Understanding current and forecast visitor flows to the South Island

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Executive summary

The South Island of New Zealand has been experiencing fast growth in tourism. This study sets out to understand measures of visitor activity in the South Island and forecasts for these activities, with a key focus being on the associated journeys. This forms part of the understanding required to undertake destination management.

An examination of current visitor statistics shows there is a wide range of data but there is no one definitive measure, especially at a regional level. In part this short-coming stems from challenges in defining the visitors of interest and in part from disaggregating visitor activity from the activity of local people. One key sector is international tourism. Methods were explored that adjusted available data to derive estimates of international tourist arrivals to local authority areas. This work showed improved estimates of visitor numbers are available from the International Visitor Survey, that there was some merit in deriving visitor estimates from spending data at a local authority level but that too many assumptions were required to turn commercial guest arrivals from the Accommodation Survey into visitor arrivals across all accommodation options. Similar conclusions were reached when applying the same methods to measures of domestic tourism. A key recommendation is to use multiple measures, including data derived from card spending, phone use and app use where available, to make inferences about visitor presence.

The study also showed that multiple counts of visitors to key locations exist, giving further information about visitor presence in an area. Collection and dissemination of this data is encouraged.

As to the journeys associated with visitor activity, again no one dataset exists to describe the quantum of visitor use of South Island roads. Methods to derive visitor numbers were explored. In particular, it was shown that breaking the visitor journeys into three segments could enable visitor flows to be inferred from data currently available or easily obtainable, albeit at a cost. Data exists to provide a reasonable estimate of international visitors to the South Island and their port of entry, likewise for domestic visitors from the North Island. These are the major but not the only visitors to South Island locations. Estimation of visitor flows between regions is possible by combining (a) the previously derived estimates of visitors to districts with (b) the arrivals to the South Island and (c) partial measures about visitor flows that are available, including data from visitor surveys, card spending and phone usage. The estimates of inter-regional flows will not be accurate but are likely to be reasonable for infrastructure planning. An illustration of this method derived figures such as 1.9 million international tourists arriving in the South Island in the March year 2016/17, with 1.3 million of them travelling east of the Southern Alps between Queenstown and the combined Canterbury/Northern South Island regions. These figures relied on assumptions. Further data analysis is required before such figures could be used for management decisions.

A fuller description of visitor flows also requires measures of route and mode use between regions and of flows between accommodation and attractions within regions. Again these measures do not exist (at present) but can be reasonably inferred within a flows model. A phased approach to building such a model – or possibly interconnected models – was proposed as part of the research project. This would entail customised analysis of administrative data. The approach could dovetail with existing regional models of flows but would require building intra-regional models for other regions. The benefit of a combined model of South Island visitor flows lies in being able to derive the current and forecast infrastructure use data that is required for a fuller cost-benefit analysis of infrastructure investment. It also provides a tool to explore scenarios around the various risks that exist.

Ultimately, forecast activity is the key to infrastructure management decisions today. Forecasts of visitor flows of relevance to the South Island were collated. These ranged from forecasts several years ahead to forecasts over two to three decades. There are also growing possibilities for forecasts of the months

ahead based on bookings and web searches; these are not reported in detail here. Forecasts derived by the three airports of major importance to South Island visits provide the core long-term forecasts available at present. These were shown to be lower than international forecasts and historical trends, implying some acknowledgement of constraints ahead. No set of long-term or short-term forecasts across all South Island regions is available. Rather than pursue such a set of forecasts, which would have a large margin of error, a recommendation is to first establish a mutual understanding of the constraints around key locations. In other words, the currently available forecasts provide a reasonable estimate of potential demand growth across the South Island but the local supply response will be, in the first case, constrained by some physical limits, in particular around major natural attractions, and otherwise will be varied, complex and uncertain. Long-term regional forecasts are unlikely to capture these dynamics. Rather a system for coordination and adaption is required.

Another key gap in information exists around the benefit of visits. The above discussion has largely revolved around the quantum of visitors. However the benefits to regions and to the country are variable. A snapshot of five-year growth between 2011/12 and 2016/17 showed tourism having different effects on local employment and gross domestic product. Further research is required – and is underway – to understand the dynamics between regional growth and tourism. A further matter of benefit is the satisfaction of visitors and of local residents. Sometimes the (lack of) supply of infrastructure can lead to negative experiences for both parties (eg not enough passing lanes). In other cases, the supply of infrastructure can lead to conflicting experiences (eg easier access increasing visitor numbers and testing local intolerance). This is a matter where ongoing monitoring of both visitor and local sentiment is required, although this still leaves future sentiment unknown. Current data exists and analysis of social media offers opportunities to develop these measures further. But a major research area is how to match measures of sentiment with costs, or in other words, what is the dis-benefit of negative sentiment that needs to be weighed against infrastructure costs?

Abstract

Data is required for destination management, both of current visitor activity and future activity. This report reviews the data that currently exists for visits to the South Island of New Zealand, where tourism growth has been, and is still expected to be, strong. Not surprisingly no one dataset was found that could reasonably describe visitor activity, nor were there forecasts for core visitor activities across each region of the South Island. Methods were tested to show how currently available data, including an International Visitor Survey and a measure of electronic card spending, could be adjusted to derive measures of visitor presence. A three-part visitor flows model was presented that could be used to derive estimates of visitor flows between and within regions. Rather than attempting to derive a regional visitor forecast, it was recommended systems be refined to ascertain current constraints and monitor planning by public and private sector stakeholders. A major area identified for ongoing research is the interaction between visitor and local resident dissatisfaction and infrastructure requirements.

1 Introduction

In broad terms, the issue at hand is the management of strong tourism demand growth in the South Island.

Research suggests this requires a combination of 'destination marketing' and 'destination management'[1].

Marketing of tourism is about developing and promoting a 'product', but not necessarily having much control over the whole visitor experience. *Destination marketing* has long been practised in New Zealand[2]. Today this occurs through Tourism NZ and the regional tourism organisations (RTOs) and through many private sector companies, such as Air New Zealand[3], Tourism Holdings Limited and NZ Ski Limited.

The role of the NZ Transport Agency ('the Transport Agency') fits within *destination management*. Destination management is undertaken by many parties, from both the public and private sectors. It is about mitigating the short and long-term effects of visits while taking the competitive advantage provided by the current attractiveness of the local region and ensuring sufficient infrastructure and services are available to support tourism activity and, in some instances, increase the number of attractions. This requires an understanding of tourists' needs, including around their journeys, and ultimately also around their experiences. The first involves a large element of forecasting – Who will these tourists be? Where will they want to go? Where will they want to stay? What will they want to do? – while the second is largely monitoring, which may then lead to adaptation of the plans of the many parties involved in the tourism supply chain. Ultimately understanding the nature of tourists and their needs will enable greater tourist satisfaction, which in turn creates the platform for a growing, profitable and sustainable tourism industry. Implicit in this management process is the creation of a tourism system that fits the needs of the local population.

This report focuses specifically on the data requirements to achieve this ideal. The practical goal is to:

- provide key current estimates of visitor numbers and visitor flows to and around the South Island
- review available forecasts
- identify gaps, inconsistencies and consistencies within current and forecast estimates.

The focus on the South Island arises from a request from the South Island Regional Transport Committee chairs to the Transport Agency for research on South Island visitor flows, which is required to assist facilitation of integrated tourism journey improvements.

Some constraint on data collection is required, such is the mass of data that exists. The data discussed in this report was chosen with subsequent data use in mind, including by local government, such as:

- development of an effective model for forecasting international and domestic visitor numbers
- defining what the transport network needs to do/provide, including improvements required
- whether a more formal business case is required to manage an identified problem or opportunity that contains a transport element

[1] See Pike and Page (2014), UNWTO (2011) for wider discussions of tourism and more explicit definitions.

[2] New Zealand was first to introduce a national tourism marketing body in 1902.

[3] Although Air NZ is 52% owned by government.

- constructing a tourism flows model for the South Island, at least to regional council level and maybe even down to territorial authority level (since that is the level at which decisions are made)
- identifying who is responsible for coordinating, planning and implementing the South Island inter-agency work that will be needed to achieve the desired outcomes common to the transport and tourism
- investigating whether it would be useful to develop some new tourism products for the South Island.

The report is structured with a brief overview of related research in chapter 2, an overview of measures of recent tourism activity that provides insights into the spatial dimension of tourism in chapters 3 and 4, and an analysis of current forecasts and potential constraints on tourism growth in chapter 5. Broadly, initial emphasis is on tourism data as a measure of people presence at a place and time, with discussions then widening to consider measures over time and measures of benefit. It turned out that an important gap in understanding was around tourist flows, so the usefulness of data for a flows model is pointed out within each chapter and chapter 6 takes up more fully how this gap might be filled. Some concluding observations are in chapter 7.

2 Background areas of research

2.1 Initial comments

Tourism is a large and fast growing industry in New Zealand. Not surprisingly there are many reports and research projects that pertain to tourism activity. Some recent work with relevance to this project is introduced below. Findings from this work will also be knitted into discussions of visitor numbers and visitor flows in the following chapters.

2.2 Recent areas of work

2.2.1 Tourism Industry Aotearoa (TIA)

Setting the scene is the TIA (2014) report *Tourism 2025* which sets out an industry aim to increase New Zealand tourism revenue from $32 billion in 2015/16 to $41 billion by 2025, with the intention of 'growing value faster than volume'. Two strategies aimed towards increasing value are (a) the reduction of seasonality and (b) the increase of regional dispersal. Planning and monitoring such strategies requires data measured at periods of a month (or less) and possibly disaggregated below the unit of territorial local authority area (TLA).

A recent initiative in support of the 2025 goal is the Tourism Insight Framework. Of relevance to this project, a leadership panel has developed a plan to identify and prioritise tourism industry insight needs, plus advocate for more funding for the government provision of a tourism dataset to meet the industry's needs and aspirations in terms of coverage and quality.

Another stream of work – Activating Domestic Tourism – has produced a tool called domestic growth insight tool (DGiT) that provides information on potential domestic visitors to a region. DGiT will be discussed in detail in later chapters.

Also of relevance to potential constraints on growth, TIA commissioned a Deloitte New Zealand (2017) assessment of the nation's tourism infrastructure priorities. The report also includes appendices describing many tourism data series. Many of these data series are summarised each year in a 'mood of the nation' report.

2.2.2 Ministry of Business, Innovation and Employment (MBIE)

MBIE offers tourism policy advice to government and hence has a strong interest in tourism data. MBIE gathers, analyses and presents data and insights on their website. Data for this project has been drawn from this site.

A current initiative is the development of a 2018 Tourism Data Domain Plan. This inter-agency document is intended to set out the questions being asked about tourism and identifying the information gaps. A review of International Visitor Survey (IVS) sampling and inference methods is also underway.

Another dataset provided by MBIE is the annually updated forecasts of tourism growth. These will be included in discussions of forecasts in chapter 5.

The MBIE regional growth studies developed through the government's Regional Growth Programme, including for the West Coast, discuss tourism opportunities. There is also work underway at present to provide a regional investment framework, which is expected to include categorisation of regions according to their tourism status.

MBIE (2016) provides an update of infrastructure supply and demand, including transport (but excluding public facilities such as restrooms and sewerage). Findings of relevance to this project are listed below.

- New Zealand scored poorly (49th out of 141 countries) in a World Economic Forum (2015) Travel and Tourism Competitiveness Report for 'ground and port infrastructure, which includes measures of road and rail density and quality' and a TIA (2015) survey pointed to the challenge and opportunity that infrastructure in general presented to the local tourism industry.
- New Zealand airport and airline capacity is growing and is not expected to constrain international tourism growth in the long term, albeit there may be short-term challenges.
- There has been an apparent slow response to growing demand for commercial accommodation (note, supply has since increased significantly and continues to increase).

Another report that was part funded by MBIE, prepared for the New Zealand Trade and Enterprise 'Project Palace' programme, is the Colliers/Fresh Info (2016) analysis of accommodation supply and demand. Both infrastructure reports are considered in this report within chapter 5.

Not directly related to tourism, MBIE funded multi-party research into the resilience of infrastructure to hazards. Termed the Economics of Resilient Infrastructure, part of the study was into the effects of the 2016 Kaikoura earthquake.

2.2.3 Ministry of Transport (MoT)

The MoT also leads a Domain Plan, this one being into transport data needs. Of use to this project, the MoT (2017a) *Stocktake of information and data sources* provides a list of data and data sources.

Looking ahead, the MoT (2016) *Transport outlook* provides scenarios of future transport demand, which are discussed in chapter 5.

Of complementary value to this project, the MoT has currently underway, due mid-2018, a project to deliver statistically sound estimates of inter-regional surface travel based on users of a major phone network. The project intends to differentiate overnight travellers and day-trippers, and may differentiate between international and domestic travellers but will not deliver an estimate of total people flows between regions (ie phone network users only). Statistics NZ has a longer-term project underway within its Data Ventures team that is looking into the potential access to cellphone data.

2.2.4 Department of Conservation (DOC)

Much tourism is centred on locations managed by DOC, including the National Parks and Great Walks. DOC (2017) has as two of its goals that '90% of New Zealanders' lives are enriched through connection to our nature and heritage and 50% of international holiday visitors are enriched by their connection with our nature and heritage'.

DOC has management plans for each National Park, including Aoraki/Mount Cook, Westland and Fiordland which are to be reviewed and updated in the next one to two years[4]. To help shape the latter of these plans, the Milford Opportunities project currently being undertaken for Southland District Council, MBIE, the Transport Agency and DOC will examine how to manage the increasing number of tourists visiting Milford Sound.

[4] www.doc.govt.nz/about-us/our-policies-and-plans/statutory-plans/statutory-planning-status-report/

Data of relevance to this project collected by DOC include people and vehicle counts at many locations and an annual survey of New Zealanders, looking at many issues but including use of and satisfaction with DOC parks and facilities. Results of the latest survey will be available later this year.

2.2.5 Other research

Environment Canterbury commissioned the 2016 report *Harnessing the potential of data for Canterbury's tourism and transport networks*, which includes discussion (Byett 2016) of tourism data needs and data sources.

Queenstown Lakes District Council (QLDC) commissioned a model of tourist flows within the district, which builds on similar economic network plans undertaken in Southland and Tasman.

Another QLDC report of interest is the MartinJenkins (2018) investigation into the Queenstown effect on other regions in the South Island.

The Transport Agency (2017) as part of the Visiting Drivers Project provided a Data Insights report which included analysis of rental car and campervan bookings.

Background information on the type of persons visiting places is provided by regular Roy Morgan[5] and Angus & Associates[6] surveys.

[5] www.roymorganonlinestore.com/Browse/New-Zealand/Travel-and-Tourism.aspx?page=1

[6] Example for Rotorua available at www.rotoruanz.com/RNZ/media/Media-Library/Business/Do%20Business/Research%20and%20Statistics/VIP.pdf

3 Current/past visitor data by location

3.1 Initial comments

The typical start of any measurement of tourism is the number of people visiting a location, with the location treated as the attraction or destination in tourism marketing and transport modelling. Such measurements will be introduced in this chapter. In economic terms, the number of visitors to any location is the result of interaction between the demand to visit and the capacity at the location for visitors. Factors that may potentially constrain capacity are discussed in chapter 5.

This chapter focuses on historical visitor numbers and demand influences. The core measures of tourism activity are:

- international visitors arrivals (IVA)
- the International Visitor Survey (IVS)
- the Domestic Travel Survey (DTS) and its proxies
- the tourism satellite accounts (TSA) and their spin-off monthly regional tourism estimates (MRTE)
- the Accommodation Survey (AS), previously the commercial accommodation monitor (CAM).

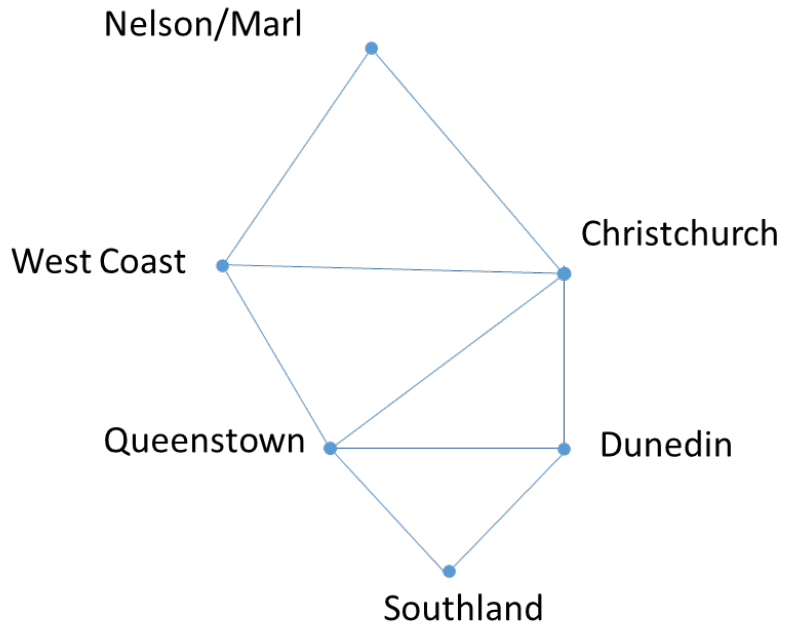
Several methods are then tested to provide estimates of international and domestic visitor arrivals, using Queenstown as an example. The core methods of measuring tourism activity are also explored as a means (a) to confirm, or not, tourism patterns evident amongst core and non-core measures and (b) isolate any intricacies of each measure. Where possible, but not always, data is presented for the year ending March 2016/17 and five-year changes since 2011/12, because 2016/17 is the latest March year with TSA and tourism gross domestic product (GDP) data available, and to enable comparison across the different data sets.

Note, one international arrival at a specific location or small area (eg a TLA) will usually represent one unique person arriving only once, although this becomes less likely for larger areas of consideration (eg one person may have more than one visit to the Canterbury region). However, many measures of domestic arrivals over a year will include a large proportion of repeat arrivals by the same person.

The following three-level framework provided a useful perspective when considering data, especially in terms of what information could be gleaned from any measurement. Different data sets are better suited to measurement of issues at the three levels, as is discussed in this chapter.

1 Data is available that can lead to greater understanding of the major entry and exit points to the South Island and the journeys between major South Island attractions. For example, entry via Christchurch Airport, visitors to West Coast and Southland, trips between Christchurch, West Coast and Queenstown, exits via Queenstown Airport. These are likely to revolve around several locations and several inter-regional transfers. When transfer is by road, travel is likely to be predominantly on 'national' roads, to use the One Network Road Classification (ONRC) nomenclature, but could also be by train or plane.

Figure 3.1 High level inter-regional flows



2 At the other extreme, there are visits to many smaller locations (eg McLean Falls in the Catlins Forest Park, Oparara Arches in the Kahurangi National Park). These destinations may often be distant from major routes and will most likely require use of 'access' roads. Or, in the case of Stewart Island, will entail use of roads to access plane or boat terminals.

Figure 3.2 An example of an intra-regional flow: accessing McLean Falls off the Southern Scenic Route (Source: Google Earth)

3 Between these two extremes, there are the many permutations of actual routes between regions and routes to the many attractions, involving use of all classes of roads. For example, various routes are taken between Queenstown and Dunedin, including via SH8, or via Middlemarch with a train journey into Dunedin, or via SH6 and/or Te Anau/Milford and/or Invercargill, with or without the Catlins.

Figure 3.3 Example of combining inter- and intra-regional flows: routes (not all shown) between Queenstown and Dunedin (Source: Google Earth)

3.2 Core national tourism measures

From a demand perspective, the number of people who can potentially visit a location is capped, first, by the number of people present in the country at any one time and, second, by the number of those people who are part of the visitor pool. The first cap is known approximately. The second cap is not so clear cut, which goes to the issue of what defines a 'tourist'? We consider first international, then domestic tourism.

3.2.1 International visitors arrivals (IVA)

For international visitors, a count is provided via the IVA card, which is filled in by all entrants to the country[7]. In the March 2016/17 year, there were 3,543,631 international arrivals (the total excluding under 15 year olds is 3,241,456). These people are considered international visitors because they live abroad and intend to stay in New Zealand for fewer than 12 months. Some details from the IVA are relevant for subsequent discussions around measures of tourism and are shown in table 3.1.

Table 3.1 Selected IVA measures for years ending March 2012 and 2017

Key characteristic		YE March 2012	YE March 2017	Change 2012–2017	% of total change	% of total 2017
Total visitor arrivals		2,617,930	3,543,631	925,701	100.0%	100.0%
Travel purpose						
	Holiday	1,221,440	1,841,728	620,288	67.0%	52.0%
	Visiting friends and relatives[8]	851,372	1,023,088	171,716	18.5%	28.9%
	Business	249,312	295,184	45,872	5.0%	8.3%
	Education	52,360	65,904	13,544	1.5%	1.9%
	Conferences and conventions	50,744	68,976	18,232	2.0%	1.9%
	Other and unknown					
Length of stay (days)						
	Median	9.1	8.9			

[7] A similar count is taken of all departees.

[8] See Tourism West Coast (2017, p169) fact book for breakdown by residence.

Key characteristic		YE March 2012	YE March 2017	Change 2012–2017	% of total change	% of total 2017
	Intended visitor nights (from IVA, December 2011 and 2016 years)	51,814,500	66,716,870	14,902,370		
	Cf commercial international guest nights (from AS/CAM)	12,631,596	16,598,352	3,966,756		
Citizenship						
	Australia	761,736	927,888	166,152	17.9%	26.2%
	New Zealand	471,308	525,584	54,276	5.9%	14.8%
	China, People's Republic of	161,740	408,752	247,012	26.7%	11.5%
	United States of America	179,804	306,976	127,172	13.7%	8.7%
	United Kingdom	233,336	231,808	-1,528	-0.2%	6.5%
	Other	810,006	1,142,623	332,617	35.9%	32.2%

Some points are noteworthy.

1 Even with the IVA full count of arrivals, it is not possible to provide an exact number of international people who will undertake tourism activity each year, in part due to the difficulty differentiating 'international' from 'domestic'. A significant proportion of international visitors are New Zealand citizens who now live abroad (525,584 in 2016/17), predominantly in Australia. They are here for various reasons and may or may not spend money in New Zealand on tourism activities. The convention is to record people living abroad as 'international' and those living in New Zealand as 'domestic' but this may not always be accurately recorded in non-IVA figures. This differentiation is further undermined when it is realised that as well as the 3,018,047 non-New Zealand citizens visiting for fewer than 12 months, 98,768 non-New Zealand citizens arrived in 2016/17 with intended stays beyond 12 months, with a similar arrival figure in earlier years. Depending on how their segmentation was recognised by non-IVA data gatherers, they may be coded international or domestic.

2 The total number of 'tourists' can vary depending on whether all visitor purposes are included. The IVA shows relatively small proportions of visitors, but significant numbers here for business (8.9%), education (1.9%) and conferences/conventions (1.9%). These figures are of interest for three reasons: (a) to put the size of these sectors into perspective; and (b) to warn that local tourism measurements sometimes include and sometimes exclude education visitors, and that business visitors, while included within New Zealand tourism figures, are not always included within tourism in other countries. Note also, there are often multiple purposes for a visit (although only one reason is requested on the arrival card).

3 International visitors come from a wide range of countries. It may be useful to aggregate visitors by groupings of country of residence but any grouping will need to be relevant to the decision being undertaken, eg visitors could be grouped by English-speaking countries or countries with left-hand drive vehicles. In this report, some international visitor data has been grouped as China, Australia and Other, simply to illustrate points about these two largest international visitor origins. However, it is important to note that the Other grouping is large (49% of 2016/17 IVA and 48% of IVA growth between 2011/12 and 2016/17) and diverse (24 countries having 0.5% or more origin share). In other words, tourism activity and tourism growth is by no means dominated by visitors from Australia and China.

