous material depicts dramatic events such as natural disasters.

Both the archive analysis of newspaper reports and interviews with tourism operators suggest that in the Bay of Islands it is widely believed (by the RTO and tourism operators) that poor information and forecasting on television weather reports puts people off visiting the region (see, for example, Forbes, 2008). While not an issue with regard to the longer Christmas/New Year holiday peak period (when pressure for accommodation means that visitors have to commit well in advance), this is thought to have a significant impact on visitor numbers on long weekends, and on those attending festivals and events, or making spontaneous trips to the Northland region. This is particularly the case in respect of potential visitors from the Auckland region who are thought to make last minute decisions (e.g. after the Thursday night television weather forecast) to visit Northland. Empirical data is required to confirm these claims.

The reliance on television weather information, and differences in weather information sources used by international and domestic tourists, is confirmed by the domestic sample in Jeuring’s (2011) research. While only 14 of the tourists surveyed were New Zealanders, the information sources used were quite different to those used by the international tourists surveyed (Table 7). As Table 8 shows, the most popular information source was the MetService website, followed by television, radio and newspapers.

Table 8 Severe weather information sources – Domestic tourists (Source: Jeuring, 2011)

Information source*	Number	Information source*	Number
MetService website	13	DOC website	2
Television	12	Land Transport New Zealand (NZTA) website	1
Radio	8	Other tourists	1
Newspaper	6	i-SITE website	1
DOC Visitor Centre	6	NZ Mountain Safety Council website	1
Family and friends	4	My tourist guidebook	1
Mountain Radio Service	4	Police	1
Automobile Association (AA)	3	i-SITE Visitor Centre	0
Locals	2	Tourism New Zealand website	0

*(N=14) Multiple responses possible

TOURISM OPERATORS

In addition to acting as intermediaries in the distribution of weather information many tourism operators also use weather information for their own operations. The MetService and MetVUW were the most popular sources of weather information reported in the case study interviews, although these were commonly used in conjunction with data from specialist websites and the occasional use of data collected via tourism operators' own weather stations. One tourism operator in Northland admitted to having paid the 'Moon Man' for forecasting services. The Northland tourism operators interviewed demonstrated a distinct preference for MetVUW, a preference that appeared to be partly based on the provision of better wind data by MetVUW (which is important for water-based tourist activities), and partly the result of historical mistrust of the MetService. In contrast, most of the Southern Lakes operators were reliant on the MetService as their primary weather provider, although they often augmented the MetService data with that from MetVUW.

Tourism operators are normally resident in a particular area and are familiar with the local climate and weather and in the case study interviews they emphasised the importance of this local knowledge. They also noted the importance of having skill with regard to 'reading' the available weather data (especially the case if MetVUW is used) and forecasts. Some operators talked about getting a 'feel' for the long-range forecast. The archive analysis suggested that there is a widespread expectation and trust by the public (and by international tourists), that commercial activity operators have sufficient weather expertise to operate safely. In contrast, a considerable amount of media space is given to reports of international tourists requiring rescue in adverse weather conditions when undertaking activities independently (see, for example: Christieson, 2005; Keith, 2010; Watson, 2005). While Watson (2005) described the rescue of independent trampers, however, he also reported that there had been calls for transport operators to take more responsibility when dropping tourists at tracks when the weather is bad or when the tourists are ill-prepared for the conditions more generally.

DOC has the greatest degree of crossover in their roles as both an intermediary and end user of weather information. Weather information is important for DOC in respect of their field operations and they use a variety of weather information providers and services. In Northland, for example, the MetService marine forecast and marine/coastguard radio channels are consulted for access to the islands where they manage campsites. They check the weather forecast on a daily basis and prefer

MetVUW because it gives good predictions for the following week. Most of the DOC staff are “*good at reading the weather forecasts*”.

In Queenstown, DOC collect weather information from a variety of sources (e.g. a customised service from the MetService, the public MetService website, MetVUW and the Australian Bureau of Meteorology (BoM) website) and primarily operate as an intermediary in the distribution of weather information. As an end user, however, they make many of their own management decisions based on the weather and rely on in-house capability to interpret the weather information they receive. While there are no formal training or unit standards with regard to weather interpretation for DOC staff, it is part of their recruitment and one of the recognised performance areas for staff. In Queenstown, DOC works with the weather to do track maintenance. They may, for example, schedule design work over the winter months and then do the work over the summer when they have more daylight hours and more staff in the hills. Many Northland tourism operators do their boat maintenance over the quieter winter months and, despite many maintenance jobs requiring an extended period of dry days with mild temperatures, none of the boat operators interviewed reported taking account of weather forecasts when scheduling maintenance.

