Local Implications of Globally Restricted Mobility

A study of Queenstown's vulnerability to peak oil and climate change

Timothy Walsh

A thesis submitted for the degree of Master of Science at the University of Canterbury

3 August 2011

Contents

Abstract

This thesis employs a case study approach to investigate local implications of globally restricted mobility by examining Queenstown's vulnerability to peak oil and climate change. Qualitative research methods are the principal means of inquiry. The research findings suggest that Queenstown is particularly vulnerable to peak oil and climate change at a broad scale because of its dependence on tourism and heavy reliance on air transport. However, Queenstown has fortuitously built up resilience to peak oil and climate change through tourism industry diversity, comparative advantage and an increasing proportion of short-haul visitors. A selection of key Queenstown tourism stakeholders interviewed as part of the research demonstrated some grasp of peak oil and climate change issues but lacked in-depth understanding. They generally considered the issues as being beyond their control although several suggested ways that Queenstown could strengthen resilience to peak oil and climate change. In terms of solutions, this research identifies three potential strategies. The first involves investing in a low carbon local transport system to increase destination level resilience to peak oil and climate change and enhance the uniqueness of the Queenstown brand. The second involves Queenstown promoters targeting the high-end niche tourism market in order to create a more resilient visitor profile. And the third involves the creation of new and expansion of existing industries not tied to tourism – preferably industries that are not excessively oil dependent and carbon intensive. But in order to successfully tackle the problem, it is imperative to first raise awareness. The research recommends implementing a framework that ensures an inclusive community-wide open dialogue process as the most effective way to achieve this.

Acknowledgements

Thank you to the people who contributed to this research including Eric, Jane, Will, Murray, the interview and focus group participants, and other supporters and advisors. Your contribution was invaluable and greatly appreciated.

List of Figures

List of Tables

Abbreviations

CEO – Chief Executive Officer

CH_4 – methane

CO_2 – carbon dioxide

DTS – Domestic Travel Survey

ETS – Emissions Trading Scheme

EROEI – energy return on energy investment

Gb – gigabarrel

GDP – Gross Domestic Product

GHG – greenhouse gas

GFAAF – Global Framework for Alternative Aviation Fuels

ICAO – International Civil Aviation Organisation

IEA – International Energy Agency

IVA – International Visitor Arrivals

IVS – Visitor Survey

NPS – National Policy Statement

OECD – Organisation for Economic Co-operation and Development

QLDC – Queenstown-Lakes District Council

RMA – Resource Management Act 1991

RVM – Regional Visitor Monitor

THC –Tourist Hotel Corporation

UK – United Kingdom

UKERC – United Kingdom Energy Research Centre

UNFCCC – United Nations Framework Convention for Climate Change

UNWTO – United Nations World Tourism Organisation

URR – ultimately recoverable resource

US – United States of America

USGS – United States Geological Survey

VFR – visiting friends and relatives

Chapter 1

Introduction

In the contemporary world, geographical boundaries cannot insulate local communities from exposure to global scale problems. This thesis is interested in the implications of peak oil and climate change at a local scale – Queenstown, a tourist resort located in the South Island of New Zealand (see Figure 1). While peak oil and climate change are distinct from one another, they are functionally linked in terms of their implications – Newman et al. (2009) label peak oil and climate change a 'double whammy'. Both problems threaten to reduce the high levels of mobility present in modern day society which would have significant implications for tourism as it is currently constructed. High levels of mobility have enabled tourism to emerge has one of the most significant industries in the world. Since the beginnings of large scale international tourism in the 1950s many communities around the world have developed a dependence on the tourism. Those communities appear to be most at risk from the effects of reduced global mobility.

Figure 1: Location of Queenstown

Peak oil refers to the situation where global oil production reaches maximum output followed by decline. The concept first emerged in the late 1950s but understanding has remained relatively obscure in the public realm despite its serious implications. However, oil price increases in recent years have reignited oil scarcity debates that were a feature in the years following the 1970s oil crises. Because the functioning of present day society is heavily reliant on oil, particularly in the developed world and increasingly so in developing nations, peak oil requires serious attention. The concept of peak oil is now widely accepted among the experts and although there is ongoing debate over the timing, the majority suggest peak oil is imminent. Consequences of peak oil include higher transportation costs and reduced discretionary spending which have potentially significant

implications for tourism. Technocrats expect that the challenge of peak oil will be solved by technological advancements and a smooth transition to alternative fuels. Long-term this may prove to be the case, however, the evidence suggests that society is not well prepared and the transition to alternative fuel will cause major disruption. Oil is unrivalled in terms of its net energy contribution and no known alternative fuel is able to provide the energy required to maintain the current levels of global mobility that oil makes possible, particularly in terms of air travel. While oil enables high levels of global mobility, excess consumption comes with a downside. Oil combustion produces emissions of greenhouse gases (GHG) that contribute to warming the atmosphere. Our oil consumption behaviour produces significant volumes of GHG emissions which are creating a potentially catastrophic affect on global climate. Climate change also threatens to reduce mobility but for different reasons than peak oil.