4 Measures of accommodation to be subsequently discussed will be significantly below the number of nights spent by international visitors in New Zealand. A large proportion of international visitors (1,023,088 in 2016/17), including non-resident New Zealand citizens, come here to 'visit friends

and/or relations' (VFR). Again this may or may not involve extensive tourism activities. Of particular relevance, these visitors are likely to stay in unpaid accommodation on many occasions. To be complete, visitors here for 'holiday' and other purposes are also able to stay at unpaid accommodation, including freedom camping, but their ability to access unpaid accommodation is likely to be much less than the VFR visitors. The proportion of combined unpaid visitor nights is unknown but an order of magnitude estimate is given by the proportion of VFR arrivals (29%). Note even allowing for such a large proportion of unpaid accommodation still leaves a large unexplained gap between the 66.7 million intended visitor nights in 2016/17 year (as tabled above) and the 15.6 million guest nights recorded in the 2016/17 AS. Note this issue of large numbers of international visitors staying at non-AS properties pre-dates the emergence of Airbnb and similar platforms in recent years. An associated complication is that intended stay is not always the same as actual stay. Some visitors may arrive with a 30-day stay in mind and then extend their visit, including when they gain a working visa while in New Zealand.

Expanding further on the large gap between commercial guest nights recorded and intended visitor nights stated, a key influence is likely to be the relatively small proportion of visitors who stay well beyond 90 days[9]. In 2016, 7% of visitors stayed beyond 90 days and made up 53% of intended visitor nights. Visitors amongst these longer stays would have included fruit pickers from Vanuatu, WWOOFers[10] from Germany, UK retirees spending an extended summer in New Zealand and non-resident New Zealand citizens who are home for an extended stay. Many of these visitors will still visit multiple locations but are likely to spend extended periods at one or several locations. Also the average spend-per-day of these longer-term visitors is well below the average of short-term visitors, a factor that will be shown later to complicate inferring visitor arrivals from spending data.

One implication of these national measurement issues, even at the arrival level which is fully counted, is that some care is required when making inferences from any tourism figures. Steps that will reduce erroneous inferences include being clear about the data required to address the question of interest and seeking validation of data from alternative sources where practical.

The common figure, and the figure used within the TSA, for 'international tourists' in 2016/17 is 3,543,631 which rounds to 3.5 million. If short-term education were excluded[11], as is the case with MRTE figures, the total international visitors in 2016/17 would be 3,477,727 which is still 3.5 million when rounded.

Usefulness for building a flows model:

- The IVA provides a total number of international tourists, their nationality and their purpose of visit which can be used to derive and/or check sub-national arrivals estimates.
- The IVA provides port of arrival as first origin in a flows model (and when combined with departures cards can provide the port of departure).
- The IVA provides total number of (intended) visitor nights to check against other accommodation figures.

[9] The general visitor visa allows nine months stay while student visas and working visas allow a longer stay.

[10] WWOOFers stands for either Worldwide opportunities on organic farms or Willing workers on organic farms.

[11] Another example of definition difficulties as short-term stay students are sometimes considered within tourism figures and sometimes not, while long-term stay students are excluded from tourism. This distinction need not reflect their travel patterns.

3.2.2 International Visitor Survey (IVS)

The IVS provides further information on international visitors but this is a survey, not a count. A sample of international visitors are questioned when departing New Zealand from Auckland, Wellington, Christchurch and Queenstown international airports. The survey is conducted and processed by Kantar TNS New Zealand Limited on behalf of Statistics NZ and MBIE. Processing comprises cleaning data, imputing missing data, treating outliers and weighting statistics to reflect the distribution of the visitor population.

The sample size is large (approximately 8,900 pa), albeit this is only around 0.3% of international visitors. This includes around 3,000 Australian residents and 550 Chinese residents. Invariably inferences made from the survey will entail sampling error. For the year ending December 2017, the 95% confidence interval was ±6.7% for total international visitor spending and ±22.7% for total spending by Chinese residents. There is also the possibility of survey bias. While efforts are make to survey a cross section of visitors, the response rates have been relatively low (although not unusual), ranging in 2017 from 18% for visitors from China to 34% for visitors from Japan[12].

The survey was designed around expenditure estimates but also includes ancillary questions about places visited, accommodation used and mode of transport. National and regional estimates of these variables will have unknown margins of error of similar or higher magnitude to those of the expenditure variables mentioned above.

It should be noted Statistics NZ is currently reviewing the IVS[13]. An early draft of recommendations has led to improved sampling techniques from 1 April 2018. A final report is due later in 2018. The April refinements to the sampling process will lead to reduced margins of error in future. The extent of this reduction is not yet known but is still likely to leave any estimates of regional visitor numbers being imprecise.

A further word of caution, the IVS was also refined in July 2013[14]. Figures prior to this date would be at risk of higher sampling and non-sampling errors and hence comparisons between recent and pre-2013 figures may be very imprecise.

In spite of the IVS shortcomings, it does produce estimates of transport use which are very helpful for making inferences about journeys, as is required in a flows model. However, some care is required when interpreting the data generally reported (as well as keeping in mind the margin of error). For example, Statistics NZ reports the quarterly number of visitors to TLAs, eg 1,137,158 to the Queenstown Lakes District in March year 2016/17. The steps involved in deriving this figure were as follows:

1 Respondents were asked to recall the places they stayed overnight during each day of their visit.

2 The number of people listing Queenstown, Wanaka, Arrowtown, Glendhu Bay and other nearby locations were identified, after some (unspecified) initial filtering and cleaning of the data.

3 The total population of adult overnight visitors was estimated by upscaling each respondent staying at least one night in Queenstown Lakes in proportion to the respondent's representation in the arrival population (eg one Chinese respondent of a certain age and purpose of visit identified as staying in Queenstown Lakes is inferred to mean 204 similar people did likewise, ie this response contributed 205 to the 1.1 million total given above).

[12] A Statistics NZ (2017) evaluation of the IVS referred to declining response rates and suspicions of over-estimated spending in 2014/15 and 2015/16

[13] www.mbie.govt.nz/info-services/sectors-industries/tourism/tourism-research-data/ivs/ivs-2018-review

[14] Including removing the itinerary questions and relying more on respondents to identify places visited

4 Excluded from this count are those people: (a) who did not recall staying in Queenstown Lakes or identified their stay in the district incorrectly, likely to be more of a problem with other districts; (b) who visited but did not stay in Queenstown Lakes; and (c) who were children.

To give some perspective to the estimation difficulties and to provide a figure to be used later in this report, the following steps were taken to derive the number of international visitors to the South Island.

- Using the 'places visited' question, respondents visiting the South Island were identified and weighted to give an estimated number of adults visiting the South Island in March year 2016/17 as 1,565,361.
- This total is 49% of the total IVS adult population of 3,179,420 (which differs slightly from the IVA arrivals count of adults for some unknown reason).
- However, amongst the other 51% of adults there were respondents who had not been coded as visiting the South Island and yet some answers show they did. The IVS includes several questions that explicitly refer to visits to the South Island, including port of arrival, port of departure, visits to national parks, visits to art galleries and museums, and travel on the ferry between the North and South Islands. Taking account of this data increases the proportion of adults visiting the South Island.
- The IVS also includes respondents who are coded as neither visiting the North or South Island, which is clearly incorrect. Excluding these respondents from the calculation raises the proportion of adult visitors to the South Island to 53% of adult visitors who were identified as visiting the North or South Island.
- Applying this ratio to the IVA arrivals, to provide consistency in figures and to include children, raises the estimated number of international visitors to the South Island in March 2016/17 to a rounded total of 1.9 million, which has been used for calculations in this report.

Other visitor patterns can be identified in a similar manner. Some of these statistics are used in later sections of this report to infer journeys. Other questions of interest in the IVS, not reported here, include scales of satisfaction, including a 'sense of safety' that is explicitly linked to road safety.

Table 3.2 Mode of transport for international adult visitors to New Zealand Mar 2016/17 (unadjusted IVS ratios)

General mode	Ratio	Of which ...	Ratio
Bus or coach	44%	Tour bus	23%
Boat	35%	Cook Strait ferry	11%
Car or van	75%	Campervan	6%
Taxi or shuttle	43%		
Air	29%	Plane	24%
Train	10%		

Usefulness for building a flows model:

- The IVS provides an estimate of international visitor spending, travel patterns and destinations that can be used as inputs to a flows model, albeit estimates are imprecise.
- The IVS also provides national and sub-national estimates to validate independent measures.
- The IVS is a core component of the TSA.

3.2.3 Domestic visitor surveys

Internationally, a domestic tourist is defined as a person visiting outside their usual environment, further refined to be someone travelling more than 40 km from their residence (one way) and outside the area

they commute for work or visit daily. Note, in non-survey studies, the 40 km limit and commute area can be determined by electronic card spending patterns or phone usage.

The issues raised earlier about measuring the number of international visitors are again relevant. Additionally there are further complications as (a) there is no equivalent census of domestic tourism that parallels the IVA and (b) the official estimate of domestic visitors that was derived from the annual Domestic Travel Survey (DTS) is no longer available.

The DTS was an annual survey of approximately 15,000 people per year, seeking number of trips, number of nights away, accommodation used and activities undertaken. Trips were broken down as overnight trips and day trips. The survey ceased in 2012.

Using the DTS for the year to March 2012, TIA reports New Zealanders took 34.1 million day trips and 18.6 million overnight trips. Over the period from 2003 to 2012 the number of overnight trips taken by New Zealanders increased by around 1% pa and the number of day trips decreased slightly. Some 57% of domestic visitors stayed in private accommodation[15]. Travel was predominantly by car[16] and business trips were included amongst the figures.

As an aside to data measurement, TIA also points to domestic tourism complementing international tourism by providing a source of visitors during seasonal and cyclical downturns.

While Statistics NZ no longer estimates the number of domestic tourists, it does estimate domestic tourism expenditure in the tourism satellite accounts (discussed in section 3.2.4).

Other parties now provide estimates of domestic tourist numbers. Qrious has used cellphone and GPS use across the Spark network to estimate the number of domestic and international tourist visits, including overnight and day trippers. The national estimates were not available for this project[17] but are expected to be available soon through the MoT ground travel data project.

Another measure derives from a one-off survey undertaken by Colmar Brunton for the TIA DGiT programme of leisure travel. This survey comprised 6,000 responses from a structured sample of the New Zealand population aged 18+ in September 2016. From this survey, the estimated number of day trips taken primarily for leisure reasons was 27.6 million and overnight trips for leisure reasons was 17.4 million. The day trip total is lower than the 2012 DTS total but has considered a narrower reason for travel. The number of overnight trips is discussed once other surveys are mentioned.

A larger survey is a Fresh Info and Automobile Association (AA) survey of over 3,000 AA members each month. Information gathered includes the respondent's location on each night of the trip, plus their region of usual residence. Day trips are not considered within this survey. Results from the survey sample are weighted up to reflect the national 15+ population using demographic information from Statistics NZ. According to Fresh Info, there were an estimated 28.2 million domestic overnight trips in 2016 entailing 80.0 million adult visitor nights. Excluding overnight business trips the annual total was 24.8 million. Both figures are above the aforementioned estimates from Colmar Brunton and Statistics NZ. The Fresh Info figures equate to an average 7.5 trips per population aged 15 and over and to an average 2.8 nights per trip.

[15] www.tourism2025.org.nz/tourism-2025-archive/domestic-tourism-the-backbone-of-the-industry/

[16] www.transport.govt.nz/resources/household-travel-survey/

[17] Some Qrious regional reports were made available to the project

Table 3.3 Estimated domestic tourism statistics for calendar year 2016 (source: Fresh Info)

Measure	2016 total	Per adult
Overnight trips	28,228,000	7.5
Visitor nights	80,006,000	
Nights per trip	2.8	

Clearly there are differences between the Colmar Brunton and Fresh Info[18] results. To gain further perspective on whether one or other figure is closer to the (unknown) actual number of visits, a comparison can be made with Australia, where the equivalent to the DTS still exists. The Australian National Visitor Survey (NVS) annually surveys via phone approximately 120,000 Australian residents aged 15 years and over. Table 3.4 shows the estimated totals for the year ending December 2017, including business trips. Of interest to this project, the average number of day trips was 10.1 per adult and annual overnight trips was 5.1 per adult. Applying these averages in New Zealand would give March year 2011/12 day and overnight trip totals of 35 million and 18 million, similar to the figures derived from the New Zealand DTS. Applying the Australian averages to New Zealand for March year 2017/18 equates to 28 million day trips and 19 million domestic overnight respectively. As an aside, the Australian figures also show a 24:76 split of expenditure between day and overnight trip expenditure, a figure not recorded in the New Zealand TSA and MRTE domestic figures.

Table 3.4 Australian domestic tourism statistics for year ending December 2017

Measure	2017 total	Per trip or night	Per adult	% of total
Overnight trips	97,203,000	A$664	5.1	
Visitor nights	350,911,000	A$184		
Nights per trip	3.6			
Overnight trip expenditure	A$64,517,000,000			76%
Day trips	191,920,000	A$107	10.1	
Day trip expenditure	A$20,444,000,000			24%
Total domestic expenditure	A$84,961,000,000			

Source: www.tra.gov.au/tra/nvs/nvs_dec_2017.html

Taken together, the figures from DTS (2012), DGiT (2016), Fresh Info (2016) and NVS (2017) reinforce the difficulty that exists around measuring the extent of domestic tourist trips.

The Australian figures provide some economic perspective to day trips, their influence being only around one quarter of domestic tourism spending. The more economically significant activity is overnight visits.

For the purposes of this report, an estimate of 24 million has been used in estimations that require a number of overnight domestic trips for March year 2016/17 (and also for 2016). This is an average of the totals estimated by Colmar Brunton (upscaled to include business trips) and Fresh Info, used because, even though the Fresh Info numbers are higher than estimated elsewhere, their process appears to be statistically sound, there is a large margin of error around any estimate and generally averaging produces reasonable estimates.

[18] One potential bias is that AA members may travel more than non-AA members, which is more likely to affect the quantum of visits estimate rather than the regional distribution of visits.

Usefulness for building a flows model:

- Surveys provide a total number of domestic tourists to derive and/or check sub-national arrivals estimates.
- The people visiting places can provide:
  - destinations (when considering inter-regional travel) and origins (when considering intra-regional travel) in a tourist flows model
  - total number of visitor nights to check against other accommodation figures.

3.2.4 Tourism satellite accounts (TSA)

The core measurement of tourism spending, employment and GDP is provided by the TSA, prepared by Statistics NZ for each March year since 1997. The latest figures, for the year ending March 2017, include $21.4 billion expenditure by tourists. Excluding imputed rent, short-term education fees and air passenger travel costs, the amount spent was $15.7 billion. Expenditure pertains to overnight trips and day trips.

These accounts provide the national spending total, which is broken down by RTO and TLA in the regional tourism estimates (MRTE) prepared monthly by MBIE using electronic card transaction data. The accounts also provide the employment and GDP totals, which are broken down by region and TLA by Infometrics annually, using the linked employer-employee data provided by Statistics NZ. These sub-national figures are discussed later in section 3.3.5.

Table 3.5 Selected TSA measures for year March 2017

Product	Domestic demand ($m)		International demand ($m)	Total demand ($m)	Filled jobs
	Business and government demand	Household demand			
Accommodation services	574	676	1,614	2,864	
Food and beverage serving services	402	1,461	2,509	4,372	
Air passenger transport**	1,348	1,488	2,242	5,078	
Other passenger transport	1,574	1,337	1,043	3,955	
Imputed rental on holiday homes**	0	783	0	783	
Cultural, recreation, and gambling services	0	675	425	1,100	
Retail sales – alcohol, food, and beverages	0	1,848	400	2,249	
Retail sales – fuel and other automotive products	731	577	793	2,101	
Retail sales – other	0	4,422	2,157	6,578	
Education services**	0	258	504	762	
Other tourism products	265	1,181	1,375	2,820	
GST paid on purchases by tourists	6	1,829	1,474	3,309	
Total tourism expenditure	**4,901**	**16,535**	**14,536**	**35,972**	230,793
Total tourism expenditure excluding GST and above marked **	**3,547**	**12,177**	**10,316**	**26,040**	
MRTE NZ total	**15,723**		**10,316**	**26,039**	

Again some cautionary notes are required about TSA figures.

1 The spending activity underlying the TSA is *estimated* from various sources[19] including the electronic card spending records, the IVS, the Annual Enterprise Survey (AES), Ministry of Education figures on course fees and, for the first time in 2017, statistics relating to cruise ships[20].

2 Estimates for the previous year are often revised in the next annual estimation process, so reported TSA results for 2016/17 tabled above are likely to be different once revised figures are released in late 2018.

3 Domestic tourism spending includes off-trip purchases (eg buy a tent), out-bound travel purchases of New Zealand goods and services (eg buy an Air NZ flight to Fiji or pay local travel agent commission) and an imputed rental on holiday homes (eg equivalent market rent on a bach). Flights and imputed rents, as well as education course fees, are excluded from the TLA figures derived within the MRTE.

4 A breakdown is provided for tourism-characteristic industries (eg accommodation), tourism-related industries (eg retail) and all other industries. A similar breakdown is reported for products. For example, the food and beverages services industry which is the largest tourism-characteristic industry sells food and beverage services (a tourism-characteristic product) and also alcohol, food and tobacco (tourism-related products). This differentiation was used in the estimation of TLA employment and GDP by Infometrics.

Usefulness for building a flows model:

- The TSA provide total tourist spending, broken down by international and domestic, to derive and/or check sub-national spending estimates.
- Likewise for employment and GDP sub-national estimates, albeit not broken down as due to international and domestic demand.

3.2.5 Monthly regional tourism estimates (MRTE)

The MRTE of tourism spending, by product and by RTO or TLA, are derived from card spending and calibrated to the TSA. Spending is broken down by domestic and international. Electronic card transactions are gathered from Paymark and BNZ by Marketview, representing around 80% of the electronic payment market.

While generally considered a good guide to regional tourism activity, four issues should be kept in mind, their importance varying with the nature of the decision at hand:

1 Marketview imputes values to provide estimates of total electronic card transactions. This is unlikely to be an issue unless a major merchant was not captured within Paymark or BNZ.

2 MBIE takes this estimated electronic payment data and further scales the figures upward to account for spending by other means such as cash and electronic transfer, to accord with total spend as per the TSA. In the year ending March 2015 there was an approximate 1:4 ratio of non-card to card spending across all international expenditure reported in the IVS. The working assumption is the non-card proportion is the same across all regions and TLAs within a sector. This can be an issue in situations where cash payments or direct debit are relatively high.

[19] www.stats.govt.nz/information-releases/tourism-satellite-account-2017

[20] newzealandcruiseassociation.com/cruise-arrives-in-official-tourism-statistics/

3 Only limited adjustments are made for centralised or out-of-region payments. This means payments are correctly recorded (subject to the two issues above) but these payments will understate the locational significance of an activity such as, say, accommodation on the West Coast which was paid within a tour package purchase or boat trips on Milford Sound paid in Queenstown.

4 Another spatial bias, having the opposite effect of (3), also occurs for domestic cards only. Take people living in Auckland provisioning for a visit to the Coromandel. This spending goes unrecorded in electronic card payment data (due to less than 40km away from home), in turn under-weighting the proportion of (true) tourism card spending in Auckland and by implication over-weighting spending share in holiday regions such as Coromandel. Because it is these regional shares that are effectively being applied to the TSA-determined national total spend, the estimated amount spent on domestic tourism in Auckland will be under-estimated and spending in Coromandel will be over-estimated.

Besides being of general interest, MBIE provides spending at food and alcohol retailers and at fuel retailers. Spending in both sectors is largely for day-to-day needs. It is likely to be relatively even on a per-person basis between locations and hence is expected to be highly correlated with the number of people in the vicinity (this assumption is yet to be tested). In this project spending by visitors at fuel retailers was chosen as an indicator of the number of visitors, due to it showing correlation with a number of partial measures of the number of visitors at TLAs; however, similar results were found using food and alcohol retailing. Using total visitor numbers derived below, the average daily spend at fuel retailers in 2016/17 was estimated to be $23.66 for international visitors and $19.26 for domestic visitors. These numbers are used below to derive visitor numbers from MRTE figures for TLAs. Note this method will not work for larger regions where nights per visit could be well above one to two nights.

Usefulness for building a flows model:

- The MRTE provide comprehensive data, using well sounded methods, that indicates tourism activity.
- MRTE spending in sectors such as retail food and fuel can be used as indicators of the number of people present in regions and TLAs.
- MRTE provides information on the origin of visitors.

3.2.6 Accommodation survey (AS), previously the CAM

Statistics NZ asks all 'commercial' short-term accommodation providers, some 3,000-odd establishments, to report selected variables (eg guest nights, guest arrivals) each month, where 'commercial' will exclude[21]:

- those providers not charging GST (and therefore having income below[22] $60,000 pa), likely to include many Bookabach and Airbnb providers
- hosted accommodation (such as 'bed & breakfast' establishments)
- marine vessels (such as cruise ships)
- private dwellings
- tramping huts (non-commercial)
- event-specific accommodation (such as temporary campervan parks)
- and freedom camping.

[21] http://datainfoplus.stats.govt.nz

[22] Until recently the GST threshold was $30,000 pa.

In practice, not all accommodation providers respond to all (or any) questions and Statistics NZ will estimate missing data, amounting to 15% of total guest nights and 27% of origin of guest figures. Statistics NZ states that the size of these resulting unknown errors 'is difficult to quantify'.

It should be noted that guests are not necessarily unique. Thus, the number of arrivals at one location or one region will exceed the number of unique persons who arrived, eg the reported number of arrivals at all New Zealand commercial accommodation was 19,319,383 in 2016/17, which is in excess of the number of local population and international visitors combined.

The number of guest nights is broken down by international and domestic, based on information gathered by the accommodation provider. The number of persons arriving is only gathered on a total basis but can be reasonably inferred for international and domestic from the guest nights split (although this will not always be a valid assumption).

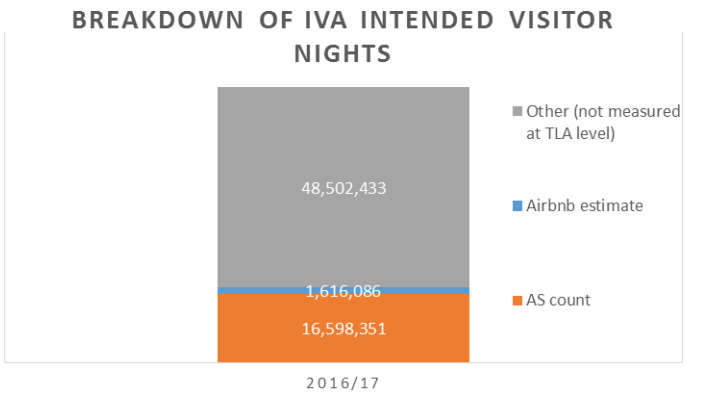
As mentioned earlier and shown in table 3.1 and figure 3.4, the number of international guest nights measured by the AS is substantially below any reasonable estimate of the number of international visitor nights. There are three explanations for this difference:

- It is possible that some international guests have been reported as domestic guests and/or have been under-estimated within the AS missing data estimation procedure.
- Some international visitors stay at paid 'non-commercial' properties, such as Airbnb.
- Even more stay at unpaid locations, mostly with friends and relations.

A crude method is explored in this project to provide order of magnitude estimates of monthly international arrivals to each TLA. The method (a) takes the international guest arrivals implied within the AS, (b) scales this up by estimated Airbnb reservations, derived by web scrapping, (c) scales up further to include unknown stays by short-term visitors and (d) further apportions a large residual national sum for longer-term visitors across each TLA in proportion to population. These TLA estimates are unlikely to be accurate, given that (a) the difference between AS and IVA-derived visitor nights has not been clearly identified and (b) any 'unexplained' visitor nights are likely to vary between TLAs. Nonetheless the order of magnitude will be closer to the actual (unknown) number of international arrivals to a TLA than the AS estimate alone. These estimates are compared with other tourism indicators and discussed below.

As it turned out, this project was unable to devise a method that could confidently be used to derive visitor arrivals to TLAs from accommodation data. There are simply too many visitors staying outside the commercial accommodation and too many assumptions are required to infer stay patterns for these non-commercial guests. Note again, this issue pre-dates the advent of Airbnb.