Tourism operators in Queenstown and Wanaka noted that experience with local climate and weather conditions were an important business skill. Many operators stressed the importance of having skilled staff who are familiar with local weather conditions. Some companies assess the weather on an hourly basis or, as noted above, have their own weather stations or measuring equipment. The most common piece of equipment was an anemometer (for measuring wind speed) and was used by a variety of air-, land- and water-based activity operators. Some companies also rely on images collected via webcams.

While air operators have to contract to the MetService as part of their legal aviation requirements they also rely on their own ability to understand the information they receive. There is also some concern about the quality of available data. In Northland, for example, although one air operator considered the 12-hour forecast and rain radar adequate, they thought that – because the MetService has no representation on the ground in Northland – those doing the forecasting did not understand the data, and that local conditions are not well understood. They also emphasised the need for their own in-house ability to read the weather information and noted that pilots make the decision to fly based on their own experience.

There is also some sharing of weather information between tourism operators, and between tourism operators and various support agencies. Many boat operators in the Bay of Islands, for example, take cues from each other (e.g. when one operator moves their boats to a more secure mooring) when bad weather is forecast. The organisers of the Queenstown Winter festival engage with a variety of information sources in order to keep a close watch on the weather. Their computer default settings, for example, include New Zealand weather forecasts (with a preference for MetVUW), Coronet Peak (i.e. weather conditions and webcam data), international snow forecasts and road reports from NZTA. They also talk regularly to mountain guides and the Emergency Services representative at the QLDC.

Tourism operators’ awareness and knowledge of weather information sources reflects the importance of the weather to their operations. As might be expected, activity operators (and especially those operating in remote or extreme natural environments) are more reliant on the

weather (and weather information) than those involved in more benign tourist services and operations (such as, for example, accommodation and some transport providers). This latter group are often also much less formal in their collection of weather information. One Queenstown rental car company, for example, gets road updates from the radio, but this is dependent on whether the staff have been listening or not (e.g. when the office is busy they have no time to listen).

Many tourism operators also informally pass on weather information to tourists. Water-based activity operators in Northland, for example, are asked a lot about the weather by tourists and some tourism operators reported “*spending their lives*” telling tourists that the weather is “*not as bad as it looks*”. They were, however, also “*professional enough*” to tell people who might suffer from seasickness that they might want to re-book or postpone their trips if conditions were marginal. Also, tourism operators in the Bay of Islands found that tourists book water-based activities by “*look of the weather*” (particularly sunshine), which was not always be the best conditions to go out in.

The ‘look’ of the weather was also an issue for water-based tourism operators in the Southern Lakes region. A fishing operator on Lake Hawea, for example, noted that people were keenest to go out on calm, hot summer days which did not provide the best conditions for fishing. Likewise, the operators of a Lake Wanaka kayak company reported struggling to explain to potential clients that despite what might look like perfect conditions (i.e. sunny and relatively calm) the direction of the wind precluded safe operation. Tourism operators in the Southern Lakes area also reported getting asked about the weather a lot by tourists in relation to their onward travel plans. Wanaka operators, for example, get asked what the forecast is for the West Coast, whereas the Milford Sound forecast is of interest in Queenstown.

Some tourism operators also pass on weather information as a source of tourist entertainment or interest. Tourism operators might install information boards that illustrate historical climatic events of interest, such as the flood level sign beside Shotover River (Photo 10), or erect weather-related signage for tourists’ entertainment (Photo 11).



Photo 10 Flood sign beside Shotover River
(J. Wilson)



Photo 11 Weather sign at NZONE Skydive,
Queenstown (J. Wilson)

TRANSFER OF WEATHER INFORMATION

The previous sections of this report have described the three main components of the weather distribution system, as shown in Figure 1. In this section, the transfer of weather information between these is examined. Here the focus is on the ways in which climate and weather information is exchanged (i.e. the means by which information is passed on and/or accessed). After briefly describing each category of information transfer, a discussion section focuses on a number of key issues associated with the distribution of climate and weather information for tourism. While these issues apply to some extent across all three information transfer categories, they are presented alongside the category of information transfer for which they are most germane:

- Between weather information providers and intermediaries, the quality and type of available weather information is a key issue;
- Between intermediaries and end users, there are issues surrounding the interpretation of weather data and, in particular, intermediaries' willingness to take responsibility for passing on information in the event of severe weather events;
- Between weather information providers and end users, there are concerns about how well weather information sources and weather data are understood by tourists.