Climate change is the better known phenomena even though the theory was developed more recently than peak oil. In the context of this thesis climate change refers to anthropogenic global warming which is different to natural cyclic warming and cooling that is a long-term feature of the global climate system. Climate change is now widely acknowledged to be the single biggest challenge facing humanity. It is now clear that human activity is the cause of rising global temperatures (IPCC, 2007b) and there is an urgent need to reduce GHG emissions in order to prevent dangerous climate change (Peeters and Dubois, 2010). The United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty signed by most countries recognising the need to tackle the challenge posed by climate change. An amendment to the UFCCC, the Kyoto Protocol, is an agreement that sets binding targets for 37 industrialised nations including the European region for reducing GHG emissions between 2008 and 2012. Although slow progress has been made towards a binding global commitment to reduce carbon emissions post Kyoto Protocol, negotiations continue by necessity. Selected governments are beginning to respond to the challenge and once further binding targets are agreed upon, we can expect a stepping up of regulations designed to reduce demand for fossil fuel. Being one of the world's largest and most rapidly growing industries, tourism makes a significant contribution to global GHG emissions principally due to its high transport energy requirements (Becken et al., 2003) – transport that is almost entirely oil-fuelled. Therefore, in the effort to reduce GHG emissions, we can expect climate change mitigation actions to impact the industry.

The implications of peak oil and climate change for tourism are significant, particularly for destinations remote from their markets. On the whole, tourism is energy intensive and oil dependent mainly due to its transportation requirements. This is particularly so in isolated island nations like New Zealand (Becken, 2008). The case for Queenstown is perhaps even more pronounced given its relative isolation within the New Zealand context. For the foreseeable future, the continued prosperity of Queenstown appears to be dependent on unimpeded mobility. Queenstown is central to New Zealand's tourism product and has been for some time. It is host to over 1.7 million visitors every year with continued growth forecast (Tourism Strategy Group, 2010). While the rapid growth of tourism is a relatively recent phenomenon, Queenstown's evolution as a tourist destination dates back to the late 19th century (Ryan, 1971). Following humble beginnings as a small agricultural settlement,

Queenstown came to life as droves of hardy opportunists sought fortune in the Central Otago gold rush during the 1860s (de la Mare, 1987). The gold rush proved to be short lived, but unlike many Central Otago towns that sprang up during this period, Queenstown did not fade into obscurity after the gold ran out. Tourism provided an industry upon which the town could develop – slowly at first and more rapidly in recent years. In fact, Queenstown owes its present day prosperity almost entirely to tourism. International and domestic tourists visit the area to experience the spectacular landscapes and participate in the plethora of activities on offer. Driven by the increasing popularity of Queenstown as a tourist destination, the Queenstown-Lakes District recorded the fastest rate of growth in the country during the most recent census period and the local authority expects the rapid growth to continue (Queenstown-Lakes District Council, 2007). In preparing for this predicted growth Queenstown-Lakes District Council's ("Council") Growth Management Strategy considers the implications in terms of pressure on social and network infrastructure, land use constraints, housing affordability, and environmental quality. These are certainly valid concerns while the tourism industry continues to grow, but they may not be so pressing if peak oil and climate change reverse the current growth trend in the not too distance future.

Queenstown highlights a wider issue of potential vulnerability on a various geographical scales. Queenstown has developed into a hub for tourism in the lower South Island region. Several tourist towns and attractions proximate to Queenstown rely heavily on visitors following on or making day trips from Queenstown. Therefore, the effects of peak oil and climate change on Queenstown will be experienced throughout the region. On a national scale, New Zealand is not tourist dependant to the same extent as Queenstown. Still, it is arguably overly dependent on tourism. The industry is the country's second largest export earner following dairy, accounting for $15.1 billion or 8.7% of GDP and supports, directly and indirectly, 184,800 full-time equivalent jobs (Tourism Strategy Group, 2010). Given the significance and size of the industry, an attenuation of tourist activity in New Zealand would have considerable socio-economic consequences. The same applies in varying degrees to other countries and locations around the world that rely of tourism. Peak oil and climate change present a truly global challenge.