Figure 3.4 Breakdown of international visitor nights



Usefulness for building a flows model:

- The AS provides an independent measure of guest nights at TLAs from which international and domestic arrivals can be inferred, albeit very approximately, which can be used to validate a flows model.
- The AS can also be used to validate establishment numbers if establishments are used as a within-region origin in a flows model (with activities as destinations).
- Guest nights provide a correlate of spending that can be used to check TLA spending estimates.

3.3 Using tourism indicators as measures of arrivals and as determinants of GDP

The above discussion pointed to several core measures of tourism activity in New Zealand and some of the issues surrounding that measurement. This section sets out to:

- explore how this data can be used to determine arrivals at TLAs
- show other indicators may be used as supplementary or replacement measures of arrivals
- consider to what extent more tourism activity has led to more local employment and higher GDP.

Various measures are explored. This is to draw out issues and validate other measures, where possible. It is also part of a search for ways to measure arrivals by country of residence. In particular, the MRTE provide spending breakdowns by country of residence and hence could be useful as indicators of numbers of arrivals by country. Queenstown is used to illustrate the various measures and issues. Data availability did mean some examples use Queenstown Lakes District while others refer to Queenstown RTO area[23].

3.3.1 International arrivals

Four of the core tourism indicators provide information that enables estimation of international visitors to TLAs. The IVA defines the total number of international visitors to New Zealand. The IVS, MRTE and AS provide independent but indirect measures of international visitor presence in each TLA. Unfortunately none provide an accurate measure of the number of international visitors to each TLA but together they show (a) the approximate number of international visitors and (b) the uncertainty that exists around any approximation. Other sources exist to validate any estimate.

The four estimates for Queenstown Lakes are tabled below, along with some partial arrival figures also known. No one estimate provides the definitive measure of arrivals.

Table 3.6 Estimates of number of international visitors to Queenstown Lakes District in 2016/17

Measure	Reported figures	Estimated arrivals	Comment
IVS	1,137,156 overnight visitors	1.4 million	IVS adults scaled up to include children and allowance for omission bias. Known to have a large margin of error.
AS	1,199,732 arrivals inferred from reported guest nights	1.8 million	Assumes non-commercial short-term visits to Queensland Lakes are in proportion to commercial visits but will average stay twice as high. Will include repeat visits. Expected to be least accurate measure of

[23] Different regional breakdowns will also likely be a challenge when it comes to a flows model

Measure	Reported figures	Estimated arrivals	Comment
			total visitors.
Arrivals by cruise ship	0		Not relevant for Queenstown Lakes.
MRTE	$89.5 million for fuel retailers	1.5 million	Assumes same average fuel spend[24] per day from all <90 day visitors to New Zealand and very low per-day fuel spend visitors for >90 days. Will include repeat visits.
Qrious	1.9 million overnight unique arrivals June 2016/17	1.3 million	Assumes 70/30 split of internationals and domestics (based on local anecdotal evidence).
Arrivals at Queenstown Airport	261,185 on inter flights 639,113 on dom flights		Unknown is the international/domestic passenger split (as opposed to flights).
Delegates at conventions	16,887		Lower than anecdotally reported.

Other sources provide partial measures of international visitor arrivals that are of interest in their own right but provide little help in estimating the total number of arrivals. However, they might in time be used within a disaggregated model of visitor flows.

Methods used to estimate international visitor arrivals at a TLA level.

1 From the IVS. Estimate by MBIE based on the sample of international adult visitors that reported visiting Queenstown, Wanaka or places within the district, scaled up by 21% using South Island average to account for children and omitted survey responses. KNOWN ISSUES: large margin of error.

2 From the AS using steps below. KNOWN ISSUES: as in brackets below

   a Take AS guest nights by international and domestic, derive estimate of international arrivals using guest nights per stay (assumes same international and domestic nights per stay)

   b Add Airbnb international arrivals estimate, derived by multiplying ratio of reservations to guest nights where reservations found through web scraping by Infometrics (assumes same statistics as AS for proportion of internationals and guests/night)

   c Using New Zealand visitor nights from the IVA, apportion the '>90 days' New Zealand visitor nights to each region or TLA in proportion to population (assumes these longer-term visitors stay in proportion to the local population and not, say, to holiday home supply).

   d Deduct totals for 1–3 above from total New Zealand visitors (IVA) to give residual visitor nights, allocate to each TLA in proportion to 1+2 above, derive estimate of arrivals using guest nights per stay x 2 (assumes same international and domestic nights per stay, non-commercial visits are similar to commercial stays in TLA mix and nights/stay is twice as long for longer-term tourists).

3 From the MTRE. KNOWN ISSUES: as in brackets below:

[24] As alternative estimates, arrivals were 1.6m using the average retail food and alcohol spend (ie at shops as opposed to cafes and bars) and 1.56m using combined fuel, food and alcohol spending.

4 Take MRTE for retail fuel:

   a Divide by New Zealand average daily retail fuel spend per international visitor, based in turn off IVA New Zealand visitor nights (assumes spend per day highly correlated with visitors present)

   b Divide by average night's stay (from AS) in TLA (assumes average derived from AS represents average for all accommodation types).

5 From Qrious. Combined overnight estimate by Qrious multiplied by 0.7 to give internationals. KNOWN ISSUES: process to impute missing values has not been disclosed.

6 Not used but also available is the international visitor nights estimate that can be made from the IVS (five-year averages are reported by MBIE while annual figures can be accessed by customised query). Expected to give same results as (1). KNOWN ISSUES: large margin of error.

What can be taken from this estimation process? First, the high estimate provided by scaling up AS arrivals to account for those staying outside commercial accommodation points to a major shortcoming in this approach, namely that the 'unexplained international visitor nights' cannot be simply assumed to be apportioned across TLAs in accord with AS patterns. Otherwise, the IVS and MRTE come up with different numbers but these results are unsurprising given MRTE will include spending by visitors who are not staying overnight and the IVS is likely to suffer from respondents omitting to report all stays (although this is likely a lesser risk with Queenstown than other TLAs). While the imprecision of the above estimates may be disconcerting, the estimates when compared across TLAs show a reasonable consistency, suggesting each underlying measure (ie survey, paid accommodation, card spending on groceries and/or fuel, cell phone presence) has information about visitor arrivals.

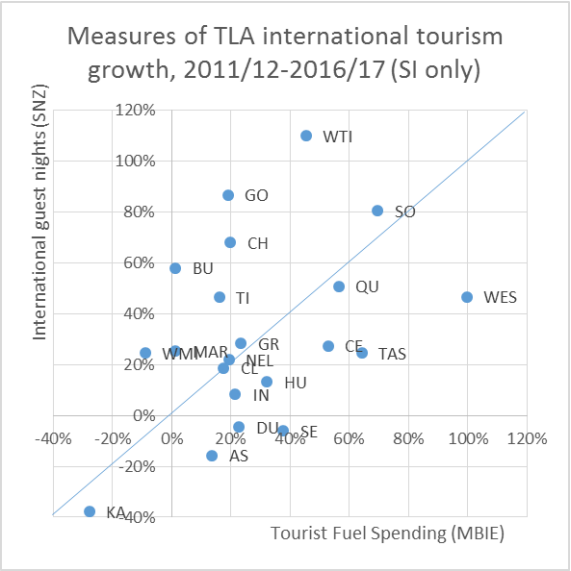
See appendix B for more graphs of visitor (level) estimates by TLA.

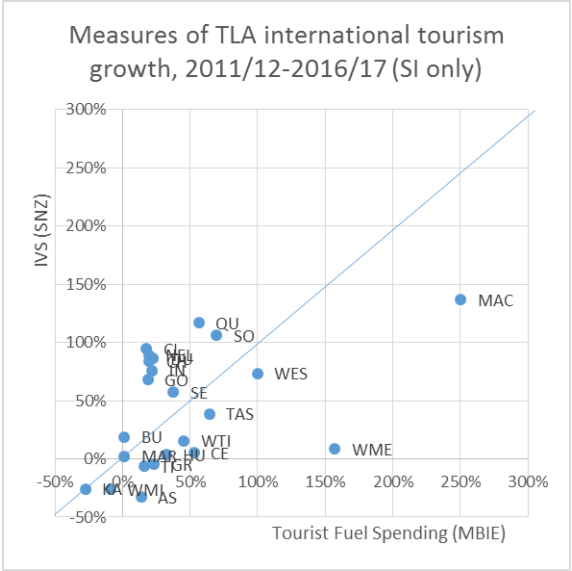
Further insight into this data can be gained by examining five-year changes. This is possible for the IVS and MRTE data series, although IVS comparisons over this period should be treated with caution due to changes in the survey in 2013.

Take again the Queenstown Lakes example – the growth rate in the number of international visitors between 2011/12 and 2016/17 was estimated as 57% based on MRTE estimates of international spending at fuel retailers, which is above the growth rate shown for guest nights by the AS (51%) and below the rate of visitor arrivals given by the IVS (117%). All three compare with international total spending growth in the district of 90%. An outlier in both comparisons (out of scale in the first graph) is Mackenzie District (MAC), which includes Aoraki/Mount Cook. Qrious data also shows strong recent growth for this location, suggesting extra care when using IVS and AS to infer Mackenzie visitor numbers[25].

[25] Mackenzie District also shows as having relatively high food and alcohol spending. The reason for this outlier was not determined in this project but is worthy of further investigation.

Figure 3.5 Growth of three core indicators of international visitors to TLAs between 2011/12 and 2016/17





Usefulness for building a flows model:

- Several methods are available to derive estimates of international visitor arrivals to a TLA, although no one method provides a definitive visitor number.
- Visitor arrivals estimates can be used to inform and/or validate, or not, a flows model (which will also require mode data).
- More generally, each arrival estimate can be used to validate, or not, the reasonableness of the figures put forward with any investment proposal.
- Forecast of the various arrival data enables the sensitivity of the capacity of a proposed project to be tested.
- Comparison between each dataset enables better insight into the intricacies of each measure.

3.3.2 Domestic arrivals

Two of the core tourism indicators - the MRTE and AS – provide information that enables estimation of domestic visitors to TLAs. A third is provided by Fresh Info estimates of overnight visits. Each provides independent measures of domestic visitor presence in each TLA. As with international visitors, no single indicator provides an accurate measure of the number of domestic visitors to each TLA but together they show (a) the approximate number of domestic visitors and (b) the uncertainty that exists around any approximation. Other sources exist to validate any estimate, including in this case some Qrious data. Some of the intricacies of these measures of regional domestic tourism are now explored.

Again taking Queenstown – this time the RTO – as an example, the Fresh Info estimates of 800,000 overnight domestic arrivals is slightly higher than that inferred by fuel sales, with both estimates also above that of Qrious. The AS estimate again appears exceptional, adding further weight to the case that the AS cannot be reasonably used to derive visitor numbers (ie the unexplained visitor nights are too large and appear to have different patterns to the AS). While these figures are approximate, there is an order of magnitude consistency, implying a domestic overnight visitor total of around 750,000–850,000 in 2016/17. Only Qrious estimated the number of day trips, reported to be 1.3 million.

Table 3.7 Estimates of number of domestic visitors to Queenstown RTO in 2016/17

Measure	Reported figures	Estimated arrivals	Comments
Fresh Info/AA	798,000 Dec 2016 year	0.8 million overnight	No adjustment to reported figure
AS	416,958 arrivals inferred by domestic guest nights	0.9 million overnight	Assumes visits to non-commercial in proportion to commercial
Arrivals by cruise ship	0		Not relevant for Queenstown Lakes
MRTE	$35 million for fuel retailers	0.7 million overnight	Sensitive to estimate of New Zealand domestic visitor nights
Qrious	1.9 million overnight unique arrivals June 2016/17 Plus 1.3 million day trips	0.6 million 1.3 million day trips	Assumes 70/30 split of internationals and domestics (based on local anecdotal evidence). Assumes all day trips are domestic.
DGiT	1.2–4.2 million potential overnight trips 0.4–1.9 million potential day trips		Not a measure of actual visitors but included as comparator
Arrivals at Queenstown Airport	261,185 on international flights 639,113 on domestic flights		International/domestic passenger split (as opposed to flights) unknown
Delegates at conventions	22,376 plus locals		Lower than anecdotally reported.

Giving further confidence that the three measures – MRTE, AS and Fresh Info – do provide an approximate measure of activity, the correlation of estimated RTO share for each variable was high (0.93 and higher) for calendar year 2016. To be clear, the AS measure provides a measure of RTO share that is consistent with MRTE and Fresh Info, although a method has not been devised to show the AS provides a reasonable measure of actual number of visitors to each RTO, nor is it likely to reflect actual growth patterns in recent years.

Methods used to estimate domestic visitor arrivals at a TLA.

1 IVS not relevant.

2 From the AS using steps below. KNOWN ISSUES: as in brackets below

   a Take AS guest nights by international and domestic. Derive estimate of domestic arrivals, using guest nights international/domestic ratio (assumes same nights per stay)

   b Add Airbnb international arrivals estimate, derived by multiplying ratio of reservations to guest nights where reservations found through web scraping by Infometrics (assumes same statistics as AS for proportion of internationals and guests/night)

   c Deduct totals for 1-2 above from total New Zealand domestic overnight arrivals to give residual visitor arrivals, allocate to each TLA in proportion to 1+2 above (assumes same international and domestic nights per stay, and non-commercial visits are similar to commercial stays in TLA mix and nights/stay)

3 From the MTRE. KNOWN ISSUES: as in brackets below

   a Take MRTE for retail fuel.

b Divide by New Zealand average daily Retail fuel spend per domestic visitor, based in turn on estimated total New Zealand visits (assumes spend per day highly correlated with visitors present and that total New Zealand visits estimate is reasonable)

c Divide by average night's stay (from AS) in TLA (assumes average derived from AS represents average for all accommodation types)

4 From Qrious. Multiply combined overnight estimate by Qrious by 0.3 to give domestics. KNOWN ISSUES: the process to impute missing values has not been disclosed

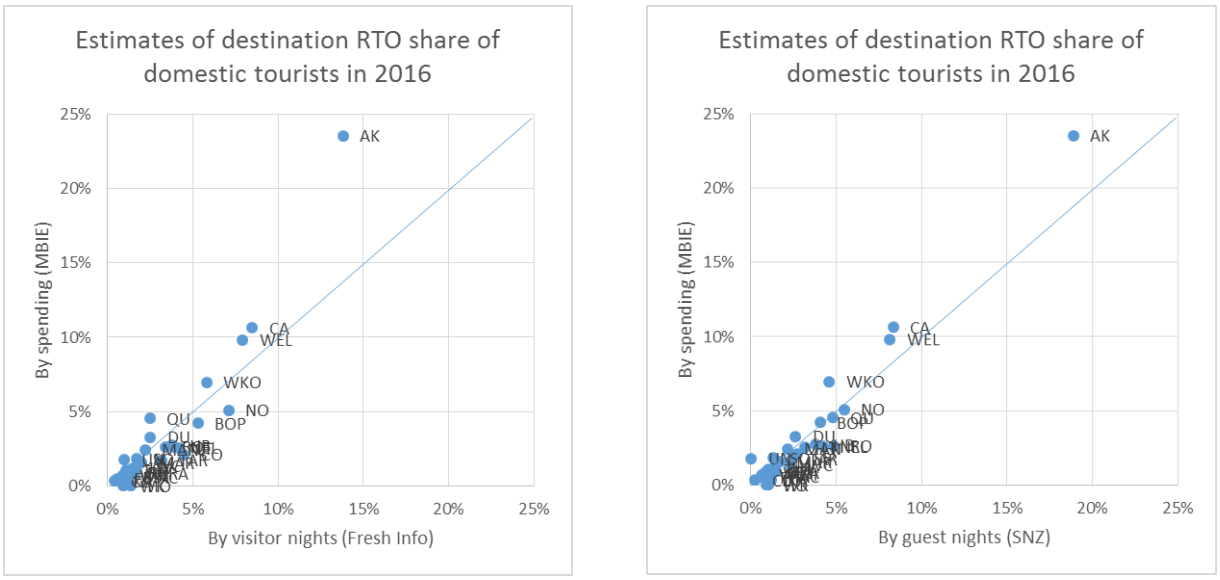
5 IVS not relevant.

6 From Fresh Info. Derive from regular sample surveys the unadjusted estimate by Fresh Info of domestic overnight visits. KNOWN ISSUES: large margin of error and higher New Zealand total than estimated by others.

7 From DGiT. Derive from one-off survey of 6,000 people in September 2016 the unadjusted estimate by Colmar Brunton of domestic visits (day and overnight combined).

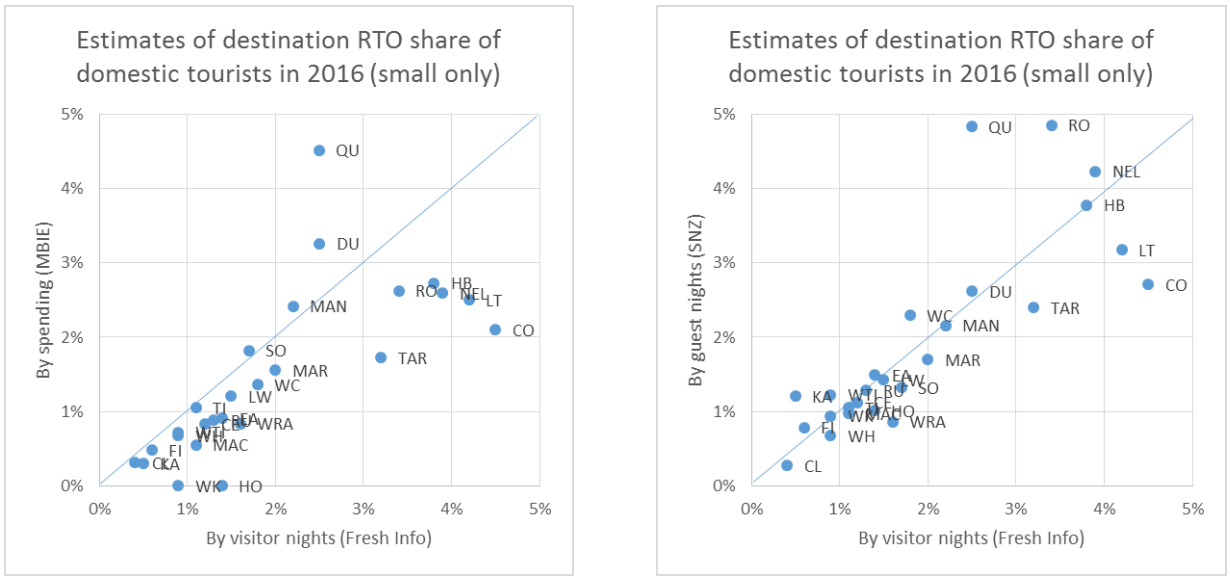
One differing pattern pertaining to the larger RTOs is that they had a higher share of total expenditure, relative to visitor nights (Fresh Info) and guest nights (Statistics NZ). A likely explanation is more day trips around the larger RTOs, including Auckland (AK in the charts), given that MBIE expenditure estimates include day trips, which cannot by definition be part of Fresh Info and Statistics NZ visitor or guest nights.

Figure 3.6 MBIE versus Fresh Info and Statistics NZ estimates of destination New Zealand RTO share of domestic tourists in 2016



As a further test of similarity, the correlation between the three measures remains high when the large RTOs are excluded (around 0.8) but more differences are evident. These include relatively high total spending and guest nights in Queenstown (QU), compared to the Fresh Info estimate of visitor nights, and conversely low shares of spending and commercial guest nights relative to total visitor nights at Lake Taupo and Coromandel. Both patterns appear consistent with a tightness of housing around Queenstown, versus high concentrations of holiday homes around Taupo and Coromandel.

Figure 3.7 MBIE and Statistics NZ versus Fresh Info estimates of New Zealand RTO domestic tourist shares, excluding large RTOS

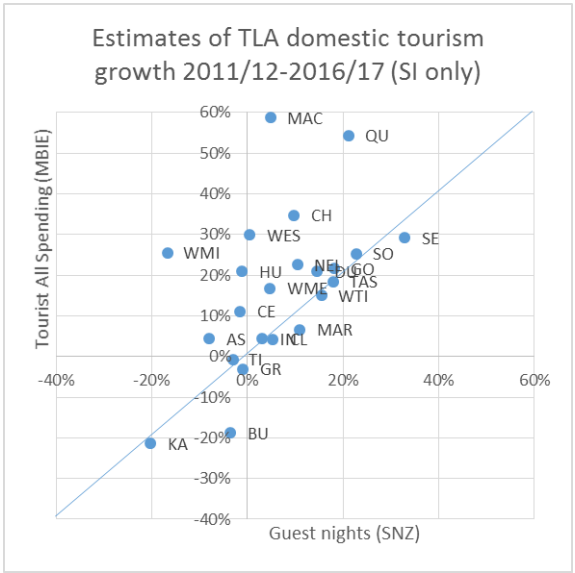


Nonetheless the charts confirm that measurement differences do occur.

Also of interest is whether changes in these measures of domestic tourism are consistent. Long-term data is available for spending (MBIE) and guest nights (AS) but not for visitor nights (Fresh Info), nor for other measures such as those produced from cell phones.

Figure 3.7 shows a correlation (r=0.51) between domestic spending growth and domestic guest nights for South Island TLAs but also shows (a) spending growth generally exceeded guest night growth and (b) some clear inconsistencies. There is a good reason for (a), namely the sharp growth in Airbnb use and a generally higher income growth. It is unknown whether the inconsistencies are a result of actual changes in visitor behaviour or result simply from measurement error.

Figure 3.8 Domestic tourism five-year growth for South Island TLAs



This analysis shows there are good reasons to treat estimates of domestic tourism activity with caution. That said, the MRTE is soundly based and produces outcomes that are generally consistent with other domestic activity measures. Likewise, while the national Fresh Info estimate of visitor arrivals and nights appears high, the estimates are soundly based, showing correlation with other measures of domestic tourism and updated regularly. Less confidence should be placed in estimated numbers based on the AS at present; the commercial accommodation census itself is sound but it requires a large adjustment to estimate all arrivals, including VFR, and given the rapid growth of Airbnb, the rate of change in AS figures is also likely to diverge from total visitor growth rates.

Usefulness for building a flows model:

- Visitor arrivals estimates can be used to inform and/or validate a flows model.
- These estimates can more generally be used in the same fashion for decision making as per international estimates discussed previously.

3.3.3 Total arrivals

The above estimates can be combined to form estimates of all visitor arrivals at each TLA. This data can also be supplemented by other figures such as estimates derived from Qrious cellphone usage or, potentially, by more novel measures such as deliveries of toilet paper.

As above, estimates span a relatively wide range. Qrious estimates 1.9 million visitors to Queenstown Lakes District. The AS survey, upscaled for Airbnb and VFR, points to around 3.5 million visitors, although this estimate is very sensitive to the assumed proportion of VFR and hence is given little weight in any further analysis. Based on average fuel retail spending per day, the MRTE points to around 2.3 million overnight visitors.

The only estimate for day trip visitors is 1.9 million from Qrious.

Table 3.8 Estimates of number of international and domestic visitors to Queenstown Lakes District in 2016/17

Measure	Reported figures	Estimated arrivals
AS	1,758,335	3.0 million = 1.8 million + 1.2 million (district not RTO) Plus day trips
Arrivals by cruise ship	0	
MRTE	$89.5 million fuel retailers for international $35.0 million for domestic	2.3 million = 1.5 million + $0.7 million (district) Plus day trips
Qrious	1.9 million overnight trips 1.3 million day trips Jun 2016/17	1.9 million Or 3.2 million including day trips
IVS + Fresh Info		2.2 million = 1.4 million (district) + 0.8 million (RTO) Plus day trips
Arrivals at Queenstown Airport	261,185 on international flights 639,113 on domestic flights	
Delegates at conventions	16,887 international 22,376 domestic Plus locals	

Again the conclusion is that there is not an accurate estimate of overnight visitors to Queenstown Lakes District but it is likely to be around 2.0 million people, ±10%[26]. While the estimates produced from the IVS and Fresh Info surveys suffer from having large margins of error, they have the advantages of both appearing to be reasonable, easily obtainable estimates of visitor arrivals to districts.