WEATHER INFORMATION PROVIDERS TO INTERMEDIARIES

The primary source of information data and forecasting is the internet and the transfer of weather information between providers and intermediaries is via a mix of contracted and freely accessible services. While tourism intermediaries collect weather information from a wide range of sources, they primarily rely on the information provided by the MetService. Many media services also contract to the MetService for graphics and interpretation of data into user interfaces for publication. Most media services offering weather information rely on MetService data, although other information providers are often used as information sources in media articles about the weather. In addition to the official MetService spokesperson, for example, Blue Skies, Weather Watch and Ken Ring ("the Moon Man") all provide weather information to the media. The selection of information source appears somewhat arbitrary with some of these weather information providers offering their services to the media and others approached by the media for comment. Blue Skies, for example, are often approached for media comment, something they attribute to their reputation for accurate forecasting.

With the exception of the i-SITE network (who display WeatherTrek), and DOC who commission data from the MetService, most tourism intermediaries rely on publicly available internet weather information or on forecasts published in newspapers. The degree to which they consult this material is based on both their own operational needs and personal interest. Many of the agencies offering institutional support also use MetService data, although this is often supplemented with data they collect themselves. Some also noted that while 'officially' they use the MetService, they personally prefer MetVUW. Often, these preferences for a particular weather information provider were based on perceived issues with the quality and type of information each provide.

QUALITY AND TYPE OF WEATHER INFORMATION

The quality of weather data was a feature in many of the media articles about the weather. There was considerable concern over the misrepresentation of climate information (when it is based on inaccurate or poor quality weather data) and the effect this has on destination image and domestic tourist's likelihood of visitation (Wilson & Becken, 2011). In many cases these data were improved, however, by the relocation of weather stations; this, in itself, often occurring as a direct result of the media attention generated by the tourism sector.

Wilson & Becken (2011) highlighted problems associated with the scale of weather forecasting and, in particular, the inclusion of places on the weather map. While many tourism operators appreciated that time (and scale) constraints limited the amount of detail that was able to be included in television weather reports, there was some concern over which locations were selected as 'representative' of particular regions. In Northland, the addition of Paihia and in the southern South Island, the addition of Milford Sound to the TV1 weather map, were both seen positively by the region's tourism operators. Concerns also surround the location of many weather stations (i.e. locations that best represent local conditions). The relocation of the Paihia weather station by the MetService, for example, was perceived by many tourism operators in the Bay of Islands to have helped to present more representative weather data and forecasts and to change the perception (fostered by previous weather forecasts) that had shown it to be "*raining here all the time*".

Much greater detail of local weather data and forecasting is able to be provided in newspapers and on the internet, and both also offer opportunities to include additional weather-related tourist information. While many newspaper weather sections include tide times, for example, those on the West Coast of the South Island report these specifically in relation to the best times for visiting the Punakaiki Rocks and Blowholes. As Photo 12 shows, DOC also displays these optimum viewing times at the Paparoa National Park Visitor Centre. Although the MetService website provides a wealth of information and data which is useful for tourism (e.g. mountain area and National Park forecasts, marine forecasts) these data are not currently presented in a tourism (or activity) specific format. WeatherMap (which is internationally based) is the only website to organise New Zealand data in an activity specific way although the data presented are merely repackaged general weather data.



Photo 12 Punakaiki signage displaying optimum viewing conditions and tide times (J. Wilson)

There were some criticisms from intermediaries as to the quality and type of weather information available and many expressed a preference for one weather information provider over another with respect to particular types of data. DOC Queenstown, for example, find that the MetVUW data and forecasting tends to err towards the dramatic, whereas the MetService is more moderate. They find the MetService 3-day forecast useful, however, although the rain forecast is difficult to read as it shows the whole of the South Island or mountain forecasts that then need to be translated into specific locations.

A number of the tourism industry intermediaries and tourism operators interviewed also expressed opinions on what additional information and data might be useful to have. There were also issues with how easy these data would be to access. Staff at the Queenstown i-SITE, for example, noted that they would like more accurate long range weather forecasts (*"5 days would be great"*). They feel that the weather forecast has been 'dumbed' down in terms of information, and that the MetService website has either too much or not enough information (i.e. *"you can search around and find what you want, but in reality you only want to glimpse the most relevant stuff"*). Others noted that it is important to have good information on wind and rain as and when it is most relevant (i.e. rain information all year round and perhaps a chance of rain estimate, wind information only in certain months).

In Northland there has historically been a great deal of mistrust for the data provided by the MetService, although this seemed to have dissipated somewhat in recent years. Generally, however, while there was nothing specific wrong with the MetService service information, MetVUW was seen as better because it gave more detailed forecast data, particularly for the weather conditions that are important for those using the water on a regular basis (as noted earlier, the main advantage MetVUW offered was more detail about wind conditions). Few Northland tourism operators, however, appeared to realise that MetVUW forecasts were actually based on MetService data.