Peak oil and climate change are examples of 'wicked problems'. Not wicked as in morally wrong, rather wicked as in especially complicated. In basic terms, wicked problems are problems that cannot be solved within the existing terms of reference but instead require paradigm shifts in thinking and behaviour to be avoided, remedied or mitigated (Rittel and Webber, 1973, Frame et al., 2009). In a resource constrained world the social, political, economic and environmental complexity of peak oil and climate change make tackling these problems extremely challenging. In light of the challenges peak oil and climate change pose, what might be the future of Queenstown, the bustling tourist resort often described as the jewel in the crown of New Zealand tourism? Does it have the capacity to adapt to enable it to prosper in an impending low carbon future or will it choose to ignore changing circumstances and carry on with the traditional business as usual approach? It is hoped that this thesis will provide greater understanding of the potential risks and opportunities associated with peak oil and climate change in order to plan for the future.

Research Purpose and Questions

The overriding aim of this research is to examine Queenstown's vulnerability to peak oil and climate change. To achieve this aim, the scope of the research has been narrowed substantially. Given Queenstown is tourism dependent, disruptions to the tourism industry will significantly affect the entire town, even those elements not directly involved in tourism. Furthermore, because tourism relies on people travelling to reach destinations, transport is a key element of the industry. Accordingly, the research will focus particularly on tourist transportation to gain an understanding of Queenstown's potential vulnerabilities.

The following four questions are posed in order to focus the research:

- In what ways has the development of Queenstown's tourism industry reflected the availability of cheap oil?
- Are the contemporary Queenstown tourism patterns and processes creating vulnerabilities to peak oil and climate change in the future?
- What is the current level of awareness of the problem among the key stakeholders and are any preparations being made to address it?
- How might the problem be addressed?

This thesis uses an emerging area of scholarship concerned with vulnerability, resilience and adaptation as a framework to explore tourism industry risk. On review of the literature, common definitions of these concepts come forward yet there remains a diversity of interpretation. It is not the intention here to provide a review of the various interpretations as they generally amount the same meaning. Nelson et al. (2007 p.396) provides the following concise definitions of the three concepts:

> *Vulnerability: the susceptibility of a system to disturbances determined by exposure to perturbations, sensitivity to perturbations, and the capacity to adapt*
>
> *Resilience: the amount of change a system can undergo and still retain the same function and structure while maintaining options to develop*
>
> *Adaptation: the decision-making process and the set of actions undertaken to maintain the capacity to deal with current or future predicted change*

While these concepts have traditionally been applied in natural sciences, entitlements and natural hazard research, they are increasingly being applied in research relating to socio-economic systems (Adger, 2006, Smit and Wandel, 2006). Nelson et al. (2007) refers to the combination of these concepts as the resilience framework. An important aspect of the resilience framework is that socio-economic systems can be vulnerable to perturbations at one scale and resilient at another. This thesis will argue that Queenstown is vulnerable to peak oil and climate change generally but also resilient because of its capacity to adapt to changing circumstances.

Field Area

The field area is situated within the Queenstown-Lakes District. The District covers a 9,358km² predominantly mountainous area in north-western Otago, New Zealand (Department of Internal Affairs, 2011). The entire region exhibits a high scenic quality. The landscape is diverse and "consists of a variety of landforms including mountain slopes, ice-sculptured rock, rocky islands, moraine, tailings, river delta, river flats, lake beaches, fans, scree slopes, terraces, river gorges, valley floors and lake basins" (Queenstown-Lakes District Council, 2010). Lakes Wakatipu, Wanaka and Hawea are the three main water bodies. The major settlements of the District are situated on the shores of these lakes, mainly a function of early transportation options. Although the District is managed in a relatively contiguous manner by Council, the populated areas can be separated into two main sub-regions either side of the Crown Range. To the north is an area often referred to as the Upper Clutha. Wanaka, the second most populous urban centre of the District, is situated in this area as well as several other small towns. To the south of the Crown Range is an area known as the Wakatipu. This is the location of Queenstown, the main urban centre of the District.

For the reason of limiting scope, the research focuses on the Wakatipu side of the Crown Range (see Figure 2). While Wanaka is an important destination in the New Zealand tourism product, Queenstown is comparatively more significant. It is the better known tourist resort attracting over one million more tourists than Wanaka in 2010 with a larger proportion of international tourists. Despite this, many of the research findings will be applicable to the District as a whole.