Usefulness for building a flows model:

- as per international and domestic arrivals
- can be used to show correlation, or not, with TLA employment, GDP and road usage.

3.3.4 Visitors to sub-regional locations

The above discussion revolved around a RTO or TLA area. It is also important to consider visitor trips to key locations within each area.

Various measurements are undertaken that can provide estimates of visits to specific locations. Levies are collected in Southland for visits to Stewart Island and (most) boat trips in Milford Sound. DOC uses counters at many locations. Ticket sales are recorded at all commercial attractions. It is possible to estimate event attendance using Qrious data. People presence can sometimes be inferred from Marketview data down to a small grouping of merchants.

A list of the number of recent annual visits to specific locations was gathered as part of this project. South Island RTOs were surveyed to give their understanding of the top ranked local destinations. Other data was gathered from reports, both from the media and individual entities. To abide with some confidentiality requests, the actual figures are not tabled here but instead grouped.

Table 3.9 Top South Island destinations (alphabetic order within group)

Destination	Source
Over 1.1 visitors pa	
Christchurch Airport	Half CHC reported pax
Christchurch CBD	100% of visitors to TLA
Queenstown CBD	Qrious report, including day trips
Wanaka CBD	Qrious report, including day trips
600-1.1 visitors pa	
Arrowtown	Local RTO
Canterbury Museum	As reported in media
Dunedin CBD	100% of visitors to TLA
Franz/Fox Glaciers	DOC counters and glacier landings
Hanmer Springs	Door sales
Milford Sound	From levy collected, plus 10%
Mount Cook National Park	Qrious report
Nelson CBD and airport	100% of visitors to TLA, half NSN pax
Picton ferries	Anecdotal (from ticket sales)
Queenstown Airport	Half ZQN reported pax
Queenstown gondola	Anecdotal (from ticket sales)

[26] Not statistically derived but a level of uncertainty shown from the various estimates

Destination	Source
300 k–600 k	
Christchurch Art Gallery	As reported in media
Dunedin Airport	Half DUD reported pax
Invercargill	100% of visitors to TLA
Pancake Rocks	DOC counter
Southland Museum and Art Gallery and i-SITE	VS report
Timaru*	100% of visitors to TLA
Queenstown bungi	Anecdotal including non-jumpers
100 k–300 k	
Abel Tasman National Park	DOC counter & concession holder boat ticket sales
Akaroa	Arrivals by cruise ship
Balclutha*	100% of visitors to TLA
Each skifield near Queenstown	Estimated ski days ticketed
Gore*	100% of visitors to TLA
Kaikoura*	100% of visitors to TLA
Larnach Castle	Ticket sales (65% international)
Mount Hutt	Anecdotal (from ticket sales)
Nugget Point	DOC counter
Paparoa National Park	DOC counter
Puzzling World	As reported in media
TranzAlpine	Ticket sales
40 k–100 k	
Hokitika Gorge	DOC counter
Matai Falls	DOC counter
Mount Aspiring National Park	DOC counter
Stewart Island	From levy collected
Te Anau Caves	DOC counter
Waikoropupu	DOC counter
Below 40 k (selected)	
Doubtful Sound	DOC counter
Heaphy track	DOC counter
Kepler track	DOC counter
Lake Brunner	DOC counter
McLean Falls	DOC counter
Queen Charlotte track	DOC counters and track passes
Routebourn track	DOC counter
Te Anau - Manapouri cycle trail	DOC counter

* Data based on overnight visits but day visits likely to be large

The act of collating the above list reconfirms the difficulty of defining visitors and visits. Much of the earlier discussion in this report has focused on overnight visitors. Mention was made of Qrious estimates of day visitors – this was inferred from the use of a cellphone on the GSM network within the area of analysis during

a day, with the same SIM card being used three times on one day, say, and twice the next day being counted as two visits[27]. However, it is also possible to differentiate between those people spending several hours at a location (eg to go shopping, take a boat trip) and those taking short stops of less than two hours (eg have lunch). This distinction is important in places like Kaikoura where many short stops occur. Fairweather et al (1998) showed short stops at Kaikoura were 3.1 times as many as overnight visits for domestic visitors and 0.35 times overnight visits for international visitors. The comparable ratios for day visits, defined as more than two hours and less than overnight in their study, were 0.6 and 0.3. As well as giving some insight into the quantum of day visits – and hence the scalar to apply to numbers used in the table above – the figures also imply that international visitors tended to treat Kaikoura as a destination whereas domestic visitors showed a higher propensity to treat Kaikoura as place for a break in their journey.

Another noteworthy feature of the list of top attractions is the importance of sites under the control of DOC. To put this importance in further perspective, the 2016 DOC survey inferred 80% of New Zealanders visited a DOC site within the previous 12 months. South Island sites visited by over half of the residents in the same region included Abel Tasman and Pelorus Bridge in Nelson/Tasman, Pelorus Bridge, Queen Charlotte and Nelson Lakes in Marlborough, Paparoa and Arthur's Pass in West Coast and Fiordland in Southland. DOC also actively promotes visits to the major iconic sites but also to the many short walks that are available[28].

DOC has counters at many sites throughout the South Island. These counters record all persons passing and can in some cases show the number of passes on an hourly basis. However, it does take some calibration to convert 'number of passes' to 'number of unique visitors', especially at sites where people tend to pass on multiple occasions. It takes further inference to estimate total unique visitors to the parks that contain the counters (or are nearby). Take the number of visitors to Mount Aspiring National Park and in particular visitors accessing the park via Wanaka–Mount Aspiring Road. On the way to the park are two popular tracks. In June 2016/17 there were 74,012 passes of the Diamond Lake pedestrian counter and also 130,360 passes of the pedestrian counter at the nearby Roy's Peak Track. However, it takes some inference to get from these numbers to number of unique visitors to each track, let alone to visitors to the park, which is further along the road. Another estimate of possible park visits is provided by the 96,739 passes of the pedestrian counter at the Wanaka DOC visitor centre. In total, these figures suggest less than 100,000 annual visitors to the park[29].

DOC also provides concessions to commercial operators in parks, including providers of planes, boats and ski lifts. These concession holders return data to DOC on people visiting.

Unfortunately DOC has not been able to provide a list of estimated visitor numbers to major sites in the South Island. Figures have been made available from various staff and reports, enabling the above list to be collated from piecemeal data. The statistics gathered are not the same measurement in all places; another reason to present the data here in groupings rather than in detail.

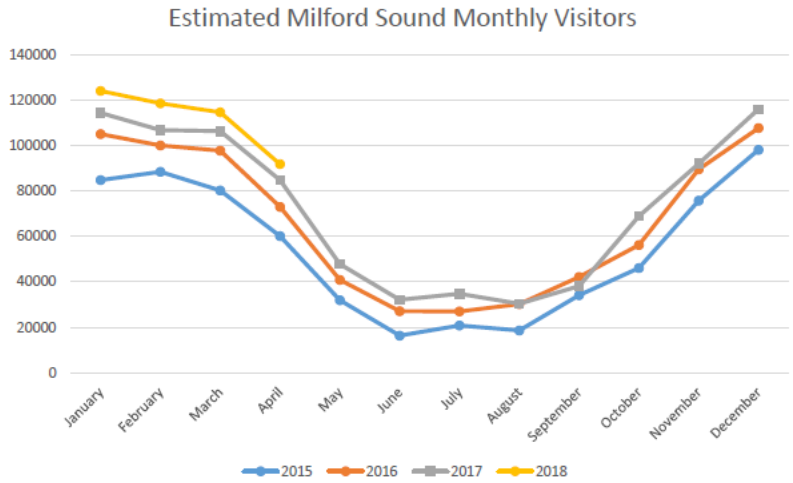
The DOC counter and concession data provides the ability to look closely at intra-day and seasonal trends. An example of the latter is shown below, using the number of levies collected in Milford Sound, plus a small upscale for people not using cruise boats.

[27] Method described in Qrious April 2017 report to QLDC 'Wanaka Population'

[28] See for example https://blog.doc.govt.nz/2018/01/12/the-ultimate-two-week-south-island-new-zealand-itinerary/

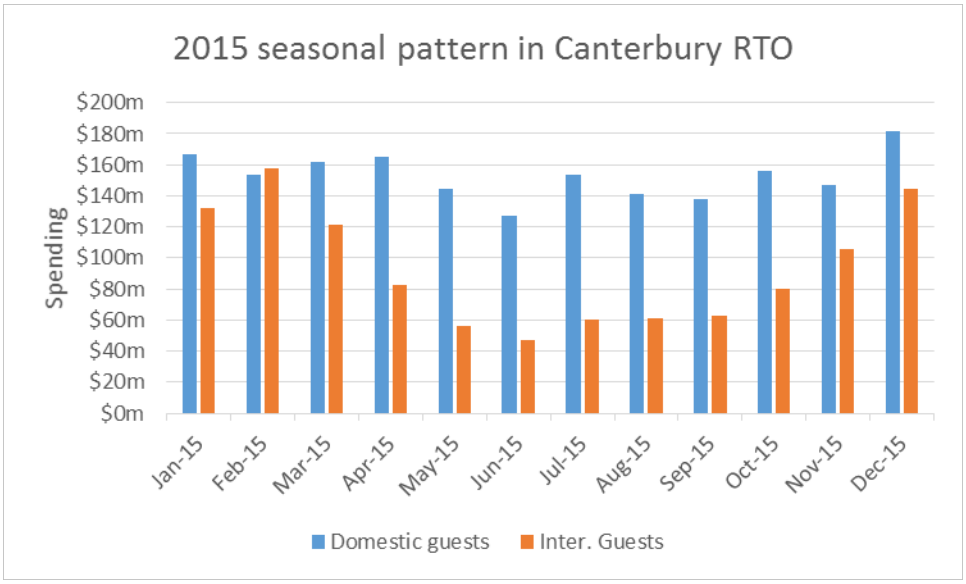
[29] To complicate matters further, the park is large and can be entered from other places.

Figure 3.9 Seasonal pattern of visitors to Milford Sound (source: Venture Southland, using data from Milford Sound Tourism Limited)



Seasonal patterns can also be measured by many other data series, including the AS, MRTE and IVA. These patterns can vary from place to place, a variation that has not been explored in detail within this project other than to point out that domestic tourism can be less seasonal, as shown using 2015 MRTE in Canterbury below.

Figure 3.10 Monthly MRTE within Canterbury RTO during 2015



Usefulness for building a flows model:

- Visit estimates can be used to validate a flows model of major routes.
- Visit estimates can be used to determine the level of attraction of a destination in a flows model, especially off major routes.
- Visit estimates can be used to estimate tourist traffic in the vicinity.

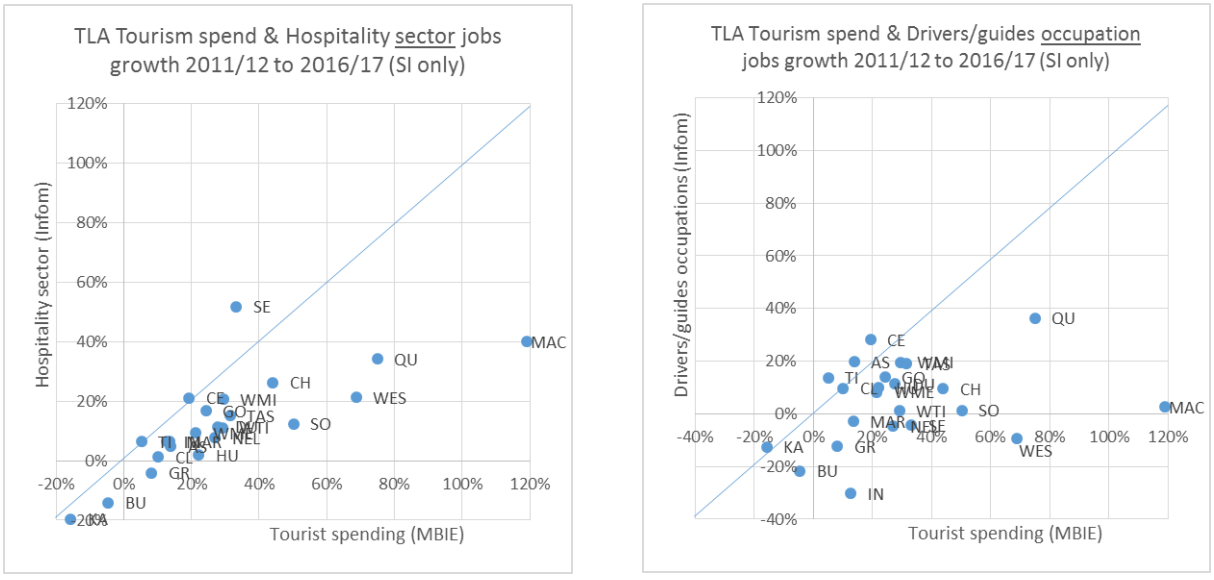
3.3.5 Tourism and TLA GDP and employment

The aforementioned tourism indicators show tourism arrivals to have increased significantly in recent years. This section examines the employment and GDP effect of this extra tourism activity, with TLA employment and GDP data series drawn from Infometrics' regional database.

Taking the MRTE as a general measure of tourism activity at a TLA level, the change in MRTE over five years between March years 2011/12 and 2016/17 is plotted in figure 3.10 against the five-year growth rate of two jobs filled data series, the first being jobs within the hospitality sector and the second being defined by occupation to be within categories such as bus drivers, fishing guides and conservation officers. To be clear, this sector and these occupations are not necessarily all entirely directed towards tourism but this is a sector and these are some occupations outside the hospitality sector where extra tourism is likely to require more workers.

Generally higher tourism spending, where it occurred, has translated into higher employment across South Island TLAs in the hospitality sector and amongst the drivers and guides occupations. The major exception is the rate of employment growth in Mackenzie District (MAC) being lower than the very high rate of spending growth. Employment growth was relatively strong by both measures, albeit below spending growth rates, in Tasman (TAS), Waimakariri (WMI), Christchurch (CH), Central Otago (CE), Queenstown Lakes (QU) and Gore (GO). Conversely, there were tourism spending and hospitality and driver/guide job declines in Kaikoura (KA) and Buller (BU), both affected by the November 2016 Kaikoura earthquake.

Figure 3.10 Tourism sector spending and employment growth for South Island TLAs



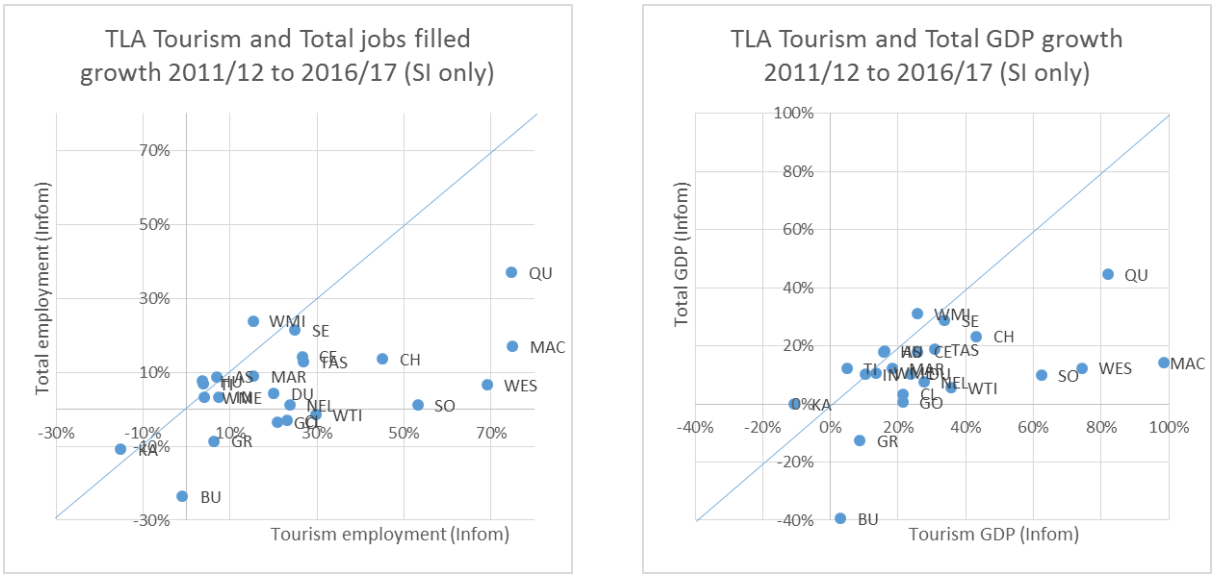
The job figures have been combined by Infometrics, using MRTE data and tying back to the TSA, to provide estimates of tourism employment and tourism GDP by TLA. Comparing rate of growth in tourism employment against rate of growth of total employment for each South Island TLA shows mixed effects influences of tourism. The rate of total employment growth exceeded the rate of tourism employment growth in Waimakariri (WMI), where tourism is a small sector, but the rate of total employment growth was more generally below the rate of tourism employment growth for most South Island TLAs. Looking at the change in terms of employment numbers, extra tourism jobs of 1,165 and 757 in Southland (SO) and Westland (WES) respectively, appear to have replaced jobs in other sectors judging by total job growth of

only 182 and 279. A similar picture is described by GDP figures: generally total GDP growth was less than tourism GDP growth.

The rate of growth in tourism activity will likely be above the rate of total GDP growth for one or more of three reasons:

- The GDP per filled job is generally lower in the tourism sector, the national averages in 2010 dollars being $55,000 per filled tourism job and $102,000 per filled non-tourism job in March 2016/17.
- The tourism sector may be a small component of the economy at the start of the period.
- The growth rate in the non-tourism sector may be declining.

Figure 3.10 Tourism sector growth and all sector growth for South Island TLAs



Based on the tourism and GDP relationship over the five years ending 2016/17, the South Island TLAs fit into eight groups as tabled below. On its own is Queenstown Lakes with strong GDP five-year growth (45% or 7.7% pa) and a strong contribution from tourism (the change in tourism GDP being 48% of the change in total GDP). Other TLAs where tourism contributed to moderate total growth included Nelson, Westland, Mackenzie, Waitaki and Southland. Other TLA economies either grew with little contribution from tourism, in spite of strong tourism spending growth, or experienced weak-to-negative growth of tourism and total GDP. Of the latter, Marlborough, Kaikoura and Buller were affected by the earthquake but there appears to be no one-off reason for the weak experience of Invercargill and Clutha.

Table 3.10 Grouping of South Island TLAs by growth and tourism contribution

Growth – tourism relationship		Strong growth (>3% pa)	Moderate growth (1–3% pa)	Negative-to-weak growth (<1% pa)
Strong tourism contribution (>25% share of growth)		Queenstown Lakes (QU)	Nelson (NE) Westland (WES) Mackenzie (MAC) Waitaki (WTI) Southland (SO)	Gore (GO)
Weak-to-moderate tourism contribution (<25% share of growth)	**Strong tourism spending growth (>3% pa)**	Tasman (TAS) Hurunui (HU) Waimakariri (WMI) Christchurch (CH) Selwyn (SE) Central Otago (CE)	Waimate (WME) Dunedin (DU)	
	Weak tourism spending growth	Ashburton (AS)	Marlborough (MAR) Timaru (TI) Invercargill (IN)	Kaikoura (KA) Buller (BU) Grey (GR) Clutha (CL)

Some care is required when interpreting the difference in GDP and job growth between the tourism and non-tourism sectors. In Queenstown Lakes, where tourism employment is 49% of all jobs but GDP/job is only around half of non-tourism GDP/job, it is very likely that the non-tourism activity would not exist without the tourism. That is, people may be working – very productively – outside the tourism sector but the causal factor in this case is in large part due to tourism.

MartinJenkins recently made a similar point about the leverage that tourism in Queenstown provides for other TLAs. They calculate that $452–$640 million pa is generated outside Queenstown by tourists who come to New Zealand primarily because of Queenstown, based on spending patterns of international visitors who spent more than 40% of their national credit card spend in Queenstown. However, in this case, the tourism effect of Queenstown is probably overstated as it would be difficult to separate from Queenstown the pulling power of other iconic sites like Milford Sound and the glaciers, both also featuring on many people's itinerary around the South Island and both not necessarily generating a large spend on site.

Usefulness for building a flows model:

- Not directly a measure of flows but the data puts tourism-related projects into perspective for TLAs, some projects being potentially a significant contributor to TLA growth while others may lead to replacement or displacement of other TLA economic activity that might have otherwise occurred.

4 Current/past visitor data by journey

4.1 Initial comments

The previous chapters discussed measures of visitor activity at specific locations or areas such as those of TLAs. This chapter extends the discussion to consider where these visitors have come from and what journey was undertaken. As with location indicators, there are no precise measures of journeys but some inferences are possible from existing data and previous research. Methods are explored that can be further refined to estimate regional flows.

4.2 The 2007 tourism flows model

A flows model was constructed jointly by Lincoln University and Auckland University between 1998 and 2005 and presented for public access in 2007 (Vuletich 2006; Vuletich and Beckon 2007; Becken et al 2007). This was a one-off exercise that was research intensive and hence expensive, albeit the process has become more easily repeatable as accessibility to large data sets has improved.

Estimates of the international journeys drew heavily on the trip itinerary that was gathered within the IVS. Domestic journeys were informed by the DTS. The DTS does not exist now and the IVS does not collect a chronological itinerary but other data can be used today to provide journey data (eg electronic cards, cellphones, trip logs, other surveys).

Results from the 2007 tourism flows model will be discussed within the sections below.

4.3 International visitor journeys

The starting point for understanding international visitor journeys around the South Island is to determine (a) the number of people visiting the South Island, (b) how they are entering the South Island and (c) what is their mode of transport. These figures can then be used to put various partial measures of journeys into perspective.

Starting with (a), there is no exact measure of the number of international tourists entering the South Island. The IVS[30] provides an estimate of 1.9 million international visitors, to be assumed in 2016/17 calculations shown below, being approximately 53% the number of arrivals to New Zealand and giving a number slightly above measures of visitors to Christchurch and to Queenstown Lakes. Other measures are required to confirm this number.

Entry to the South Island is primarily through the major airports and the Cook Strait ferries. The IVA shows annual arrivals from overseas to South Island airports was 746,272, split between Christchurch (67%), Queenstown (32%) and Dunedin (1%). The IVS gives an unadjusted estimated number using the Cook Strait ferries of around 400,000. Discussions with KiwiRail suggest this number is likely to be below current levels. Using an 80:20 southward:northward split, this project has assumed around 480,000 international visitors cross to the South Island by ferry, which, combined with the approximate 750,000 on international flights, leaves around 700,000 international visitors entering the South Island on domestic flights. It

[30] Derived from places visited, ports of entry and exit, Cook Strait ferry use and activities undertaken, adjusted for non-response and to include children

should be noted that this figure for international visitors on domestic flights is sensitive to the initial assumption of total visitors and slightly above the 23% of internationals taking internal flights inferred from the IVS.

Sabre data provided by the MoT (2017b) shows the proportion of passengers in 2016 travelling on domestic flights from North Island to South Island locations to be Nelson (12%), Marlborough (4%), Christchurch (56%), Queenstown (15%) and Dunedin (10%). MoT reports that Sabre bookings overstate actual flights by around 3% but that is unlikely to bias the relative shares. More significant is anecdotal feedback to this project that the international share of domestic flights into Queenstown is higher than implied by the calculations below. This is being separately investigated by Queenstown Airport Corporation (QAC) at present. For now, the current figures are presented to illustrate method.

Combining the above figures suggests a mix of the point of entry to the South Island as tabled below, admittedly derived using bold assumptions but providing some perspective for discussions to follow. Passengers on cruise ships arrive at multiple ports in the South Island and have been separated from other international visitors, the latter expected to be the predominant users of South Island roads (a summary of cruise ship road use follows in section 4.5).