In the event of severe weather forecasts, activity operators often have to make a call on whether it is safe to go out, and would like to have better information on exactly what type of severe weather to expect and when it is expected to arrive. The tendency was to *"pull the pin"* well before they need to, which had significant economic impacts (e.g. skippers were not paid if they didn't go out). Many expressed a desire for there to be more weather stations and more frequent updates on frontal or cyclone systems (and where they were). Similarly, DOC staff in Northland commented that while they have undertaken tsunami preparation exercises they did not have the information they really needed (e.g. how far away it was). One Northland accommodation operator (whose property was particularly vulnerable to flooding) did not feel that there was an adequate early warning system in place for flooding events.

Although overall most operators were well-informed and aware of what weather information was available, a few (generally those for whom the weather had limited direct impact) appeared less well-informed. The Queenstown rental car company, for example, noted that they *"would find a seasonal weather/climate forecast useful"* i.e. if they knew summer was starting a little earlier than usual it would be helpful. As noted earlier, this information IS actually freely available from both the MetService and NIWA.

INTERMEDIARIES TO END USERS

As noted in the previous section, there is relatively limited variation in the sources of weather information used by the intermediaries with the MetService the predominant weather information provider, followed by MetVUW. While, operationally, the weather (and weather information/forecasts) is important for many of these intermediaries, in respect of the weather information distribution system the greatest variation appeared to be in how 'active' they are in passing on weather information. The level of engagement each has with tourists varies, along with the variety of modes employed to convey weather information. Also, there are variations in the degree to which intermediaries interpret weather data and in intermediaries' willingness to take responsibility for passing on information in the event of severe weather events.

One of the most proactive of the intermediaries is DOC. In the Queenstown DOC visitor centre they provide interactive touch screens which give climate and weather information and also provide an area with a variety of weather resources for visitors (as shown in Photos 5, 6, 7 and 8). They are building up a gallery of photographs which show realistic winter and spring conditions (i.e. the norms in the field rather than touristic postcard images) and trying to establish a different sort of norm in customers' minds. The remote (i.e. away from the mountain areas they advise on) location of the Queenstown DOC Visitor Centre presents challenges when conveying weather information to the public.

The i-SITE Visitor Centres also provide a range of different types of weather information for visitors. In Paihia, the i-SITE staff put the MetService (from the website) weather forecast for the day on their outside notice board, they also have WeatherTrek showing on screen inside the i-SITE. On wet days they can have as many as 50 people inside the office looking at the latter. The i-SITE also displays some current weather information (and forecasts) on their website. These data are provided by the international weather provider, Freemeteo. The i-SITE manager did not know why the Far North District Council (who is responsible for this website) used this particular supplier.

In both case study areas, i-SITE staff reported being asked about the weather a lot. The majority of questions the Queenstown i-SITE get asked about the weather are when it is a wet day (the i-SITE has a wet day activity sheet prepared); they also get asked when the best time for seeing autumn colours is. Despite noting that many tourists do NOT consider the weather when making their plans, i-SITE staff will often take a proactive role and look at the forecast weather to help tourists plan their following few days' activity (this is especially important if they want to do anything involving scenic flights). The Paihia i-SITE find that many international tourists come specifically to them to find out what was happening with regard to road closures – most probably because they are known as (and expected to be) a public provider of information.

The Queenstown i-SITE staff show tourists the forecast on the MetService website and put up signs if there are road closures. Easy access (on the website) is important especially when they have a customer in front of them and they don't want to have to 'scroll around' too much. They also know which 'bits' of the weather forecast to 'trust' (and which bits not to trust) and are very careful when giving longer term information to people. Again, it can be difficult to convey 'remotely' what the weather is like (i.e. might be sunny outside, but raining where the tourist is going).

INTERPRETATION OF WEATHER DATA

In Queenstown, DOC provides a crude description of what the mountain forecasts relate to in terms of different types of tracks, i.e. that 'headwaters' relate to the eastern part of the Routeburn Track and the Rees/Dart Track, and so on. DOC are extremely proactive in respect of the provision of weather resources in an attempt to get people to engage with the weather information that is out there, as well as giving them the tools to understand it. An important part of their weather message is conveying to the public what equipment they should carry.

In the Bay of Islands, DOC take a daily weather forecast (from MetVUW) to campers on Urupukapuka Island. They do not interpret these forecasts at all, but rather assume that people talk about the weather and that they know something about it – even when they are on holiday. Most campers on the island are domestic. Also, the fact that everyone on the island has got there by boat reinforces this assumption. Some people do still get 'stuck' on the island as a result of the weather conditions, including DOC themselves, as a result of reading the forecast wrong or as a result of being poorly equipped (e.g. by using the wrong type of boat).