The Wakatipu area is comprised of several urban and suburban nodes with rural lifestyle properties prevalent throughout the spaces in between. Queenstown town centre occupies the gently sloping land of Queenstown Bay flanked by residential areas mainly located on the surrounding hill slopes. These residential areas extend continuously from Fernhill to Kelvin Heights encircling the Frankton Arm of Lake Wakatipu. Frankton, once distinctly separate from Queenstown, is situated at the head of Frankton Arm. This area is an emerging commercial centre and also the location of the Queenstown International Airport. The main residential satellites to Queenstown are located at Arthurs Point 4.5km north of the town centre, Jacks Point 6km south of Frankton, Quail Rise 3km northeast of Frankton; and Lake Hayes Estates 4.5km east of Frankton over the Shotover River.

Other towns contained within the Wakatipu area include Arrowtown, Glenorchy and Kingston. Arrowtown, located 17km northeast of Queenstown, is both a modern functioning town and a historic tourist attraction. The town's commercial activity supports some of the 2,000 plus residents, however, most commute to Queenstown for work. Glenorchy and Kingston are smaller towns located at the northern and southern ends of Lake Wakatipu. Tourists commonly refer to the wider Wakatipu area as Queenstown which is not surprising given this is how the destination is marketed. Even though Queenstown is a town within the Wakatipu, it has evolved into something of a brand name for the wider area that encompass the various year-round tourist attractions.

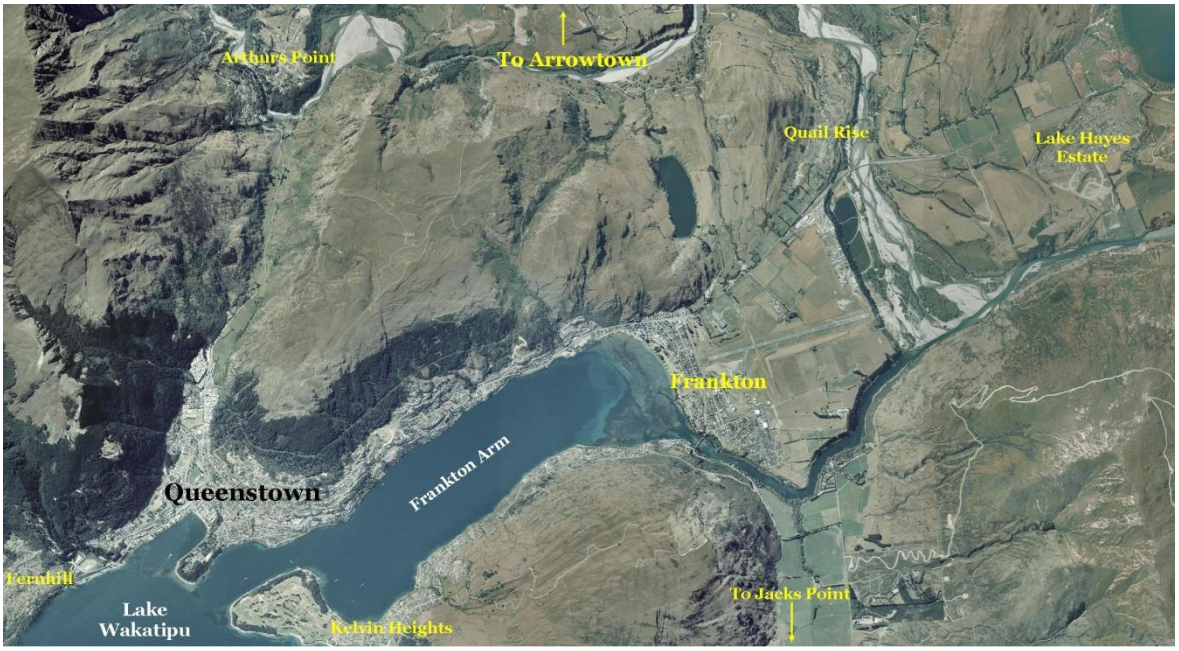

Figure 2: Aerial photograph of the Queenstown area

Thesis Structure

The thesis is divided into six chapters. The following two chapters provide the context of the research problem and the methodology. Chapter's four and five examine the research problem specific to Queenstown, and the final chapter provides a summary and recommendations.

Chapter 2

Tourism and the 'Double Whammy'

While there are a myriad of serious problems associated with oil scarcity and climate change, this thesis is interested in their effect on mobility. In this way the research complements an emerging area of scholarship concerned with the various aspects of mobility (Adey et al., 2007, Cresswell, 2006, Cwerner et al., 2009, Gogia, 2006, Kesselring, 2006, Lassen, 2006, Sheller and Urry, 2006). The human population is more mobile than ever, thanks largely to the energy provided by affordable and abundant oil. This has allowed tourism to flourish and develop into one of the world's most significant industries. However, maintaining the high levels of mobility that sustain the industry will be difficult to achieve as we begin the transition to a low carbon future. This is the crux of the research problem identified in the introductory chapter. The following chapter provides the context of the thesis by reviewing the current state of knowledge relevant to this research. It begins by explaining how tourism, as currently constructed, is dependent on high levels of mobility. The following sections discuss peak oil and climate change and examine the threat they pose to continued high levels of mobility, particularly aeromobility. The chapter concludes by considering the New Zealand implications and presenting the research problem as a wicked problem.