Table 4.1 Crude estimate of international arrivals (000s) at South Island locations in March 2016/17

Destination region	Share of total pax on domestic flights from North Island (from Sabre 2016 OD matrix)	Inferred international persons on domestic flight (assumes dom% = intl%)	International flight (from IVA)	Ferry (estimate based on KiwiRail conversation)	Total (=sum of 3 to left, with total from IVS and IVA)	Plus cruise ship pax*
Nelson-Tasman	12%	82			**82**	2
Marlborough	4%	27		480	**507**	73
Kaikoura						2
Canterbury	56%	376	497		**873**	145
West Coast	0.4%	2			**2**	
Timaru	0.7%	5			**5**	3
Queenstown	15%	102	242		**344**	
Dunedin	10%	68	7		**75**	161
Southland	2%	10			**10**	164
TOTAL to SI	100%	674	746	480	**1900**	

* The tabled cruise ship figures include some domestic passengers

The next step in a flows model is to establish the major inter-regional flows. In the interests of simplicity at this stage, an exercise was undertaken where flows between Canterbury, West Coast and Queenstown were inferred from (a) the visitor numbers in each location and (b) the arrivals to South Island figures above. The mathematical exercise is one of linear programming. The initial results are shown in the table below. This method can be extended to include the major flows shown in figure 3.1.

The bi-directional flow of international visitors in 2016/17 between Canterbury and north (C+N) and West Coast (W) was estimated as 650,000 or 34% of internationals visiting the South Island, and to/from

Queenstown Lakes (Q) was 1,300,000, with the balance of 550,000 travelling between West Coast and Queenstown Lakes, assuming:

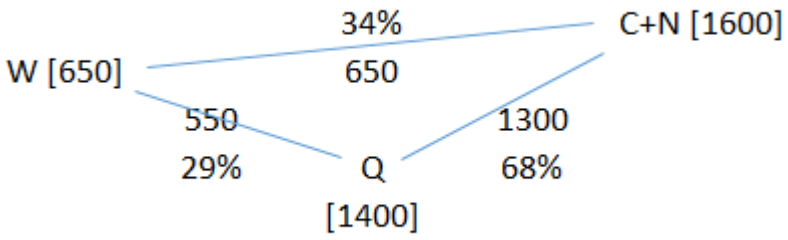
1 The arrivals into the South Island were as tabled above.

2 The number of unique international visitors to each region was as shown in brackets below [thousands] eg 1,600,000 visitors to Canterbury and north.

3 Around 10% of visitors travel to all three regions (a working assumption at this stage).

4 There is only small there-and-back travel between West Coast and Christchurch/North and between West Coast and Queenstown Lakes (again a working assumption).

Figure 4.1 Crude estimate of international visitors (000s and % of visitors to South Island) travelling between regions [plus number of unique international persons (000s) visiting each region]



As an example of the calculation in this simple model, an estimated 400,000 internationals flew[31] directly into Queenstown from overseas or the North Island and 1,500,000 arrived at Canterbury and north via plane or ferry. If 1,400,000 visited Queenstown then 1,000,000 visitors travelled south from Canterbury/north to Queenstown. Using similar logic, the northward exchange is 100,000. Adding in a requirement that 650,000 visit West Coast during their travels and that an assumed 10% of people visit all three regions and 100,000 travel between Canterbury/north and West Coast gives rise to the three inter-regional flows in the diagram.

The point of constructing such a model was to explore what information could be gleaned from current data sources and what other data would be required to remove sensitive assumptions. In this case, some simple calculations, which time did not permit in this project, using the IVS data can replace some assumptions, eg calculate the proportion of international visitors to multiple regions to replace assumptions (3) and (4) above. Other calculations can be used to validate the model, eg one IVS query that was undertaken showed that 28% of international visitors to the South Island reported visiting both Westland and Queenstown Lakes, close to the 29% derived from the model. Other data sources can also be used as inputs or validation, including electronic card, phone and app use to derive these and more complex flows.

Some such data will soon be available. The MoT inter-regional surface travel will soon make available the relative number of Spark cellphone users who undertake region-to-region travel, broken down for domestic and international phones. This data will not definitively determine the number of people

[31] Feedback to the project suggested this figure is probably too low but it is retained in this exercise for now as (a) the true number is unknown and (b) the inter-regional bi-directional flow is insensitive to this assumption in this simple model (ie the direction of flow changes but not the total number travelling)

travelling between regions as Spark is only one cellphone network but it will provide further measures to either support or question inter-regional flows otherwise estimated (including those above).

An important study would be to complement IVS and phone-derived measures of travel with electronic card data. For instance, Marketview can track the progress of a card being used on a South Island journey. The card holder cannot be identified but international cards can be identified by country of issuance and the home base of a domestic card can be reasonably inferred. Likewise the journey requires some inference as the sequence of card use will not identify the exact trip given the time lapsing between payments and will not identify visit to places (eg waterfalls) where payment does not occur. Nonetheless the data would be very informative at an inter-regional level (at least). Marketview have indicated to the project team that they are in a position to provide such analysis for a reasonable cost.

Before going further, it should be pointed out that the above inter-regional flow calculations would only form the first phase of a flows model, with second and third phases being required to (a) allocate inter-regional travel to routes and modes and (b) represent travel to activities[32]. The economic network plan method applied in Queenstown, Southland and Tasman is an example of (b), to be discussed further in chapter 6.

The method explored above can be applied to disaggregated data, including by country of residence, time of year and/or mode of transport, again with Qrious phone and/or Marketview card data as inputs. A quick look at IVS mode of transport data leads to the results tabled below. Again it is possible to refine this IVS estimate by a customised IVS query but for now the national mode shares are assumed to apply. It is possible that visitors will use multiple forms of travel. For example, people travelling on the TranzAlpine train will very likely use other modes of transport for other parts of their journey. Thus in the table below the 'train' has been considered independently of the other modes of transport. Out of interest, the IVS estimate of 188,000 international visitors using trains while in New Zealand exceeds those travelling on the TranzAlpine, probably around 80,000–100,000 of the reported 130,000 annual passengers, but commuter train trips would also be included in the nationwide ratio tabled below[33]. Assuming the interchange between tour bus, rental car and private car is assumed to be small, combining assumptions leads to estimated tour bus visitors of around 440,000, campervan of 110,000 and 1.3 million travelling by car. This method does not provide an estimate of those flying within the South Island.

Table 4.2 Crude estimate of mode of transport in South Island by international arrivals (000s) in March 2016/17

Mode of transport	Unadjusted New Zealand IVS share	Estimated number in South Island
Tour bus	23%	441
Campervan	6%	113
Car (rental and private)	69%	1312
Not one of the above	2%	35
Train	10%	188
Internal South Island flight	Not available	Unknown
Estimated international visitors to SI		1,900

[32] As an aside, Zhao et al (2013) show some innovative ways to represent activity data.

[33] Plus there are other tourist trains trips, including the Taieri Gorge.

At this stage, data from tour bus companies was not available to this project to validate these statistics. Local anecdotal evidence suggests the bus tour share of West Coast visitors exceeds the 23% national bus mode share recorded in the IVS, possibly being around 30% (ie over 200,000 of the 550,000 estimated Haast Pass international visitor flow). This is one further piece of work required.

Campervan statistics are available from the Transport Agency Visitor Drivers Project, where 2113 campervan national rental bookings were analysed for the period late November 2015 through to early April 2016. These bookings included 11.5% domestic visitors to the South Island but otherwise were from a cross section of international citizens. The mix of residents is copied below from the report.

Table 4.3 Camper van rental percentage of bookings by traveller country of origin November 2015 to April 2016 (source: NZ Transport Agency (2017))

Switzerland	China	United States	New Zealand	Australia	Germany	United Kingdom	Rest of world
4.1%	4.4%	5.3%	11.5%	15.0%	15.8%	19.6%	24.2%

One specific observation of the Visitor Drivers Project was that visitors from countries in Asia usually journey within the South Island only, and their journeys are commonly on state highway networks.

The study also recorded the number of visitors on journeys judged to be popular. These results implied 62% of campervans include the West Coast in their journey, 79% Queenstown and 100% Christchurch (reflecting the high pick-up rate in Christchurch). Applied to the mode share estimates derived above, this implies 68,000 international visitors to West Coast in campervans, with the number of vans being lower given multiple persons per van. Also implied from these figures, 79% of campervans that include Queenstown in their tour also travel through the West Coast.

Table 4.4 Number of visitors on South Island popular campervan tours November 2015 to April 2016

		Coded 1 if tour included this location, with visitor totals summed at bottom							
Number of visitors by popular tours	Number of visitors	Nelson	Picton	Kaikoura	Chch	Tekapo	Queens-town	Te Anau	West Coast
Full tour of NZ	586	1	1	1	1	1	1		1
Nelson Westport	1958	1			1				1
Chch, Hanmer, Kaikoura	275			1	1				
Chch, Tekapo	419				1	1			
Chch, Queenstown, West Coast	3852				1	1	1		1
Chch, Queenstown, Te Anau, Hokitika	1284				1		1	1	1
Chch, Queenstown, Tekapo	3997				1	1	1		
Totals	12371	2544	586	861	12,371	8,854	9,719	1,284	7,680
Percent of total	100%	21%	5%	7%	100%	72%	79%	10%	62%

The Visitor Drivers Project also collected other vehicle rental records from eight rental vehicle companies in New Zealand, where the vehicle was either picked up or dropped off in February, March, June or July of 2015. 105,305 records were available for analysis, 29,689 from drivers with New Zealand licences, and 75,616 from drivers with licences from other countries.

Approximately 59% (62,040) rentals were picked up in the North Island and 41% (43,265) in the South Island. A total of 43% (44,814) of the vehicles were picked up at an airport location.

Rental trips that probably included Otago/Southland/West Coast (37.5% of rentals) had on average, relative to rental trips that probably did not include this study region:

- higher total kilometres (1,519.2 compared with 721.6)
- more days rented (8.7 compared with 5.4)
- and higher kilometres/day (183.1 compared with 149.8).

Also international visitors showed a higher propensity to visit the study region with 41.5% of rental drivers with overseas driver licences travelled in this region, a higher ratio than the 27.5% of rental drivers with New Zealand licences.

The statistics for rental car pick-up and drop-off showed a roughly even market share between Christchurch and Queenstown, with a small proportion picked-up in Picton or dropped off in Dunedin. An unknown number of rentals would have crossed the Cook Strait.

Table 4.5 Use of rental car pick-up and drop-off locations, early 2015

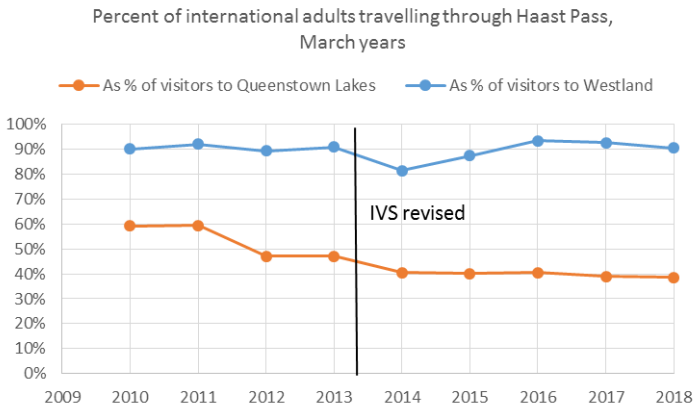
Per 1,000 vehicles	Pick-up	Drop-off
Auckland	412	390
Wellington	94	109
Picton	31	
Christchurch	175	183
Queenstown	139	153
Dunedin		23

The rental car data reinforces the inference implied by van and bus statistics and by regional visitor numbers and spending that a large part component of the South Island journey is travelling between Christchurch and Queenstown. The Visiting Drivers Project noted that within the broader data set it was found that the places where visitors spent most of their time within these journeys included:

- Christchurch – Queenstown – Tekapo
- Christchurch – Queenstown – West Coast
- Nelson – West Coast.

Another piece of work of relevance to visitor journeys is a flows model applied in Queenstown Lakes within a wider project termed the Economic Network Plan. Using records from the June year 2011/12 IVS, the proportion of different nationalities visiting two nearby regions/districts was estimated and the journey along major routes that connected these locations was inferred. For example, 39% of international visitors to Queenstown Lakes were estimated to have travelled between West Coast and Queenstown Lakes, by inference via SH6. This ratio is much lower than the 79% of campervan travellers mentioned above. An IVS query within this project showed the ratio of persons visiting Queenstown Lakes who also visited Westland was higher in 2011/12 than in the QLDC study but is around 39% now (see figure 4.2). By implication, visitors in campervans show a higher propensity to travel via West Coast than visitors using cars and planes and possibly buses.

Figure 4.2 Proportion of international visitors to Queenstown Lakes and Westland who visited both TLAs



Besides inferring the proportion of persons visiting two nearby locations (and then joining the pieces) from IVS records and other piecemeal data, a more coordinated dataset can be derived from Marketview (same card use in differing locations within a short period), Qrious, Datamine and other cellphone data providers (same cellphone use) and Geozone (same phone using app). This data is not generally made available – given the cost and many permutations – but can be bought from the respective organisations. Also MBIE and Venture Southland hold large Geozone datasets. Examples of analysis with some of this non-core data are shown in appendix A. The challenge with this data is to ensure the persons being measured are representative of the population of travellers of relevance to the decision being undertaken.

4.4 Domestic visitor journeys

The number of domestic visits from the North Island is inferred from the previous calculation for international visits, namely the net of flight and ferry passenger arrivals once international arrivals have been deducted. This calculation points to 2.9 million domestic visits to the South Island from the North Island.

Included in this total will be people who are day tripping, eg flying Wellington–Christchurch return on the same day. The 2007 tourism flows model reported the combined ratio of day trippers on the Auckland – Christchurch and Wellington–Christchurch flights was 15%. Applying this ratio to northern South Island airports and half this ratio to southern South Island airports reduces the estimated number of overnight domestic arrivals. Further adjustments for South Islanders returning to the South Island reduce the estimated number of domestic overnight visitors from the North Island to 1.6 million (the applicability of these assumptions to today is yet to be tested). The implied arrival share at Christchurch Airport of North Islanders travelling to stay overnight is 54%. These figures will include repeat visits by the same person to the South Island within the year.

Table 4.6 Crude estimate of North Island domestic overnight visitor arrivals (000s) at South Island locations in March 2016/17

Region	Domestic flight	Ferry	Total domestic persons arriving	Excluding day trips	Excluding South Islanders returning	% of North Island visitor arrivals to SI
Nelson-Tasman	324		324	264	**166**	9%
Marlborough	108	200	308	251	**158**	14%
Kaikoura						0%
Canterbury	1,482		1,482	1,208	**761**	54%
West Coast	9		9	9	**9**	0%
Timaru	20		20	20	**20**	0%
Queenstown	403		403	366	**298**	11%
Dunedin	268		268	243	**198**	11%
Southland	41		41	37	**30**	2%
Milford Sound						0%
TOTAL NI to SI	2,655	200	2,855	2,398	**1,641**	100%

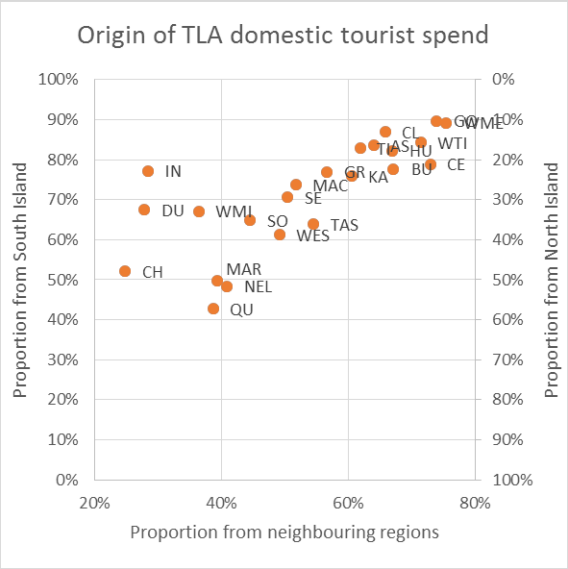
To recall from above, this calculation forms the first step in any flows model. Rather than repeat the initial inter-regional model building step shown in the previous international section, some of the intricacies of data that would provide inputs to a domestic flows model are discussed here.

The MRTE figures show 40% of domestic tourism spending in the South Island with origin identified ($1,953 million) was by visitors who reside in the North Island (the origin of 4% of South Island spending is unidentified). On the assumption that day-tripper spending will be small, applying the above overnight arrival estimates points to average spending per trip of $1,775.

The MRTE origin-destination data also shows that North Island visitors are a large share of the domestic tourism market (around 50% or more of spending) in Queenstown Lakes (QU), Nelson (NEL), Marlborough (MAR) and Christchurch (CH).

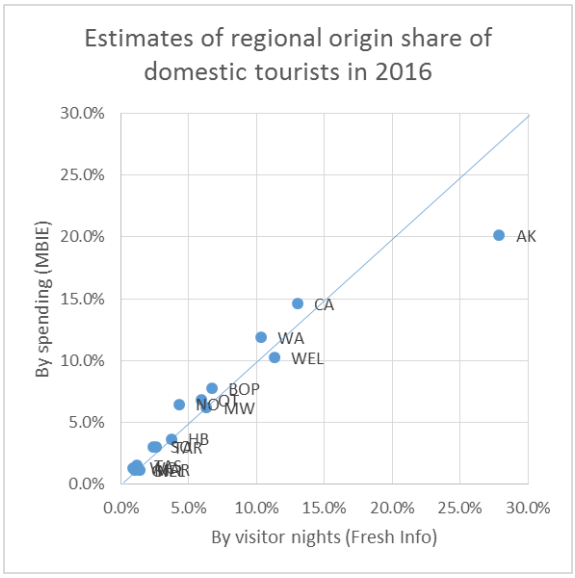
Conversely TLAs such as Gore (GO), Waimate (WME), Waitaki (WTI) have low contributions from North Island visitors (<20%) but higher ratios of visitors from neighbouring TLAs (>70%).

Figure 4.3 Origins of domestic tourism spending in South Island TLAs 2016/17



The Fresh Info survey data also provides information on the origin of domestic overnight visitors. Before looking closer at some results, it is worth noting that the Fresh Info survey estimates a larger share of visitors originating from Auckland than shown by the MRTE figures. In part this could reflect under-reporting of travel by Aucklanders where spending in the destination location was low and the extent of pre-trip provisioning was high (eg stocking up before heading to the beach). It may also reflect a travel bias among AA members.

Figure 4.4 Estimates of origin region share of domestic tourists in 2016



Anecdotally, Fresh Info reports that a high proportion of domestic travel is by car (80%–90%), and over short distances (under a two to three hour drive). Similar figures were shown in the 2012 DTS.

The Fresh Info estimate of visitor nights in the South Island is 24.1 million, of which 2.8 million or 12% arrive from North Island regions. A higher source of domestic visitors is Canterbury with 32% share of South Island visitor nights.

Both Fresh Info and DGiT provide estimates – based on their surveys – of the proportion of visitors to a RTO from other regions. For example, Aucklanders comprise 14.2% (DGiT) or 10.0% (Fresh Info) of domestic visitors to Southland RTO, while Cantabrians comprise 10.9% (DGiT) or 16.6% (Fresh Info) of domestic visitors to Southland RTO. A difference in estimates is unsurprising given the margin of error around any such estimate.

As to any particular route, the same sources discussed in section 4.3 can provide data on actual or probable journeys. Fresh Info can also build journeys from the places visited by respondent on each trip. As with other non-core figures, this data is not generally reported.

The focus in the discussion above has largely been on journeys approaching the destination. It is worth recalling there are also traffic movements generated by South Islanders driving to airports to start longer journeys, including possibly to outside the South Island. This travel can be significant for people from Southland and West Coast. A Qrious study in Southland showed 40% of Southland residents joined their flights elsewhere than Invercargill, including Queenstown, Dunedin and Christchurch.

Usefulness for building a flows model:

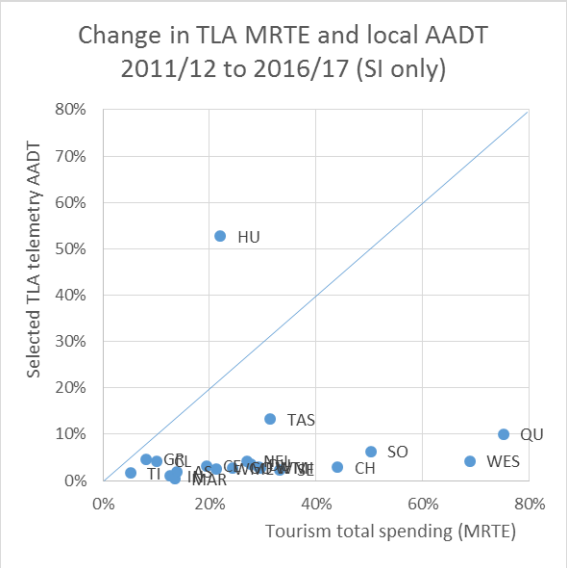
- Several sources of data are shown to be useful in estimating visitor movements between specific locations.
- More generally, although this data is not a complete measure of all journeys, in some cases it may be sufficient for the decision being made.
- The above calculations show where gaps in the information are likely to exist.

4.5 Tourism and road usage statistics

There has been little success linking tourism growth and road traffic. The Visiting Drivers Project noted higher tourism activity but said ‘it has not been possible to conclude that the accommodation demand and traffic volumes are directly related with any significant level of statistical evidence’. MBIE (2016) points to the coinciding seasonal pickup in traffic volumes and tourism activity, including in Kaikoura, Westland, Tasman and Southland but also concedes ‘It is difficult to measure specific use of roads by tourists because they are generally dwarfed by local commuters, and there is no clear way of separating them from overall vehicle use’.

This lack of general correlation between tourism activity and road use is illustrated in figure 4.5 showing five-year growth rates in tourism spending per South Island TLA and AADT at selected telemetry sites within each TLA.

Figure 4.5 Change in MRTE and AADT for South Island TLAs, 2011/12 to 2016/17



An example of the issues is evident at Punakaiki on the West Coast. Typically road usage is measured as annual average daily traffic (AADT), ie the average number of vehicles – light and heavy – that cross a line on the road each day within one year. Counts are usually taken with electronic or mechanical counters, which may remain in place continuously or be used occasionally. One such counter is located on SH6 near Punakaiki (Telemetry Site 39) on the West Coast. The light vehicle AADT in 2016/17 was 990. The monthly daily average ranged from 622 (June) to 1518 (February), producing a seasonal lift of around 900 vehicles per day. The 500,000 visitors per annum to the nearby Pancake Rocks will also show strong seasonal variation. Judging by the pattern of AS guest arrivals, the seasonal swing from low to high is probably around 55,000 visitors[34]. If there was an average 2.5 persons per vehicle then the tourism induced swing in traffic would be around 730 vehicles per day, assuming tourists made only one pass a day over the counter. That is, it is conceivable that the seasonal variation observed at Telemetry Site 39 is primarily due to tourism activity and potentially could be confirmed by observation. Over time the causal relationship is more difficult to see in times series of AADT. Potentially a 40% increase in tourist numbers to Pancake Rocks, as has happened in recent years, would lead to around 16% higher AADT. The actual increase in light vehicle AADT between 2011/12 and 2016/17 has been 5.2%, lower than the nearby increase in tourist arrivals. This may be due to the fact that heavy vehicle AADT has increased 12.3%, possibly due to a tourism growth bias towards buses[35]. The actual reason is not known but the example illustrates the difficulties with having to match AADT to tourism estimates: tourist vehicles are only one component of the traffic; the change in numbers of tourists is only approximately known and it gets more difficult to turn this estimate of people into estimates of vehicles; changing activity around a counter may alter the number of times a vehicle may typically pass; and vehicle counts from year-to-year are variable for many other reasons.