The Paihia i-SITE staff find that they have to take care when recommending what they themselves think of as acceptable or comfortable conditions for tourists booking commercial boat activities, as some tourists still find those conditions challenging. They also find that some tourists are very pedantic about the weather and will not do any activities unless conditions are perfect, i.e. if any rain or cloud is forecast they will delay. In these cases, the i-SITE staff will go on-line and show tourists the 3-5 day forecast (which might show, for example, that their best opportunity is now).

For support agencies, such as local councils, there are issues surrounding the amount of information people (both residents and tourists) are given, and with how well people understand weather information. They have to be careful, for example, not to pass on technical reports to the public who either do not require, or would not understand highly technical information. While translation of information is important and necessary they take no responsibility, however, for interpreting weather information – at most they provide links to the MetService and might put up a warning if they have an altered road plan associated with a MetService weather warning.

WARNING FOR SEVERE WEATHER EVENTS

In the event of MetService severe weather warnings, there is considerable variation in intermediaries' willingness to both pass on information and to take action. The primary deterrents to taking action were reluctance to impact on, or disrupt, tourism business activity and more generalised caution with regard to taking responsibility for how end users understand and use weather information. Also, there are varying degrees of institutional and practical involvement in emergency situations, (i.e. some intermediaries are themselves actively involved in Civil Defence, whereas others are careful to defer responsibility to the appropriate authorities).

In many areas, officially designated chains of responsibility are established to deal with severe weather events and other natural hazards. One Northland accommodation operator, for example, noted that in emergencies they are in phone communication with Civil Defence with regular updates and that there are also some phone chains (for warnings – and information updates) in place for a tsunami. False alarms are an issue, however, and they have to be careful not to "*cry wolf*" or engage

in scaremongering with tsunami and cyclone warnings, or people will stop taking these warnings seriously. Some intermediaries also talked about the “*fine line*” between panicking people and providing sufficient warning. In the case of flood events (which occur reasonably regularly in parts of Northland), for example, accommodation providers might have to evacuate guests; a call which some operators noted could be difficult to make. Also, it is often difficult to decide how to respond to warnings, e.g. does an accommodation provider wake guests up or not? Will their response be ‘wait and see’ or immediate evacuation?

The nature of flooding in the Southern Lakes region differs from that occurring Northland as a result of topography and climatic zone. A number of those interviewed from Queenstown support agencies noted that in the case of some severe weather events (e.g. some flooding events) there were often no direct visual weather cues, which makes it difficult to convey risks to tourists. While there was some concern in the Southern Lakes region that tourists (and residents) might not know what the best source of information was, there was also considerable reluctance on the part of many support agencies to take responsibility for interpreting weather forecasts for end users. For those who did take on this responsibility (e.g. DOC), there was still concern that they not extend advice that would impact financially on tourism operators (e.g. through cancellations).

In the case of severe weather events, managing the media – to ensure that correct information is disseminated – is an issue. Both the Northland Regional Council (NRC) and the QLDC, for example, have a professional communications manager and they have a relationship with the local media, but they have no control over other visitors in the area who start blogging, use social media, and post photographs on the internet. The Harbourmaster also noted that they have to be careful what they say to the media in accident interviews. In the past, the Queenstown Harbourmaster’s office would tell tourism operators not to operate if bad weather was forecast, but they no longer do so as do not want liability coming back to them.

Tourism service providers, such as the i-SITE Visitor Centres and the DOC Visitor Centres, take a much more proactive role in informing tourists about possible severe weather events. When there is a storm forecast, for example, the Queenstown DOC office receives fax from the MetService and the Regional Council. The Queenstown i-SITE gets emails (used to be fax) from NZTA about road conditions and they check the AA website. They also have contact with bus drivers with regard to the state of alpine passes. The Queenstown i-SITE keeps their information updated for both safety and booking purposes.

However, the Queenstown i-SITE takes no responsibility for safety or the weather impacts on specific activities, this is left up to individual companies and their safety plans. They refer tourists to DOC for information on walking tracks and strongly recommend that they check the weather conditions before venturing out into the back country. A Queenstown rental car company did not consider it to be their role to tell people about the weather, although they did pass on important information about road conditions (especially black ice). They noted that it is not always easy giving out information to tourists, for example, “*if we tell tourists that the Milford road is closed and then it opens we get complaints*”.

WEATHER INFORMATION PROVIDERS TO END USERS

While intermediaries play an important role in interpreting and conveying weather information to end users there are ever-increasing opportunities for end users to by-pass these intermediaries and access weather information directly. As has been shown, there is a vast array of weather information available on the internet which can be freely and easily accessed.