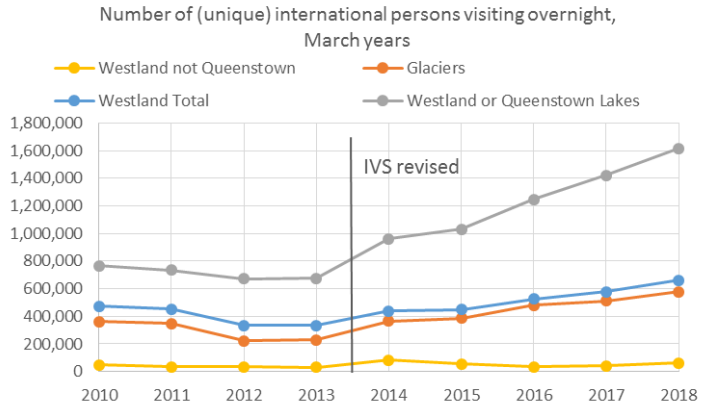
An example where an AADT-tourism relationship is evident is at Telemetry Site 111 on SH6 near Haast. Unfortunately the count only started in December 2011 and is missing data for November 2016 and December 2016. However the count data shows a 53% increase in average (All) traffic flow between the

[34] DOC data not gathered by this project would be able to show this seasonal swing more accurately.

[35] There is also the possibility of more heavy vehicles servicing local tourist demands.

March quarter 2012 and March quarter 2017. Between the two March years (nb not March quarters), the IVS figures show an 80% increase in international tourists (see below for visitor growth in the vicinity). As with Punakaiki, the growth rate is not the same but strong growth (44%) of heavy vehicles hints that growth of tour buses is one influential factor. The road count data also shows the strong seasonal effect, not just in the level of activity but in growth of activity. Growth rates of AADT over four years (2012 to 2016) shows growth ranging from 41% in March to an average 10% over June and July. That is, not only have international tourist flows increased sharply over recent years, the growth has been concentrated on this road in the summer months.

Figure 4.6 Estimated international visitors to Westland and Queenstown Lakes (adjusted IVS figures)



One unique road use is generated by cruise ship passengers alighting at port, typically for several hours. The following box provides feedback from local RTOs as to typical visitor movements.

Cruise ship onshore activity

The major ports where cruise ship passengers go ashore are Dunedin, Akaroa and Picton. This will also happen at Lyttelton once large cruise ships tie up again from 2020. Large numbers visit Milford Sound but most people do not leave the ship. Smaller numbers alight at other ports but are not discussed here.

The popular destinations for passengers in Dunedin are the Otago Peninsular, including Larnach Castle, the Taieri Gorge Railway and the local CBD. The majority of passengers will be met by buses or vans at Port Chalmers in the morning to be taken to one of these destinations, returning late afternoon.

In Akaroa[36], passengers arrive ashore by tender. Just over one-third will be met by pre-booked buses to travel into Christchurch CBD, around one-third will bus to meet a special TranzAlpine Selwyn-Arthur's Pass train or a visit a high country farm, while the rest will walk around the vicinity of Akaroa.

In Picton, there is also a rough three-way split of passengers[37]: some will be met by buses and vans to drive through to Blenheim and the Wairau Valley vineyards, some will join boat cruises of the Marlborough Sounds and the rest will mingle around Picton. As above, there is large traffic and pedestrian movement around mid-morning and mid-afternoon.

[36] Wilson and Shone (2013) report on local community attitudes to cruise ships visiting Akaroa.

[37] Crew tend to remain near Picton.

Usefulness for building a flows model:

- This stage shows the challenge faced in matching tourism statistics with observed traffic flows.
- It is a reminder of the seasonal effect on road usage by tourists.
- Some road data away from urban areas and near tourist attractions will provide data on tourist road use, these being the roads that are also likely to have capacity requirements determined by tourism needs (with capacity being just one tourism requirement)
- Need to keep in mind it will be peak season road demand that usually establishes the road capacity requirement.

In sum, this chapter has presented various partial measures of visitor journeys. However the figures are likely to be better understood if presented within a South Island flows model. A method has been presented, and will be further discussed in chapter 6, which can be used to create such a model using data that is currently available or easily accessible, albeit at a cost. The starting point for that model is the entry of international and North Island visitors into the South Island and the inter-regional travel that then follows. Using crude estimates at present, the major flows in 2016/17 are estimated to include 1.3 million international visitors between Queenstown and Canterbury and north. The assumptions made to estimate this figure can be refined with more detailed data analysis – a step that is recommended before use of the numbers presented here. Tourist flows will be difficult to discern from non-tourist movements in data for road usage near major urban centres but the effect of tourism does show within road data near isolated tourist attractions.

5 Forecasts

5.1 Initial comments

The future by nature is uncertain. Nonetheless infrastructure planning is required to anticipate future needs, in this case the transport needs of international and domestic tourists. Thus forecasts are prepared to inform investment. For the Transport Agency, forecasts are required to be derived from evidence-based forecasting models, showing what is underlying the forecasts and how reliable the assumptions are to influence road investment.

This perspective shapes the following discussion of various forecasts of relevance to tourism in the South Island. The discussion proceeds with an overview of tourism models, then a look at global trends, followed by discussion of specific local forecasts and what these imply for transport investment decisions, and, last, a look at factors that may constrain growth. No distinction is made here between forecasts and projections, as any forecast or projection beyond the next 12 months will require assumptions about interdependent supply and demand factors. More pertinent, the uncertainty surrounding these assumptions will generally become greater as the forecast horizon increases.

5.2 Tourism forecast models

A general discussion of tourism forecast models is provided by Song and Li (2008). A text book of models is Hyndman et al (2018), as used by MBIE. Forecasts are typically derived using one or more of three methods, as listed below. No one method accurately measures the future and no method has been shown to be superior to others.

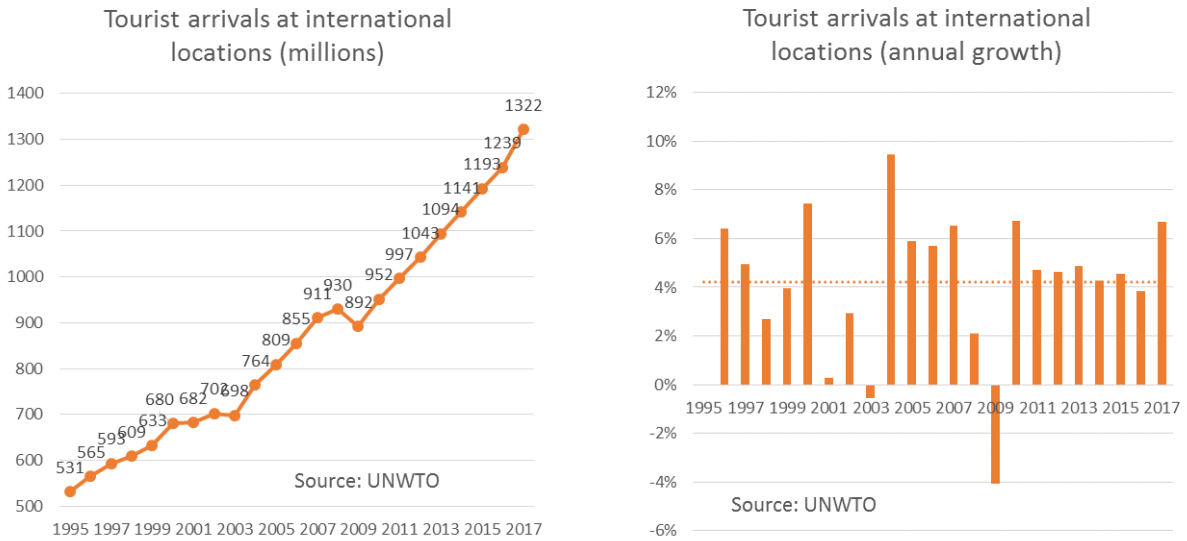
1 Extrapolate forward one or more time series of tourism data, bringing into account the patterns in past data. The most widely used of such techniques is the autoregressive integrated moving-average (ARIMA) model, which will take into account trends, cycles and seasonal effects that are evident in a data series, or in several series considered together (in which case correlation is also taken into account). Artificial intelligence (AI) techniques have also been applied to tourism data recently to explore patterns in the data. Both ARIMA and AI are 'black box' methods which will provide forecasts but only little insight into why the described future is likely.

2 Determine the relationship between tourism outcomes and other key causal factors, and then forecast tourism outcomes on the basis of forecasts for the causal factors. A simple regression model might be between tourist arrivals, as the dependent variable, and personal income as the explanatory variable. More sophisticated models can include more explanatory variables and more dependent variables. The major econometric challenge is to isolate the causal relationship from amongst the many influences that existed during the period of study. The major forecasting challenge is to produce forecasts of the explanatory variables, which in turn determine the tourism forecast.

3 Bring together a panel of experts to derive a consensus forecast. The Delphi method is a well-known technique for iterating towards mutual agreement, where initial forecasts are refined through a series of non-live feedback rounds.

Before delving deeper into the many techniques, some observations about tourism patterns are insightful. First, tourism is generally increasing. Globally, international tourist arrivals growth is reported[38] at an annual average compound rate of 4.2% pa between 1995 and 2017. Second, irregular events have occurred, the so-called shocks, that reduce the growth rate sharply – and sometimes the level of activity – for a period of one to two years. Taken together, the past can be characterised as international tourism growth around 4–7% pa (average of non-shock years was 5.3% with standard deviation of 1.6%), inter-dispersed with the odd year of no growth (average of five shock years was 0.1%). There is little evidence to suggest future patterns will be much different. As is discussed below, the trend rate is typically picked up in forecast models but the shock years are rarely, if ever, forecast.

Figure 5.1 International tourism growth 1995–2017

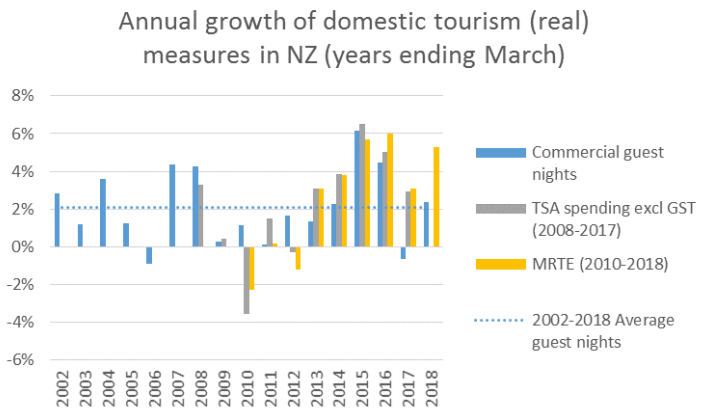


The historic pattern of domestic tourism in New Zealand is less apparent, as there is no long-running measure of domestic tourism. Growth rates for various data are shown below, with the longest running series, domestic commercial guest nights[39], showing an average 17-year compound annual growth rate of 2.1%.

[38] www.trbusiness.com/regional-news/international/global-tourism-surges-7-to-1-32bn-in-2017-says-unwto/135772

[39] Some extrapolation of the months Feb, Mar, May, Jun, Aug, Sep, Nov, Dec was required to estimate domestic guest nights from total guest nights for 2000–2007

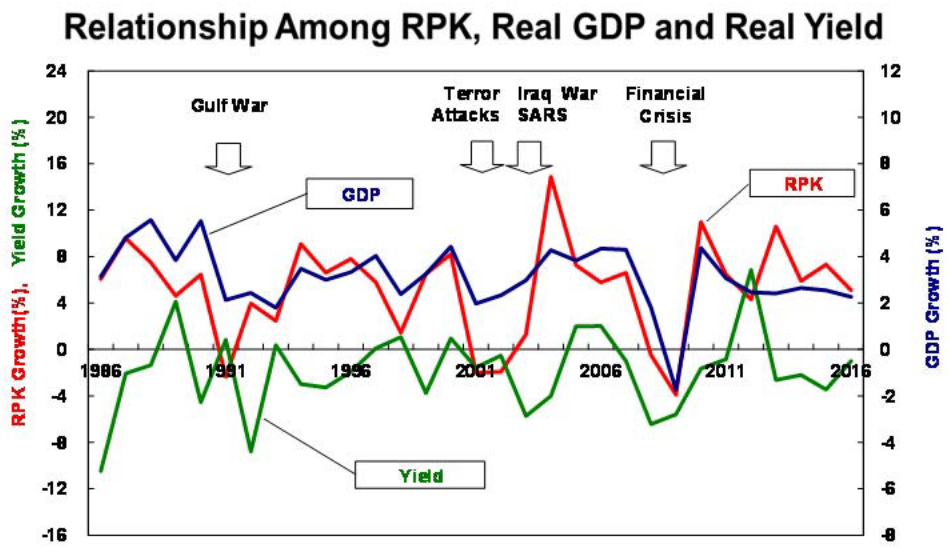
Figure 5.2 Annual growth of domestic commercial guest nights and real expenditure for years ending March



5.3 Determinants of tourism

Tourism growth will entail the interaction of demand and supply growth. On the demand side, the key determinants of international tourism have been shown to be GDP growth, in turn highly correlated with income growth. The graph produced by Japan Aircraft Development Corporation (2017) and shown below illustrates the close relationship between GDP and revenue passenger kilometres (RPK). The graph also shows the nature of shocks that have occurred in recent years, being a mix of economic downturns, health scares, war outbreaks and terrorist attacks.

Figure 5.3 International tourism growth and global GDP 1986–2016



Source: Japan Aircraft Development Corporation (2017, p23)

Cross and Wang (2014) looked more rigorously at the determinants of outbound tourism of New Zealanders during 1988–2010 and concluded that New Zealand real GDP per capita was the key driver for departures across the major purpose of visits. Other factors of lesser importance to New Zealand included the exchange rate, the international oil price and the airfares. Schiff and Becken (2011) had earlier found similar results for international arrivals in New Zealand, segmented in 18 ways. In their study, arrivals of visitors were strongly influenced by economic conditions in their home country.

Researchers report mixed results on exchange rate effects. Even if there was a strong exchange rate effect on inbound tourism, from a practical point of view it would be difficult to predict the tourism outcome given that exchanges rates are in turn difficult to predict.

Another pricing effect is via higher fees and travel costs. To some extent this is picked up in models by an oil price explanatory variable but this is also difficult to predict. Other costs such as levies or taxes will also from time to time have an effect. Not surprisingly the response to levy changes is likely to be greatest when the levy increase represents a relatively higher percentage increase in total cost. McWha and Murray (2015) estimate that an increase in ticket prices by $22 (say a higher customs levy) reduces year-ahead visitors by around 0.5%–2.4% against those forecast, with the majority of any reduction (from counterfactual) in their example expected to be Australian visitors (77%).

Domestic tourism has also been found to be closely linked to local incomes. Hazledine (2016) analysed New Zealand domestic flights, applying a 'gravity' model that showed GDP and population in both the origin and destination regions to be strong explanatory variables. His base case forecasts have domestic air passenger departures increasing between 2015 and 2043 at a compound annual growth rate of 2.4% pa. However, short-term increases in GDP can have perverse effects on domestic tourism. Athanasopoulos and Hyndman (2008) showed domestic visitor nights in Australia between 1988 and 2005 were positively related to rising personal debt levels and negatively related to GDP. The interpretation from this study is that higher local economic growth can have mixed effects on domestic tourism, generally raising the propensity to travel but also raising the propensity to travel abroad (instead of locally).

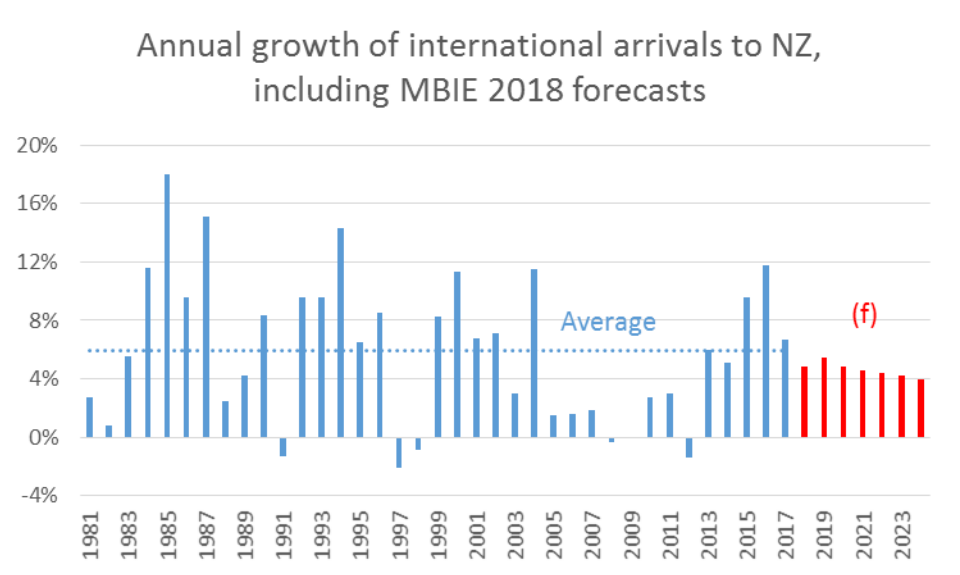
5.4 Current forecasts

A small range of forecasts is available for tourism in New Zealand.

The pivotal forecasts produced in New Zealand are international tourism forecasts provided by MBIE. Many of the few regional forecasts that exist can be traced back to these New Zealand-wide figures. In turn, the MBIE forecasts rely on the United Nations World Tourism Organization (UNWTO) international forecasts as a benchmark. The MBIE forecasts results from a combination of all three forecasting methods presented earlier in this chapter. The results cover New Zealand's eight key markets (Australia, China, UK, US, Japan, Germany, Canada and Korea) and two fast growing markets (India and Indonesia). For each country, 'others', and for all markets combined, the model generates annual forecasts for international arrivals, visitor nights and expenditure. Visitor mix by purpose of visit, namely holiday, visit friends and family, business (including convention/conference) and other (including education) are also provided. The latest figures, released May 2018, include forecasts to 2024. Visitor arrivals with historic data are shown below[40].

[40] Number of visitors is for December years but 2016 visitor nights reported within the MBIE forecast table for calendar year 2016 is actually the IVA intended visitor nights for March year 2016/17 (as tabled in chapter 2 of this report)

Figure 5.4 Annual growth of international tourist arrivals to New Zealand, actual and MBIE forecasts



The steps taken by MBIE to produce their forecasts of international arrivals are[41]:

1 Create models and make forecasts for three variables (annual visitor arrivals, visitor nights and visitor expenditure) using various models including ARIMA and exponential smoothing techniques.

   a ARIMA models

      i. Models are constructed for each variable independently and with combinations of the three variables together.

      ii. Models are also constructed that can include exogenous variables (ie explanatory variables) such as origin country GDP growth, international oil price and route airfares to New Zealand. Excluded is any change in the exchange rate, largely due to difficulties in exchange rate forecasting.

   b Exponential smoothing models

      i. Models are constructed for each variable independently.

2 Combine the forecasts for each variable as a weighted average of the individual forecasts produced by each model in step (1) for that variable. Weights can be naïve (ie each forecast evenly weighted) or determined from the information criteria produced by each model, with the latter often used in practice.

3 The model-derived forecasts and background information are provided to a panel of experts, who then meet and determine a consensus forecasts. Their industry knowledge (eg new air route starting soon) will typically have a large influence on forecasts for the next one to two years but it would require strong reasons for longer-term forecasts to diverge far from UNWTO long-term projections.

[41] Source: personal communication

It is noted that Tourism Research Australia (TRA) follows a similar approach[42]. Figures of relevance to New Zealand forecasts from their latest forecasts (TRA 2017) include:

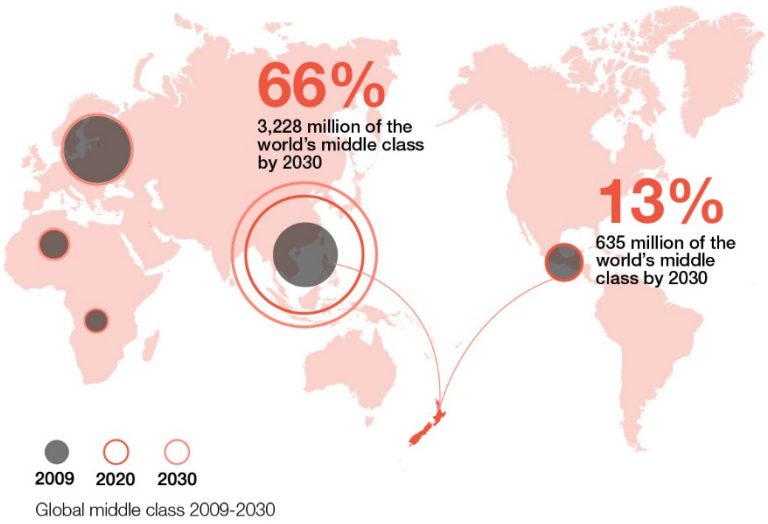
- a high annual growth rate (5.8%) for international inbound arrivals to Australia for 2017–2027, starting from a base of 8.6 million arrivals in 2016/17
- a strong driver of the expected growth being increased tourist arrivals from China, forecast to rise by 11.9% pa and contribute 40% of the additional arrivals by 2026/27
- outbound Australia tourist departures to New Zealand (and hence inbound New Zealand arrivals) rising by 3.2% pa 2017–2027.

Influencing both MBIE and TRA forecasts are those of the UNWTO. Their latest forecasts[43], made in 2010, show New Zealand's long-term annual growth to 2030 in arrivals could range between 2.2% and 4.9%.

Both from a theoretical perspective and in terms of the actual forecast numbers, the MBIE system appears sound. The technique brings together the best of current forecasting methodologies (over a 5–10 year horizon) and is providing results that are broadly similar to those of international forecasters.

As mentioned, a strong driver of tourism growth expectations is strong Asian income growth, and hence outbound tourism. Auckland Airport provides the following chart to illustrate this expectation.

Figure 5.5 Size of global middle class 2009–2030



Source: https://corporate.aucklandairport.co.nz/airport-of-the-future/whats-driving-growth

The latest forecasts of relevance to South Island tourism are tabled in table 5.1.

[42] www.tra.gov.au/research/forecasts-of-tourism-activity/forecast-methodology/forecast-methodology

[43] www.iata.org/pressroom/pr/Pages/2017-10-24-01.aspx

Table 5.1 Reported forecast compound annual growth rates (CAGR) relevant to South Island tourism

Standing	Forecaster	Around 2025	Around 2030	Around 2040	Asia-Pacific only	Explanation
World	UNWTO		3.3%		4.9%	20-yr arrivals from 2010
World	IATA			3.6%	4.6%	20-yr arrivals to 2036
World	Boeing			4.7%	5.7%	20-yr RPK to 2036
World	JADC			4.6%	5.5%	20-yr RPK to 2036
New Zealand	MBIE	4.6%				Visitor arrivals 2017–2024
New Zealand	Infometrics	5.3%				Visitor arrivals 2017–2023
New Zealand	MoT/Hazledine[44]			2.4%		28-yr pax on domestic flights 2015–2043
AKL	AIA			3.3%		30-yr pax to 2045 (2014 Masterplan)
CHC	CIAL	3.8%	2.1%	2.2%		Pax to 2040
ZQN	QAC			3.6%		Constrained pax to 2045, from Masterplan consultation
QLDC	Rationale		2.4%	1.1%		Visitors to 2028 and 2048
Waitaki	DOC	5.1%				International visitor growth 2015/16 to 2021/22 ranges from 3.5–5.5% pa for South Island locations
West Coast	Tourism West Coast	5.5%				Visitors 2016–2021
Milford	Venture Southland	8.1%				Visitors 2017–2025
TranzAlpine	KiwiRail	1.5%				CHC–Grey pax 2017–2025 (2016 report)

Note: JADC = Japan Aircraft Development Corporation; MBIE = Ministry of Business, Innovation and Employment; MoT = Ministry of Transport; AKL = Auckland Airport; AIA = Auckland International Airport; CIAL = Christchurch International Airport; CHC = Christchurch; ZQN = Queenstown Airport; QAC = Queenstown Airport Corporation; QLDC = Queenstown Lakes District Council; DOC = Department of Conservation; RPK = revenue passenger kilometres.

The first point to note is that the local forecasts provided are generally for the next few years, and not over the timeframe of a major infrastructure investment.