A wide assortment of technologies is available to connect end users directly to internet weather providers. Private sector providers have, in particular, adopted communication technologies to deliver information (Scott & Lemieux, 2009) and, for those seeking information, the increasing use of mobile phones to search the internet is a notable change over the last five years. It is now possible to access weather information via many email account providers, Facebook, twitter, RSS feeds and text messaging services. Many internet weather services are either free to access, or are available for a one-off download charge as applications for mobile devices.

UNDERSTANDING OF WEATHER INFORMATION SOURCES AND WEATHER DATA

As end users, tourism operators access weather information on a regular basis and are knowledgeable about which sources provide the most accurate and credible information. Most tourism operators, for example, use either the MetService or MetVUW (which is often preferred), or a mix of both. Also, while DOC staff in Queenstown were of the opinion that the MetService website information was good for technical users like themselves, it was suggested that it should be more focused on user-friendly information for the public.

There is some concern by intermediaries that many end users do not properly understand the weather data they do access. DOC in Queenstown, for example, has found international tourists are often unprepared for how quickly the New Zealand weather can change and that they do not fully understand what the data presented in weather forecast means in respect of actual conditions experienced. Most tourism operators and support agencies generally consider domestic tourists to be more knowledgeable about local conditions, and more familiar with the most credible sources of weather forecasting and information. Evidence for this was found by Jeuring (2011) with 13 of the 14 domestic tourists surveyed consulted the MetService website. Jeuring's (2011) survey also asked tourists how important they thought a variety of organisations were in respect of their own safety (in the event of severe weather) as tourists; overall the domestic tourists ranked the MetService, DOC information Centres, the Mountain Safety Council and Land Transport New Zealand more highly (i.e. with higher mean scores), and organisations such as travel agents and i-SITES lower (i.e. with lower mean scores), than did the international tourists. However, DOC in Queenstown suggested that although New Zealanders are more readily accepting of rapid weather changes (which are the biggest issues in respect of tramper safety), the New Zealanders walking tracks like the Routeburn are usually less experienced back country users.

Other research suggests that New Zealanders' awareness and understanding of weather information sources is somewhat mixed, however. In 2009, Geological and Nuclear Science (GNS) conducted a survey of 160 New Zealanders which explored their recognition and understanding of severe weather advice in New Zealand (Wright, Johnston & Becker, 2010). The survey asked what respondent's main sources of daily weather information were. The results confirmed the popularity

of television, radio and newspapers as weather intermediaries; while websites were second in popularity, the survey did not specify which websites were consulted (Table 9).

Table 9 Source of daily weather information (Source: Wright et al., 2010)

Source of daily weather information*	%
Television	74
Websites	37
Radio	35
Newspaper	25
Natural signs	14

*(N=160) Multiple responses possible

The GNS survey also asked respondents if they subscribed to any weather services (i.e. paid for a weather service). Altogether, only 12.6% reported doing so, with 3% subscribing to the MetService and the remainder to other services (e.g. SKY TV). When asked which primary organisation produced the weather information they received/accessed only 44% of respondents named the MetService. Amongst the 'other' weather organisations named (by a further 43% of respondents), were television, radio, Blue Skies and NIWA. This suggests that many people are not aware of the ultimate source of weather data, especially given that the MetService provides weather data to television, radio and newspapers, and supplies data to NIWA. Altogether, 19% of those surveyed did not know where their weather information came from.

Respondents were also asked to indicate from a list provided which type of severe weather events the MetService provides forecasts for: responses varied from high awareness of the MetService with respect to very strong wind and heavy snow warnings (98% and 97% respectively), good awareness for thunderstorms (67%) and moderate awareness with regard to storm surge warnings (53%). However, the issuing of flood warnings was incorrectly attributed to the MetService by just over half of respondents (57%) (Wright et al., 2010). Respondents in the GNS survey were also asked if they had heard of the terms used by the MetService ('outlook', 'watch' and 'warning') with regard to severe weather forecasting and advice. Most had heard of these terms, with 'warning' the most well known and 'watch' the least well known. When asked, however, for some explanation of the terms there was considerable variation in levels of understanding.

The popularity of the internet as a source of climate and weather information for both international and domestic tourists was confirmed by these GNS data and the surveys reported earlier. In the Becken et al. (2010) survey, for example, the most common source of climate and weather information pre-trip was the internet (consulted by 62.6% of the total sample); also, for the 76% (N=327) of respondents who looked at weather information whilst travelling in New Zealand, the internet was the most popular information source (mentioned 121 times, or by 37% of these respondents). Also, 37% of respondents in Wright et al.'s (2010) domestic sample reported using the internet as a source of daily weather information (Table 9). However, neither of these surveys looked in specific detail at which internet sources were consulted and it is reasonable to assume that there may be differences in the types of sources consulted by international and domestic tourists.

International tourists may not be aware of the MetService as a weather information provider or they may continue to consult websites that they are familiar with from their own countries (which might not always provide the best information with respect to New Zealand weather). In Jeuring's (2011) research, for example, the two most popular internet sources were the MetService website and i-

SITE websites. Altogether, however, 13 of the 14 domestic tourists and 117 of the 388 international tourists in the sample consulted the MetService website, whereas the i-SITE website was consulted by 106 out of 388 international tourists, but only 1 of the 14 domestic tourists. As Table 3 showed, the weather data displayed on i-SITE websites comes from a variety of sources.

As noted above with respect to the internet more generally, the data sources used by mobile applications might not always be optimal. Scott & Lemieux (2009), for example, reported that The Weather Channel was the second most downloaded weather-related application available in the Apple App Store. New Zealand i-PHONE users commonly have a Yahoo weather application, which uses a different weather model for forecasting than does the MetService (although this is based on MetService data). While the New Zealand MetService offers a range of personal weather services including access to forecasts via mobile phones (a daily SMS message weather forecast service can be purchased) and other internet access they do not currently offer a mobile application themselves.

A wide range of more general climate and weather information resources are available to international tourists via the internet, many of which provide climate and weather information. The usefulness of this information appears limited however, as Wilson and Becken (2011) found in their analysis of RTO websites. Commonly, climate data only describes average conditions which, as de Freitas (2005) argued, do not provide adequate information for tourism activities. Indeed, as Becken et al. (2010) found, despite looking at some climate and weather information pre-trip, 59% of tourists found the weather in New Zealand different to expected. When asked what information would have been useful to have, tourists expressed a desire for more detailed forecasting information and for more information about where weather information could be found. Amongst the most 'unexpected' aspects of New Zealand weather encountered were the temperature range, cold nights, and the strength of the wind, the rapid changeability of the weather and regional variation – all features that are not easily conveyed by descriptions of average conditions. Jeuring (2011) asked respondents how important a variety of different types of weather information was to them and, of all the weather variables suggested, the only one for which New Zealanders in the sample had a higher mean score (i.e. was rated more important) was wind direction.

CONCLUSION

This report examined the distribution of climate and weather information for tourism in New Zealand, with a focus on weather information. Data for the report was drawn from a number of research projects including tourist surveys, interviews with tourism operators and infrastructure providers as part of two regional case studies, and desktop research of newspaper archives, internet materials and relevant academic literature. The report is structured around a model of weather information provision which included:

- Weather information providers, both New Zealand and internationally-based (Figure 2);
- Intermediaries, including media, tourism industry and agency and community support (Figure 3);
- End users, including international tourists, domestic tourists, and tourism operators (Figure 4); and,
- The transfer of information between these (see Figure 1).

Overall, there is a wealth of weather information available. Of note are the number of internet portals that offer weather information and the number of links between the various websites. These links are either across websites (i.e. links from one portal to other sources of useful data) or take the searcher through a number of information layers to eventually identify the base-line information/data provider. Snow.co.nz, Surf.co.nz and Swellmap.com, for example, are all published by the parent company, <http://www.nzXsports.com> and are promoted as New Zealand specific sites but, as noted earlier, they all use data provided by the international company Met Ocean Solutions. There are, however, a number of these websites which do not report the source of the weather data they present. Data for New Zealand locations available from the many international weather information providers, however, does usually originate from the New Zealand MetService. In some cases the data are presented in different ways while in others different forecast modelling is used (although the base data is the same).

An obvious result of this is that those using this weather information might not always access the best (in terms of accuracy or relevant) weather information. Also, as this analysis has shown, both end users and some intermediaries (e.g. some RTOs and i-SITES) are not always aware of the original source of the data they access. In contrast, New Zealand residents and many people working in the tourism industry appear to be both aware of, and to rely on, the MetService as their primary weather information provider. The New Zealand MetService provides a wealth of weather data and forecast information and offers tailored services to a variety of industry sectors, although to date there has been limited engagement by the MetService with the tourism sector. Intermediaries play an important role connecting end users to weather information providers, and there are some notable differences in how active these intermediaries are in respect of interpreting or passing on weather information.

As active intermediaries in the provision of weather information, the media tend to rely on the MetService for their complete weather services (i.e. interpretation and display). Media data and weather information is also passed on to other intermediaries. For other intermediaries (i.e. those involved in the tourism industry and in agency and community support) the choice of weather information source is based on a variety of criteria including personal preference (and historic

allegiances) and the suitability of available data (in content, scale and forecast parameters) for their own operations. Overall, tourism operators rely heavily on their own ability to understand weather information and forecasts and are relatively cautious in respect of interpretation of weather data and in taking responsibility for informing end users, particularly in the case of extreme or severe weather events. Many tourists appear to rely on tourism operators as a source of weather information and more formal weather training, within the tourism sector, may give tourism operators more confidence to pass on weather information.