The first few rows in the table show a range of international forecasts; note the expected Asian Pacific annual growth rate around 4%–6% pa out to 2036, being 20-year forecasts at the time of release. MBIE forecast a similar growth of inbound visitors to New Zealand out to 2024. Other forecasts over this relatively short-term horizon are reported by Tourism West Coast, Venture Southland and DOC[45]. Each is higher but this in part reflects an earlier starting point and includes strong growth in the last couple of years. From the limited feedback made available to this project team, forecasts by these organisations are strongly shaped by MBIE's national forecasts at the time, superimposed with local trends and expectations. Tourism West Coast also reports TranzAlpine forecasts which show a low expected growth

[44] MoT also has an international departure model which is not included given the focus here on projections of visitors to the South Island (see https://transport.cwp.govt.nz/assets/Uploads/Research/Documents/GOTO-Future-State-A4.pdf).

[45] DOC is not producing forecasts on an annual basis at present.

rate. It is likely that these forecasts reflect the train and carriage constraint within the current schedule rather than a realistic expectation of demand growth.

An independent source of short-term forecasts is Infometrics. These are not tied to MBIE forecasts but instead are derived from a model with Consensus Forecasts of home country GDP and unemployment as key exogenous variables (ie a model of type (2) listed towards the start of this chapter).

The longer-term forecasts are of more relevance to an infrastructure investment. Each pertains to combined international and domestic persons. The three airports are known to use standard econometric techniques to produce forecasts, either in-house and/or through consultants, and will overlay these with their own knowledge of airlines' plans and local airport capacity. Auckland Airport is the largest port of entry into New Zealand and is both predicting and planning for 30-year passenger growth of 3.3% pa, from a 2014 base[46]. Queenstown Airport forecasts strong demand growth at 4.8% pa out to 2045 but believes airport and local constraints will mean that passenger growth in and out of Queenstown Airport rising at 3.6% pa out to 2045 is more likely. This figure and the associated plans are being consulted with the local community at present. Christchurch Airport's long-term forecast, which equates to a 2.7% pa on a comparable basis to the other two airports, also acknowledges expected airport constraints on growth. All three airport long-term forecasts appear low compared with expected tourism growth in Asia–Pacific, as well as with the historical trend in New Zealand international visitor arrival growth and with the historical trend in domestic tourism (albeit the latter is difficult to measure).

The other forecast being applied at present – and also under review – is that formed for Queenstown Lakes by Rationale. This forecast is also closely tied to the MBIE forecast over the next few years but then reduces to a 1.1% pa growth rate which is at odds with tourism trends and international expectations.

Not tabled but nonetheless significant, TNZ reports[47] a 32% increase in passenger port days scheduled for the 2018/19 season, relative to the recent 2017/18 season. This is against a backdrop of a 7% increase in berths amongst the global cruise ship sector[48]. Longer-term forecasts for New Zealand are not available but TNZ also notes a global forecast of relevance, namely a significant number of new cruise ships on order out to 2026.

No attempt is made – and no mention is found – by any forecasters mentioned above of forecasting the occasional low growth years that historically have existed. It would appear, based on the numbers reported, that the occasional bad year has been averaged across all years. This is quite typical but it is important to remember – and expect – this variation from trend.

5.5 Other potential forecast models

Before moving on to discuss forecast visitor numbers, a number of models exist that could be easily adapted to provide regional tourism forecasts.

The regional land transport demand model (RLTDM) was developed by NZIER as a research project for the Transport Agency (Stephenson 2016). Although the model was developed to project travel demand, it also produces regional population forecasts that could be useful for forecasting domestic tourism. The model has no specific reference to tourism – regional light vehicle kilometres travelled is related to regional

[46] AKL split of pax arrivals in April 2017/18 was 52% international flights and 48% domestic, with annual growth of 5.9% and 7.9% respectively (https://corporate.aucklandairport.co.nz/news/publications/monthly-traffic-updates)

[47] www.tourismnewzealand.com/media/3359/cruise-sector-infographics-march-2018.pdf

[48] www.maritime-executive.com/article/cruise-industry-poised-for-growth

population density and household characteristics such as income, employment and composition. Migration is modelled via region-specific origin-destination migration probabilities, coupled with a vector autoregressive model for calibrating uncertainty in age-specific mortality and fertility rates.

Covec produced tourism forecasts for many years for various forerunners to Tourism New Zealand and MBIE.

Like the current MBIE forecasts Covec's approach recognised that models cannot capture everything. Tourism forecasts from an econometric model can be easily undermined by the closure of an existing air link or by the occasion of a major sporting event. Thus forecasts from models were (and still are under the MBIE approach) typically reviewed and moderated by a panel of industry experts as a type of Delphi method[49].

Covec preferred the use of univariate time series modelling for forecasting tourism (arrivals, mean length of stay and mean expenditure per night), as they considered that establishing valid structural models of tourism was too difficult. They also wished to avoid the problem of having to forecast exogenous variables. Of course good time series modelling requires testing for non-stationarity, the presence of serial correlation, the normality of residuals and so on – which Covec did.

For domestic tourism Covec also used a time series approach to forecast the number of domestic (day and overnight) trips per capita at a regional council level, combined with Statistics NZ regional population projections, and augmented by a conversion rate – the ratio of trips from an origin region divided by visits to a destination.

However, in later sets of forecasts some models for visitor numbers were changed to multivariate models, utilising exogenous variables such as exchange rates and GDP.

It is unclear in Covec's and MBIE's methodology whether forecasts by broad region of origin are derived from their own equation or from the additions of forecasts from its component countries (for example Taiwan, Hong Kong, South Korea and others constituting say North Asia). If an equation at the country level is poor and therefore unusable, an inconsistency may arise between forecasts at the regional level and the sum of its component country-specific forecasts. To avoid this problem the equations need to be estimated in a way that takes into account the non-independence of errors across the equations. Seemingly unrelated least squares would probably be appropriate.

In a NZIER report (Stephenson and Vita 2007) to the Ministry of Tourism the objective was not to present forecasts of tourism, but rather to ascertain whether the exchange rate affected inbound and outbound travel demand, and tourist expenditure. In essence the analysis sought to explain underlying trends by income (in the source country) and then ascertain the role the exchange rate had in explaining the residual, allowing for lagged effects.

Their findings were that the exchange rate had a generally weak effect on visitor numbers, but a strong effect on visitor expenditure. Unsurprisingly though, the effects varied considerably by market segment.

NZIER noted that other effects such as transport costs were not addressed in the analysis, so the models were not directly capable of producing forecasts. Nevertheless with a core explanatory variable such as income the models could certainly form the basis of reasonable simple multi-variate forecasting models that do not go fully down the structural model route.

A model of the Wellington regional economy developed by Grimmond[50] for Greater Wellington Regional Council has projections of GDP and employment by industry to 2048. Two of the industries identified are

[49] The Delphi method is a systematic and interactive forecasting method using a panel of experts.

[50] Source: personal communication

accommodation and restaurants, and wholesale and retail trade, but neither is directly linked to tourism as a component of final demand. The forecasting methodology contains both structural equations and time series analysis. The model also has population projections for the Wellington region that respond to the demand for labour. This is different from Statistics NZ regional population projections which are based on alternative exogenous assumptions about fertility rates, mortality rates and net migration rates.

Not considered within this report are models that can improve short-term forecasts, ie for several months ahead as opposed to decades. Such models include work looking into wave effects (Balli et al 2018) and use of Google analytics (Gunter and Onder 2016). Of a similar ilk, Australian firm Fuse Insights offers forecasts of arrivals to New Zealand based on bookings through the four major travel distribution systems (Amadeus, Sabre, TravelSky and Galileo), which is complemented by background material on visitors derived from web search behaviour and official demographic statistics.

5.6 Discussion of current forecasts and future decisions

Returning to the currently available forecasts, the following exercise combines the visitor and flow (crude) estimates of previous chapters with the above-tabled Auckland Airport forecast, being the mid-point of the three airport forecasts and also capturing the thinking and planning of the most pivotal New Zealand airport. These calculations are not intended as forecasts for specific places and routes but rather presented as logical consequences, which in turn invite the questions 'why could this not happen?' or 'what must be done to allow this to happen'. At the heart of the exercise is the question, 'what do we (New Zealanders) wish to gain from the opportunity that a seemingly insatiable tourism demand presents?'[51]

First, the Auckland Airport compound growth rate of 3.3% pa equates to 2.5 times more visitors in 27 years (and double the current number in 21 years). So, for example, in an unconstrained environment – other than the constraints that limit average annual tourism growth in the first place to 3.3% – a visitor population of 1.3 million, such as estimated to be the 2016/17 international visitor flow between Canterbury and Queenstown, would be 3.2 million in 2045. Likewise 0.9 million, around the total visitor numbers to the three iconic natural wonders of the Sound Island, would be 2.2 million. The flow along the Haast Pass could be 1.3 million international visitors. The visitors to a small waterfall could be 0.1 million. These are large numbers and rapid changes, especially relative to infrastructure investment horizons. But the uncertainties are huge.

Table 5.2 Potential future visitor numbers (000s) in 2045 at various growth rates

	Numbers in 2045 if visitor CAGR 2017–2045 …			
Current visitors (000s)	**2.3%**	**3.3%**	**4.3%**	**Current examples**
1,900	3,591	4,716	6,176	International arrivals to South Island
1,300	2,457	3,227	4,226	CH–QU international visitor flow
900	1,701	2,234	2,926	Milford Sound, Aoraki, glaciers
550	1,040	1,365	1,788	WC–QU international visitor flow
300	567	745	975	Large skifield
40	76	99	130	Small waterfall

[51] A related question is 'why does NZ show so poorly in international productivity comparisons of the tourism sector?' – see Assaf and Tsionas (2018).

Even more uncertain is the road usage implied by these visitor numbers. The airport constraints already explicit in the 3.3% passenger forecast and the lack of apparent planning for a large growth in inter-regional South Island rail imply inter-regional travel is likely to be by road. In the meantime, self-drive vehicles could significantly change the number of vehicles on the roads[52]. Under the brave assumption that non-tourist AADT continues at recent growth rates and that tourism demand grows in accord with the above figures, the implied AADT changes are table below for three types of road. A road which currently caters primarily to tourists – say Haast Pass – would have implied annual AADT growth near 3.3% pa, leading to 2,600 vehicle passes per day by 2045. At the other extreme, vehicle growth on a road near an urban environment where tourist use is dwarfed by non-tourism activity – say on the Dunedin motorway – would tend towards the other extreme of 2.7%, being the 10-year average on SH1 near Burnside (repeating, this is a brave assumption!). As with visitor numbers, there will be constraints on some roads that can be overcome to enable growth of this magnitude. In other cases real constraints, or large costs, will mean such growth rates will not be achieved.

Table 5.3 Sensitivity of AADT to long-term visitor forecasts

		AADT in 2045 if visitor CAGR 2017–2045 …			
Current tourist share of AADT	AADT 2016/17	2.3%	3.3%	4.3%	Current examples
Mainly tourists (assumed 90%)	1,081	2,067	2,643	3,390	Haast Pass
Medium tourists (assumed 50%)	6,000	11,980	13,756	16,061	
Low tourists (assumed 10%)	29,342	67,261	68,997	71,252	Burnside 2-way in Dunedin

However, even these averages, with all their uncertainties, do not capture the rapid vehicle growth rate that can occur when a place becomes more popular or capacity is increased (or a sharp change in mode share). For example, the average growth of AADT along Frankton Road in Queenstown was 7.3% pa between 2011/12 and 2016/17 (that is 42% in five years and, just out of interest, Queenstown Lakes guest nights increased by 40% and visitor fuel spending by 42%). It is unlikely that forecasts of a 20–40 horizon would be able to capture such surges of activity. However, it may be possible to indicate places and routes where rapid surges of activity are possible (eg access or promotion of a natural beauty is created), where they are impossible (eg physical constraints simply prevent that happening) and where they are very unlikely (eg there are little natural features likely to attract visitors).

The point of the exercise is to show there are large changes implied by tourism growth rates, with that rate being the current Auckland Airport working assumption which is moderate by historical standards. Transferring this assumption to individual locations and roads is a complex task. However some simple calculations are likely to draw out from stakeholders what is possible, what is not and what needs to be done to accommodate – or slow or accelerate – such growth at specific locations.

This leads to the issue of how then to measure whether the benefit of any transport intervention exceeds the estimated cost, especially if the volume of vehicle travel is uncertain. In a traditional transport investment, a largely known capital cost is incurred to produce an ongoing stream of travel cost reductions for road users. These travel cost savings, in turn, may manifest themselves in many ways

[52] The change in volume could be either more or less – this is unknown at present.

through an economy, eg as more leisure, or more production, or reduced imports. Tourists can also benefit from lower travel costs, which in turn may lead to more spending at the immediate destination or maybe provides the time and/or budget to add an extra destination. However, there are other tourism benefits or dis-benefits that may also occur. For domestic tourism, a bad experience, say due to road congestion, in one location is likely to lead them to visit elsewhere in future. The bad experience largely leads to a spatial displacement of activity. This scenario has many similarities to travel associated with any other New Zealand industry and, hence, there seems little case for different treatment in an investment analysis[53]. However, international tourists can leave New Zealand and not return, or can advise their friends and relatives (and wider social media circle these days) to not visit New Zealand. Conversely a good experience may achieve the opposite. That is, there is the potential for local activities to influence future international tourist arrivals and hence total GDP, not just to the local area but to New Zealand. While this risk – and opportunity – is well known, it is very difficult to quantify and even more challenging to anticipate.

The implication of this logic is that deciding on the right moment(s) for intervention when it comes to international tourism and transport – or any other major infrastructure – is likely to require another metric, other than usual expected travel cost reductions. This metric may well also vary by location, depending on capacity and social licence at each location. This metric does not appear to have been established yet[54].

Quite likely it will entail an ongoing measure of negative sentiment which, in turn, will require both an understanding developed as to what magnitude of sentiment change will lead to change in future international tourism demand and an understanding of what conditions will lead to undesired sentiment change (or desired sentiment improvement to be complete). This is an area for ongoing learning.

Sentiment measures are increasingly available today. In the main, visitor satisfaction is currently running at very high levels but, as always, some issues exist. Examples of sentiment measures include:

- The IVS, including as reported by Tourism NZ in their visitor experience reports (where, in the April 2018 report, cost and inconvenient public transport were listed as contributing to lower satisfaction scores).
- In a six-monthly TNZ and TIA survey of New Zealanders reported in the Mood of the Nation report (TIA 2018) that road use and crashes were seen as the largest negative impacts.
- DOC annual survey of New Zealanders.
- Angus & Associates regular surveying within their Visitor Insights Programme (VIP).
- New Zealand tourism phone apps such as Campermate.
- International apps such as TripAdvisor (one example provided by Venture Southland is 'I found better things on the way from te anau to milford rather than on the cruise').
- Data mining of sites such as Facebook and Twitter, including by companies such as MeltWater, and, specifically for Chinese visitors, sites such as Sina Weibo, WeChat and Mafengo.

A recent review of big data use in tourism is provided by Li et al (2018).

The second part of the benefit of investment into the tourism infrastructure issue, besides what is the benefit, is who benefits? The categorisation of TLAs in section 3.3.5 by GDP and tourism showed Clutha, for

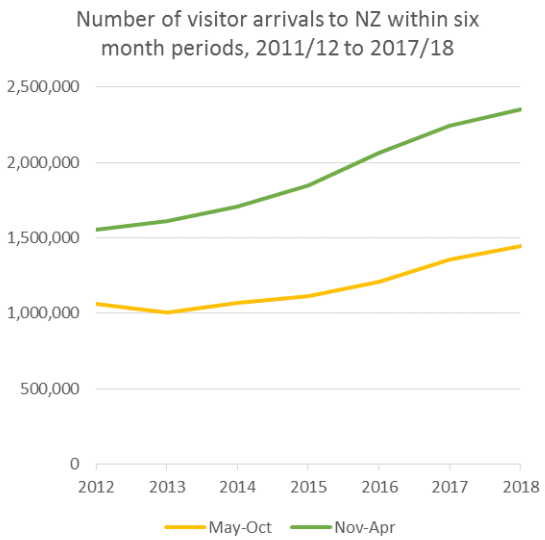
[53] This still allows the possibility of consumption preference effects and regional development objectives, albeit these do not fit neatly within the EEM framework.

[54] A recent international study that attempts a tourism cost-benefit analysis is Rolfe and Flint (2017).

example, as having experienced low tourism spending growth and low GDP over five years. And yet tourism numbers have been increasing following ongoing sealing of the Southern Scenic Route and promotion of the area. It would appear that tourism growth is imposing costs on the local community with little apparent benefit from them (at least over the five-year period). This apparent mismatch between benefit and cost to locals may be due to measurement and timing issues – this requires further research – but it is likely to be primarily due to nearby centres offering a greater variety of hospitality services, such as Invercargill and Dunedin. It is not within the scope of this project to address this issue other than to mention that data indicates this mismatch and suggests that different funding solutions will apply in different situations, eg Clutha District Council may be more inclined than other councils to introduce parking and toilet fees and/or the Transport Agency may consider the Southern Scenic Route as regionally important enough, in spite of relatively low traffic volumes, to be brought within the state highway network.

Before moving onto some reflections about what data can be used, and what data is still needed, for future transport investment decisions, a further uncertainty around future tourist numbers is the extent to which dispersal is successful. Some dispersal of tourist arrivals will naturally happen if the price incentive to choose another time of day or time of year exceeds the cost of changing arrival time. It is also an explicit objective of the New Zealand tourism industry. This project was not able to find forecasts that disaggregate by time of year or time of day. It is simply noted here that these forces exist and that some modest success appears to have occurred in recent years. In the last two years, the growth rates for the quieter months (May–October), at 12% and 7% respectively for 2016/17 and 2017/18, have exceeded the busier months (November–April), at 9% and 5%. However this growth bias is modest, it has a short history to date, the seasonal gap is large and there are good reasons why international tourists choose to predominantly visit during the New Zealand summer; in other words it is likely that seasonality will remain a key feature of international tourism[55].

Figure 5.6 International visitors to New Zealand for April years grouped in six-month periods



[55] See TIA (2016, p12) for historical snapshot of international arrival patterns by month of year

5.7 Constraints

The above mentioned forecasts are, from a regional perspective, a measure of the demand potential in the area. A major determinant of whether this demand potential can be realised will depend on physical and financial constraints. This section briefly reviews work undertaken around this topic.

One constraint that is increasingly discussed internationally is the notion of 'overtourism', or to use a phrase mentioned more locally, the social licence to operate. McKinsey and World Travel & Tourism Council (2017) provide a review of this issue in international locations. For now, it is noted the issue is a growing concern, that the ratio of tourism to local community populations is still relatively low compared with international sites, and information as to New Zealanders' sensitivity will unfold in surveys, including a current survey being undertaken by DOC.

In terms of any transport cost-benefit analysis, 'overtourism' can show through two channels: (a) higher demand due to tourism will change relative prices, which may lead to lower domestic welfare (which in turn could show as negative sentiment), but it will also increase incomes, which on balance would be expected to create a net welfare gain for the country, albeit there may be issues of redistribution of welfare; and (b) higher visitor presence will create externalities, both positive and negative, that will likely swing to a net negative balance at some stage as effects such as congestion and pollution come to dominate effects such as enhanced local experiences and pride.

Whatever local attitudes turn out to be, there appear to be primary constraints on tourism that are physical. Many of the infrastructure constraints are discussed in MBIE (2016); TIA (2016b) and Deloitte (2017).

The forecasts provided in the previous section have been influenced by airports' consideration of airline and airport capacity constraints. Each airport also has a masterplan which outlays its investment intentions. An element of self-prophecy exists with the airport forecasts and plans, in so much that tourism arrivals into the South Island will not be able to grow much faster than the constraint imposed by the airlines and airports. That said, the forecasts growth rates are still high in terms of opportunity, relative to constraints to be discussed below.

Looking at the major two South Island airports, CIAL reports that terminal capacity in the peak hour determines terminal requirements and that demand forecasts imply increases in plane and passenger movements busy hours that will require a significant terminal expansion sometime around 2030. Furthermore, any further terminal expansions past 2040 may require relocation of the fuel reserves. QAC also reports the need for investment and acknowledges that it is undesirable to try and meet 4.8% pa forecast demand, at least at Queenstown Airport. While limits to noise and the length of the Queenstown runway will limit the growth in arrivals, QAC is already looking into expansion of activity at Wanaka Airport. This will have implications for road investment in the area.

The other major entry/exit point to/from the South Island is via the Cook Strait ferries. It was not considered a priority of this project to probe managers of KiwiRail and Bluebridge as to their investment intentions. However the InterIslander is known to be approaching capacity and there are no publicly reported intentions for new ship purchases.

Accommodation for tourists is a near-term constraint in key locations. Hotel investment is occurring at present but a Colliers (2018) report warns of capacity constraints on hotel accommodation until at least 2021. Relieving pressure in recent years has been the strong uptake of private accommodation into the Airbnb pool. However the competition that Airbnb has brought is anecdotally reported to have reduced margins amongst smaller accommodation providers, which may be a deterrent to future investment into

new motels and small hotels. It is likely that a process of higher accommodation pricing and more investment will eventuate but accommodation does appear to be a significant limiting factor in many locations.

Another significant challenge for the tourism industry is labour. Unemployment levels are relatively low in key tourism regions. Employment pressures have been relieved by the widespread use of itinerant labour, including international visitors on six-month working visa. However the general low wages combined with housing shortages are acting to provide a supply constraint in the hospitality sector.

The above listed constraints – transport, accommodation and labour capacity – will increasingly become important in tourism-related cost-analysis. In situations where spare capacity exists in any of these resources, then extra international tourism can take advantage of economies of scale and can potentially provide a high marginal benefit per dollar of visitor spending to the country. In the longer term, the creation of capacity requires drawing on resources (ie land, equipment, labour) that could have been used for other economic activity, diminishing the marginal benefit of each tourism dollar spent. In regional development terms, this dynamic shows as the current advantage to trying to disperse visitors by region and by season. As mentioned above, while appealing, it is yet to be seen how much pricing and promotion aimed at dispersal will alter travel patterns. This is one uncertainty.

A more material constraint on travel patterns is likely to be physical bottlenecks. Major constraints of this sort appear to be three of the major South Island destinations, namely Mount Cook, Milford Sound and the Franz Josef and Fox Glaciers. At present, the number of international visitors to each site is just over one-third of international arrivals to the South Island (it has not been calculated how many visit two or three of these attractions but could be done using IVS data). These sites' share of international visitor growth in recent years is likely to be higher (again this could be calculated using IVS). Each attraction sits within a national park, with each park having a management plan. These plans are subject to periodic review and hence current limits on tourist activity in the parks can be raised. However it is unlikely that visitor limits will be raised to the extent implied by current growth rates and potential demand forecasts. This is a matter that requires high-level discussions with DOC[56]. While it may be possible to quantify the extent of the constraint around these parks, it is uncertain how travel patterns will change in light of these constraints (eg lower share of growth on West Coast? More overnight stays in Te Anau (to get to Milford early)? A lower share of growth for the Christchurch–Queenstown nexus?)

One potential response to these constraints and the desire to slow and disperse visitors is the enhancement and promotion of touring routes, such as the Wild Atlantic Way in Ireland (Colliers 2013)[57].

Data exists to measure pressure in each of these sectors but the implication of these constraints for future tourism activity does not appear to clearly articulated, let alone incorporated into regional tourism forecasts. This is a major area for future research.

[56] Research was taken some years ago into the impact of visitors (Barringer et al 2002) and into management approaches to sustainability (Hughey et al 2004) but this thread of research was not investigated in this project.

[57] One negative consequence of creating and promoting a tourist route is potentially more carbon emissions but that depends on what activities the tour displaces and/or whether a higher revenue yielding tour enables profitability to be reached at lower visitor numbers. To put the second trade-off into perspective, a return flight London-Auckland emits equivalent Co2 of 7254kg while driving an extra 1,000km emits 198kg (https://calculators.enviro-mark.com/public?calculator=travel)

6 Outline of South Island tourism flows model

The preceding chapters confirm that tourism flows through the South Island are not clearly described at present and cannot be readily forecast but that a tourism flows model can be created with information available and/or easily obtained.