The findings of the weather surveys reported here, indicate that the type of weather information available to tourists (particularly international ones), and tourists' understanding of New Zealand weather data, are not ideal. For international tourists, it may be that they are used to accessing a variety of types of weather information, much of it tailored more expressly to their needs than is the New Zealand MetService information which is currently available. Scott and Lemieux (2009) for example, note that, internationally, private sector providers often offer more 'user friendly' forms of information than governmental agencies, although in many cases those tailored to the needs of tourism and recreation end users are often little more than renamed local forecasts for nearby cities and provide little or no added value for tourist decision-making (Scott & Lemieux, 2009). In New Zealand, there appears to be considerable scope for both the MetService to provide more tourist-friendly weather information, and for the intermediaries from the tourism sector (e.g. RTOS and i-SITES) to direct tourists to the MetService.

The weather (and information about it) is important for tourists as it impacts on their ability to undertake activities, has safety implications and ultimately impacts on their holiday satisfaction. For organisations offering tourism services, tourism operators, and infrastructure providers, managing peoples' expectations of the weather are as important as managing the weather impacts themselves. Many of the weather issues in the Bay of Islands, for example, relate to weather information and the ways in which potential visitors read/understand the weather forecasts. For domestic tourism this appears to have more impact on getting visitors to the region than on their behaviour once there; empirical research is required to test the validity of this.

The impact of the weather (and weather information needs) also varies according to location. Compared to Northland, the Southern Lakes region often experiences more severe weather conditions and DOC takes a much more proactive role in both interpretation and passing on weather information to tourists. Generally, the weather conditions experienced in Northland are relatively benign and the biggest weather impact is on the way people book trips – i.e. waiting to see what the weather looks like before making decisions. As noted, on occasion intermediaries may take an active role in persuading tourists that the weather forecast and actual conditions are conducive to participation. While DOC in Queenstown also has to deal with tourists perceptions of the weather based on what it 'looks' like, in Queenstown they have to convince tourists that (according to the forecast and actual condition) it is in fact worse than tourists think.

The limited data available suggest that there are considerable differences between international and domestic tourists' understanding and uses of weather information sources and of what climate and weather data mean. While domestic tourists have a much better understanding of the New Zealand climate and weather conditions, it seems reasonable to assume that autonomous agents (e.g. media articles about the weather and weather forecasts) influence both their image of specific destinations

and their decisions to visit those destinations. More research is required to test whether this is actually the case.

Before coming to New Zealand, international tourists are potentially more influenced by tourism marketing which, with its 'blue skies' bias and limited provision of 'useful' climate data, leave tourists poorly informed and unprepared for the weather conditions they encounter once in the country. While tourists might subsequently 'learn' about the weather once here, this learning is often heavily reliant on the intermediaries (such as DOC) in the weather information system. It is not clear, however, if it is weather forecasting or actual weather that tourists respond to. Research suggests that many international tourists use the internet to get weather information. This effectively by-passes intermediaries, and increases the likelihood of tourists' not properly understanding what the weather information they look at actually means in respect of the conditions they might encounter or the impact of these weather conditions on their activities. Also, the increasing use of mobile technologies also suggests that social media may provide an increasingly important source of weather information for tourists. The use of the internet (i.e. both the means of access used and the sites visited) needs to be more carefully considered in tourism surveys in order to generate useful data.

This analysis has highlighted a number of gaps in the distribution system of climate and weather information for tourism in New Zealand, particularly in respect of understanding what weather information tourists would find most useful and the ways in which international tourists, as end users, access weather information via the internet. Within the weather information system the exchange of information is important. As Scott and Lemieux (2009) noted more research is also required to properly understand the effectiveness of different communication pathways and formats. Traditionally, this information exchange has taken a variety of forms and, across the system, a variety of formal, informal, organic and historic relationships have evolved over time. Internet and mobile technologies are increasingly challenging the forms and type of information available and the ways in which it is distributed.

In conclusion, this evaluation of the sources of climate and weather information for tourists and tourism in New Zealand has shown that a wide array of information sources are used, although not all users are familiar with which weather information sources are the most credible or appropriate. While the tourism industry is reasonably weather 'savvy' in respect of their own weather needs, there is a need to better convey weather information to tourists as end users. One way in which this could be achieved is through a more climate/weather-focused approach to 'marketing' destinations, in which climate and weather data are given more prominence. Another option is for the presentation of the available weather data in a more tourism-friendly format; MetService data across a range of relevant parameters for any given destination, for example, could be arranged 'spatially' to match those destinations.

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