It is possible in time that data will be available to show the flow of tourists through the South Island, in a near-live fashion, using for example cellphone connections. However this is not available at present and will require some data from all three major phone networks to provide accuracy. There is little reason to believe this will occur near-term. Furthermore, even if such data were available, the information is largely descriptive and would require a model to infer future flows and to infer response of flows to changes in the tourism network.

It is also possible that a national tourism flows model could be created in the next few years but it does not exist at present and there are no known plans for such a model.

At present, the more plausible way forward to understand South Island tourism flows is to construct a South Island tourism flows model, possibly using models that exist at present.

As stated in chapter 3, a tourism flows model can be dissected into three parts, with parts (a) and (b) providing inputs into parts (b) and (c):

- part (a) calculates inter-regional flows
- part (b) allocates inter-regional flows to routes and modes
- and part (c) spreads regional tourists across the local attractions.

Data requirements would also mean that each part would be calculated separately for international tourists and domestic tourists, potentially creating six parts that form the South Island tourism flows model.

There are several benefits to the creation of such a model, brought together in this manner.

1 The whole model provides a description of key tourism flows across the South Island. This information is missing at present. Knowing the flow provides the data that is necessary to estimate the benefit of any road investment aimed at tourists. It also enables the risks associated with any particular link to be examined. Also it provides a clearer insight into the interdependency of ports, roads, accommodation providers, tourism operators and natural attractions.

2 The model allows scenarios and forecasts to be created. These scenarios can inform and test investment and marketing strategies. They can also show the likely journey ramifications of problems that might occur, including seismic events. Plus the model allows forecasts of arrivals at airports and at attractions to be translated into people on roads, or at least the route implications of constraints at one or more attractions (eg West Coast glaciers) to be understood.

3 Treating the model as three parts enables a phased creation of the model, with each part being of value in its own right. The key missing data is the inflow to the South Island and the spread from the major ports to the regions. Methods were explored in chapters 3 and 4 that could model these flows, using data currently available from the IVS, the IVA, Sabre and the Cook Strait operators. Spark cellphone data will soon be available to further refine these models. Plus a Marketview customised query can be done quickly and at reasonable cost to build further confidence in the accuracy of the model. Note these methods can be easily adapted to allow disaggregation by place of origin and/or by season.

4 Assigning inter-regional flows to routes and modes, part (b), can partially be estimated in a similar manner to above (ie inferring flows by presence at key locations and using IVS dual presence) but is expected to rely more heavily on customised queries of card, phone, app and/or Eroads data. The benefits of this phase are in linking tourist flows more directly to the major inter-regional infrastructure, for investment and risk analysis.

5 The three-part approach also has the benefit of being able to take advantage of regional models that already exist in Queenstown Lakes, Southland, Clutha and Tasman. These councils already have economic network plan models that take tourist inflows into each district (or region in one case) via the state highways and airports, route them to known accommodation providers and then re-route visitors from accommodation providers (the 'incidents') to known attractions (the 'facilities'). The allocation of trips is jointly determined by the stay units available at each incident and by the estimated arrivals at each facility. The chosen route is typically taken to be the quickest route but re-routing is possible by imposing more or less travel time (or costs) on specific routes. These models can be replicated in other South Island regions. The advantage of this part of the model is in linking local road use to the actual attractions. Note, the pivotal role of known accommodation providers, including some 'non-commercial' accommodation, which may not accurately capture trips by non-commercial visitors but (a) is likely to be a reasonable approximation where commercial and non-commercial accommodation co-locate and (b) artificial incidents can be created as centroids of clustered non-commercial accommodation if need be.

In sum, part (a) is not a major exercise but would provide a measure for inter-regional flows now and provide the basis for forecasting such flows. This can be done quickly and for relatively low cost. Part (c) already exists for some districts/regions and can be refined with the information from part (a). It is relatively costly to build such models for other regions but some economies of scale are likely. Part (b) is likely to rely more heavily on customised data queries from private data holders; further investigation is required to determine whether this presents a major cost.

7 Conclusions

This project investigated the data and forecasts that are available for tourism and transport in the South Island. Not surprisingly there are many datasets and few forecasts.

The project identified the major demand data sources and revealed some of the intricacies that make them more or less suited to different issues. An important requirement was to cross-check inferences reached by examination of any one data set. The numbers provided in this report – put together quickly – are intended to illustrate and investigate methods rather than provide the definitive measure of recent activity.

Key data gaps were revealed and are mentioned in the table below, under the issues to which they relate.

Tourism forecasts for the South Island are typically short term (ie to around 2025) and many rely on MBIE's annual forecasts of New Zealand international tourism, which are soundly based and consistent with international forecasts and New Zealand historical trends. Longer-term forecasts, being of more relevance to infrastructure investment, are provided by the three major airports that service the South Island (including Auckland Airport which is the major first port of arrival). Their forecasts for passengers at present are below those for tourism growth expected in the wider Asian Pacific region and below New Zealand historical trends and appear heavily influenced by consideration of supply constraints that exist at each airport, even after extant levels of planned investment.

The major uncertainties identified in forecasts are how local conditions will constrain the growth in visitor demand implicit for the South Island in the airport forecasts. This is one area where coordination between DOC and the Transport Agency in particular, and more widely involving other government agencies and the private sector as well, can come to a common understanding of where the limits exist.

The other major needs appear to be twofold: (a) measuring the flows between and within regions; and (b) determining how to measure the benefit created by public sector investment. The first need can be addressed by a South Island flows model, as discussed in chapter 6. The second requires research into the causal link between transport investment, visitor and local sentiment and future demand growth. A good or poor visitor experience has the potential to change future international tourism demand, and hence future New Zealand GDP. This relationship is not well understood at present, nor is it apparent (yet) how to build sentiment metrics into investment decisions and, by implication, into the ONRC.

More specific reflections are provided in the following table, where comments are grouped according to the future stream of work that was indicated of relevance to this project.

Table 7.1 Reflections on future streams of work on tourism data for transport planning

Potential use of data for ...	Comment
Forecasting model	• The project confirms the sound approach taken by MBIE at present for forecasts of international tourism, which can be compared with various international forecasts and with independently derived forecasts by Infometrics. • A useful addition to the current MBIE forecasts would be a South Island total arrivals figure • However long-term national forecasts are required for infrastructure planning (ie a parallel to Statistics NZ's population projection scenarios), including for domestic tourism. • Longer-term projections are available for passenger numbers through key New Zealand airports (AKL, CHC, ZQN) and in total (from MoT), which will likely suffice for much planning. • However there would be value in either regularly collating these forecasts and/or producing longer-term projections independently (by say Statistics NZ or MoT). Data and methods exist to form such projections, albeit these forecasts will suffer from the usual problem of a large margin of error and unknown future constraints and risks.

Potential use of data for ...	Comment
	• It is questionable whether regional forecasts over a long-term horizon would add much value, especially as there is likely to be unknown responsiveness to local constraints that are initially deemed as dampening influences, ie forecasting, say, low tourism demand growth in a region over a 10-year horizon does not allow for the supply response to increase demand. • A more insightful approach may be to have major organisations (DOC, the Transport Agency, KiwiRail, airports) publish their estimates of capacity caps over a 20–30 year horizon, and then allow others to respond as they see fit. • With a shorter-term horizon of around 12 months, there is likely to be merit in pursuing big data analysis of web bookings and enquires to show near-term demand. • An annual report addressing South Island tourism would be one way to bring together the existing forecasts, including scheduled cruise ships and maybe supplemented with big data type forecasts, with constraints and plans known to exist.
Transport network needs	• Road investment decisions for tourism are more sensitive to non-travel cost concerns due to the risk and opportunity of future international demand being influenced by current conditions (ie congestion is not simply a matter of possible travel cost savings but also of future New Zealand GDP). • How this benefit risk/opportunity is measured and built into investment decision making is yet to be established. Quite likely sentiment data will be of value, including big data sets produced through internet activity, especially social media. • Also the experience nature of tourist travel – as opposed to getting there quickly – means there are likely to be network needs of international tourists that are independent of road volumes (ie some tourists' needs are similar whether the road is high volume or low volume). • This may require an overlay to the current ONRC for international tourism needs, rather than an additive adjustment as at present.
Formal business case for identified problem or opportunity	• Many issues were mentioned to the project team but no one infrastructure bottleneck emerged that required immediate attention (that does not already have plans in play). • The immediate needs appear more related to coordination of tourism management. • The confronting statistics are the forecast demand growth for visits to iconic places versus the likely environmental constraints, reinforcing the need to create more opportunities for tourism away from the popular destinations of the glaciers, Queenstown, Milford Sound and Aoraki.
Tourism flows model	• It is clear that the flow of international and domestic tourists around the South Island is not generally well known. Some individuals know a lot about pieces of the sector but there appears to be no mechanism to bring this information together. • A tourism flows model would both (a) enable a wider understanding of tourism movements and activities to emerge and (b) provide an opportunity to bring people and their information together. • It is possible to measure much activity now (at a cost) using phone, app and electronic card usage. • A computational model, though, has the added advantage of being able to examine what-if type questions and enable a disaggregation of higher-level forecasts. • Such a model need not be complex, can be phased and can be largely established from data that is currently available or that can be easily obtained. • For example, the major inter-regional travel can be quickly established using a mix of current data, the forthcoming Qrious inter-regional data and a targeted analysis of Marketview electronic card records for individual card holders. • The second phase – establishing mode and the inter-regional route – could be determined using a mix of data, including from Eroads, Qrious and Geozone.

Potential use of data for ...	Comment
	• The third phase – establishing visitors to key attractions – can be determined by a mix of visitor counts, including in particular those from DOC and phone data. • It is also possible to have a 'live' record of South Island flows, although it will take some time to learn the representativeness of the people being monitored. • Again a phased approach to a 'live model' is recommended. As a first step, there is data gathered by Tourism Holdings Limited and Eroads that shows journeys for segments of the market. Second, the sample approach taken in Tasmania using phones would enable insights into other market segments of key interest.
South Island inter-agency work	• Inter-agency cooperation is required but the nature of that cooperation lies beyond the scope of this report. • Except to point out that the current supply constraints being faced at iconic sites is not apparent from currently available data and forecasts. This at least requires some coordination between the Transport Agency, regional councils and DOC.
New tourism products	• The project listed many locations that currently act as strong attractors, which in turn can be developed for more and higher-value tourism. • It is also likely the big data techniques will be insightful and of wider interest to determine visitors' potential interests. • Tourist flow and driver behaviour can also indicate itinerary 'gaps' where opportunities for new provision can be made. • An example of a potential product is the development of a 'great road journey' akin to Ireland's Wild Atlantic Way or Australia's Great Ocean Road.

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Appendix A: Data sources

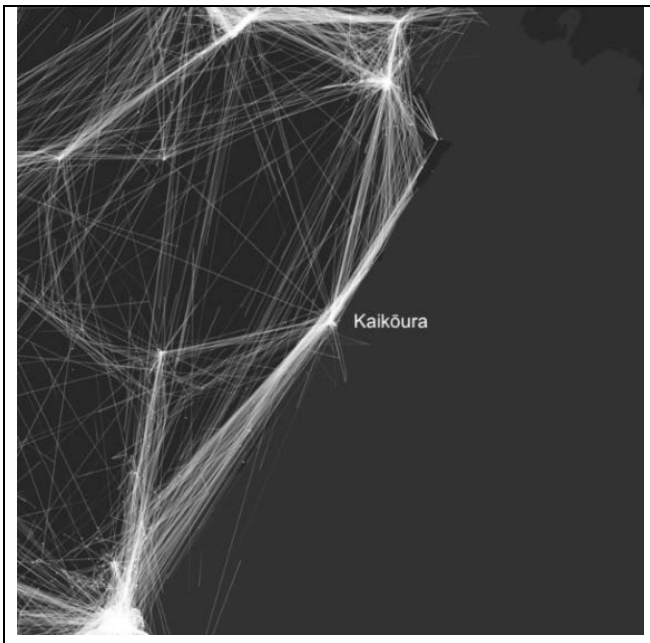
The core tourism datasets are discussed in chapter 1. A recent snapshot of these and other data is shown in the TIA (2016a) *Technical appendix to state of the industry*.

Data lists are also available at these sites:

- www.stats.govt.nz/topics/tourism
- www.mbie.govt.nz/info-services/sectors-industries/tourism/key-tourism-statistics
- https://tia.org.nz/resources-and-tools/insight/
- https://tia.org.nz/assets/Uploads/Tourism-Infrastructure-Project-Appendices2.pdf

Meanwhile the Data Ventures team of Statistics NZ is currently exploring what non-core data exists and can be accessed. These non-core datasets include data derived from use of phones, apps and trip loggers, the latter used by some rental car companies and by some buses. This information will be available later in 2018.

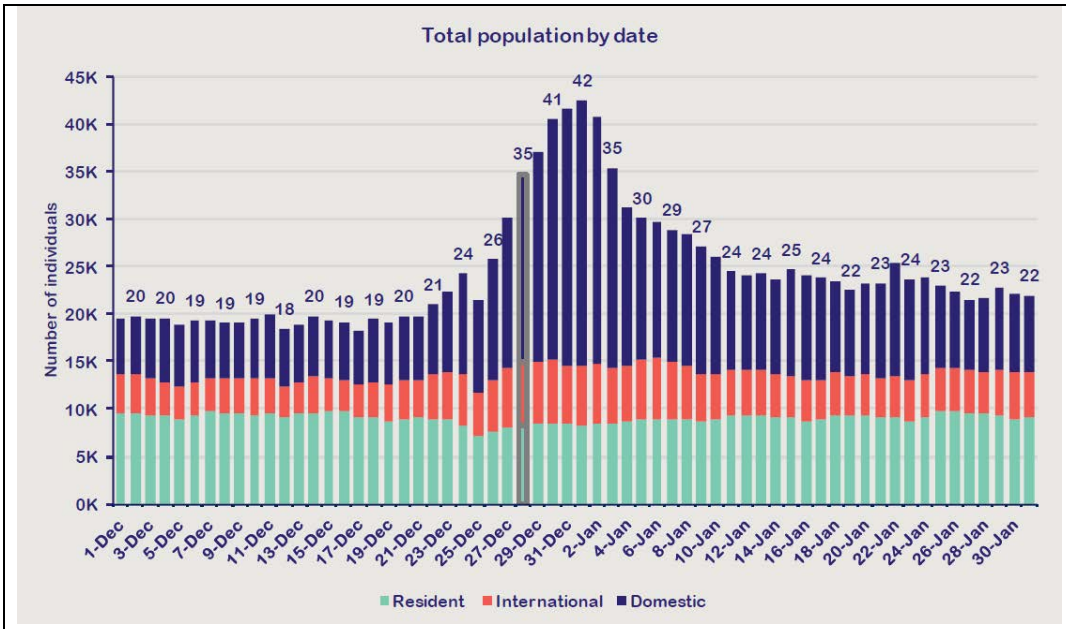
Some examples of recent use of non-core data are shown below.



Geozone (Source: Simmons et al 2017

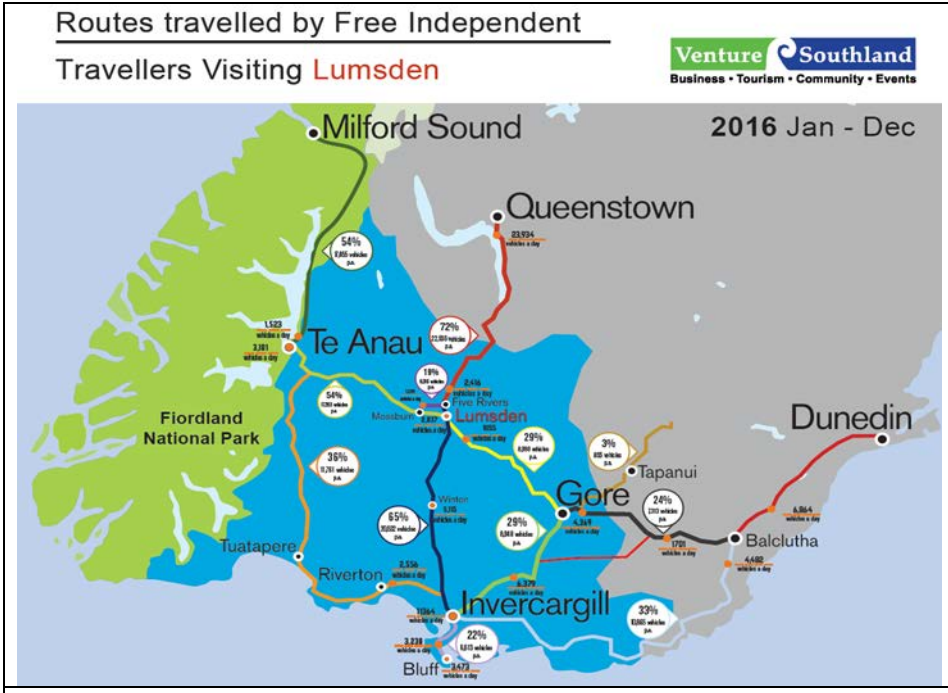
Commercial campervan movements and stay data: 24 hours 7 November 2016.

Lines connect when apps were used (and not necessarily the route). Shows a concentration of journeys via Kaikoura prior to the 14 November 2016 earthquake but also dispersed travel patterns.



Qrious (Source: Qrious 2017)

Population in Wanaka during December/January 2015/16. Bars show numbers of people present in Wanaka as inferred from Spark and Skinny cell phone usage

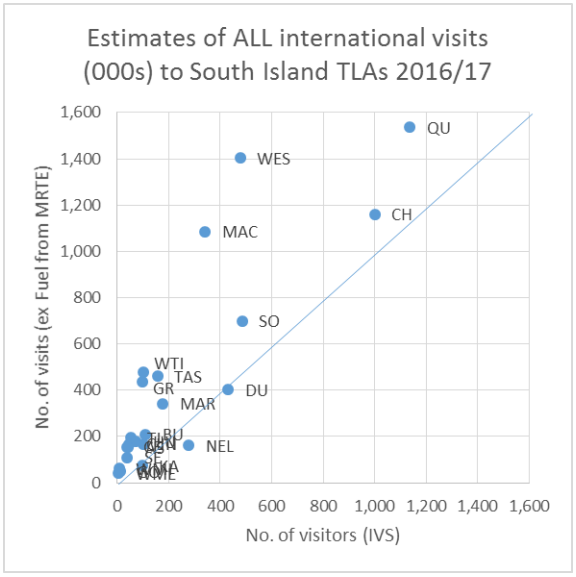


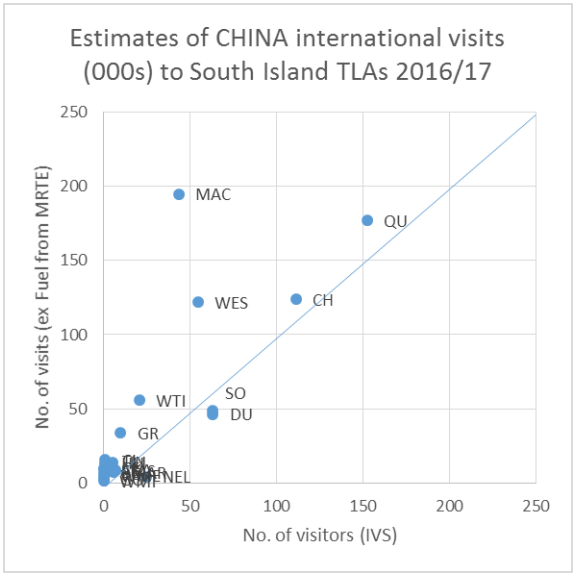
Geozone (Source: Venture Southland analysis of Geozone raw data)

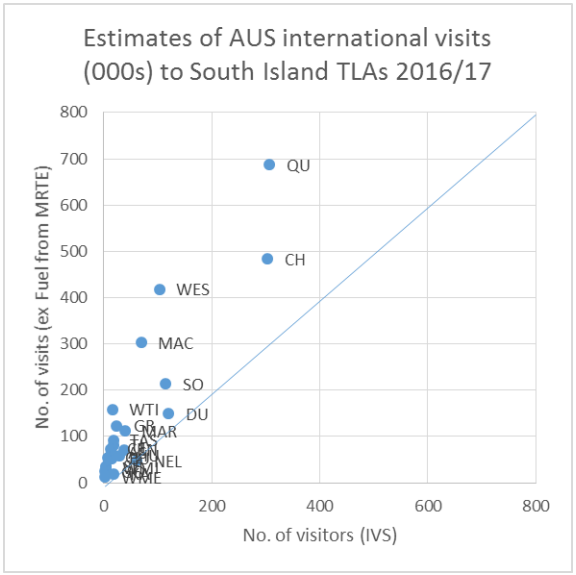
Routes also used by FIT visitors to Lumsden, as measured by percentage of app users at Lumsden who also accessed the apps on other routes during 2016. For example, 56% also journeyed to Milford Sound, 36% along SH99 through Tuatapere and 24% along SH1 to/from Dunedin.

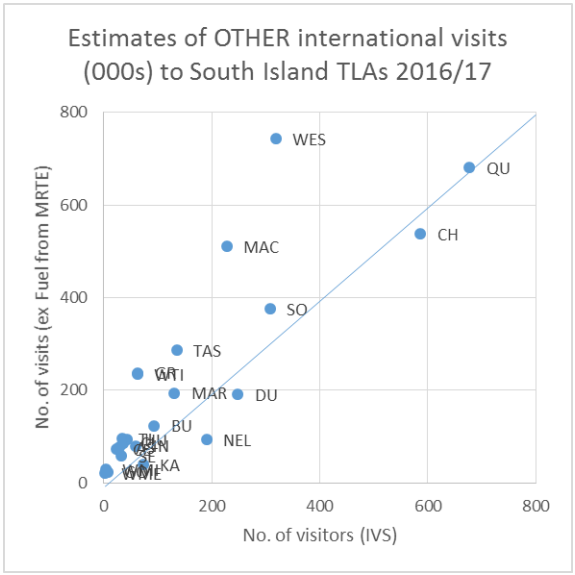
Appendix B: Graphical indicators of activity

Figure B.1 Comparing visitor numbers from IVS and estimated from fuel MRTE for various countries of residence









Appendix C: Glossary

AA	Automobile Association
AADT	average annual daily traffic
AES	annual enterprise survey
AI	artificial intelligence
AKL	Auckland Airport
ARIMA	autoregressive integrated moving-average (model)
AS	accommodation survey (formerly CAM)
ASEAN	Association of Southeast Asian Nations
CAGR	compound annual growth rates
CAM	commercial accommodation monitor
CBA	cost–benefit analysis
CBD	central business district
CHC	Christchurch Airport
CIAL	Christchurch International Airport Limited
DGiT	domestic growth insight tool (of TIA)
DOC	Department of Conservation
DUD	Dunedin Airport
DTS	domestic travel survey
EEM	*Economic evaluation manual* (of the Transport Agency)
FIT	free independent traveller
GDP	gross domestic product
GFC	global financial crisis
IATA	International Air Transport Association
IVA	international visitor arrivals
IVS	International Visitor Survey
JADC	Japan Aircraft Development Corporation
LEED	linked employer-employee data (of Statistics NZ)
MBIE	Ministry of Business, Innovation And Employment
MoT	Ministry of Transport
MRTE	monthly regional tourism estimates
NSN	Nelson Airport

NVS	National Visitor Survey (in Australia)
NZIER	New Zealand Institute of Economic Research
ONRC	One Network Road Classification (of the Transport Agency)
POV	purpose of visit
QAC	Queenstown Airport Corporation
QLDC	Queenstown Lakes District Council
RLTDM	regional land transport demand model
RPK	revenue passenger kilometres
RTC	Regional Transport Committee
RTO	Regional Tourism Organisation
SARS	severe acute respiratory syndrome
SH	state highway
TFR	tourism flows model
TIA	Tourism Industry Aotearoa
TLA	territorial local authority
TRA	Tourism Research Australia
Transport Agency	New Zealand Transport Agency
TSA	tourism satellite accounts
UNWTO	United Nations World Tourism Organization
VAR	vector autoregressive (model)
VFR	visiting friends and relatives
VIP	visitor insights programme (of Angus & Associates)
WIM	weigh in motion
YE	year ending
ZQN	Queenstown Airport