While climate change is a more recently developed phenomenon, it is more well-known than peak oil. There is a United Nations Convention on Climate Change which most countries are a party to, but no comparable framework for tackling the issue of peak oil. There are numerous volumes dedicated entirely to the physical processes of climate change and its environmental, social and economic implications and comparatively little published literature devoted to peak oil. While the general public has at least some understanding of climate change, there is very little awareness of peak oil. For these reasons, the peak oil section of this chapter goes into reasonable depth to provide an understanding of the phenomenon, whereas the climate change section assumes previous knowledge.

Tourism and Threatened Mobility

Tourism is one of the largest industries in the world. It employs 8.1% of the workforce (235,758,000 or 1 in every 12.3 jobs) and attracts 9.2% of all investment (WTTC, 2010). To achieve this level of global success, tourism has taken advantage of the high levels of mobility made possible by a progressive process of time-space convergence. While there are numerous factors that have contributed to global tourism development, time-space convergence is the chief enabler. Without it tourism would be almost entirely localised with only very wealthy and/or very adventurous individuals travelling beyond their resident environment. Time-space convergence is principally driven by transportation innovations which lessen the friction of distance bringing places closer together in terms of travel-time (Janelle, 1968). In this sense transportation innovations include new forms of transport, improvements to existing technologies, more efficient fuels, more direct routes, or any other technology/method which increases the level of accessibility between locations

(Janelle, 1969). Convergence between destinations has been particularly pronounced since the late 18th century when the speed and efficiency of transport began to improve considerably (Dicken, 1992, Knowles, 2006). Air travel is the most recent contribution to the convergence process and it has revolutionised tourism by bringing international destinations within easy reach. Since the development of passenger jets in the 1950s, aircraft have been built progressively larger and more comfortable, and the cost of flying has decreased (Cruz and Papadopoulos, 2003, Gottdiener, 2001). The combination of speed, comfort and increasing affordability has made long-haul travel easier for those with sufficient time and money, and has resulted in large scale international tourism. Today, air travel has become deeply ingrained in the culture of those who are able to afford it. In 2009, 2.5 billion passengers were transported on commercial flights worldwide (Centre for Asia Pacific Aviation, 2011). The term *aeromobility* has emerged in the social sciences to describe the dominance of air travel as the normal mode of international travel much like *automobility* describes the dominance of the automobile for land transport (Sheller and Urry, 2006, Adey et al., 2007, Cwerner et al., 2009). This thesis is particularly interested in long-haul tourism as it relies heavily on air travel.

Despite the present day popularity of air travel, the number of people participating in international tourism represents a small proportion of the global population. The early days of air travel and international tourism were almost exclusively the domain of elite society. While the air traveller demographic is considerably broader today due to rising incomes and increasing affordability, air travel, and thus international tourism, remains a pursuit of wealthy individuals. One reason for this lies in the fact that the transport cost of international travel is but one component of the total cost. While a person of limited means may be able to afford a low cost fare on a budget airline, the other costs of travel (food, accommodation, activities) additional to the ongoing living expenses at home, is often prohibitive (Alegre et al., 2010). A UK Civil Aviation Authority study found that budget airlines have not "significantly altered overall [air] traffic growth, nor have they substantially changed the profile of those flying" (Clement, 2006). The introduction of the budget airline has not increased the number of low income air travellers, if anything it has resulted in wealthy people travelling more frequently (Adey et al., 2007). Even in wealthy countries the proportion of the population that are aero-mobile is not particularly large – "[h]alf the UK population has never flown, and a further 25% have flown only once" (Adey et al., 2007). It is clear that wealth permits the type of mobility required to participate in international tourism. There is a small portion of wealthy aero-mobile people and a large portion of the opposite.

Why do people travel? The basic categories of travel are for business, to visit friends and relatives, for education or for holiday. Motivations for the first three categories of travel are reasonably self-explanatory but the fourth is more complex. Urry (2002) explores this in considerable depth and suggests that people holiday away from their residence to generate different experiences than those encountered in everyday life. And of the motivation to holiday Urry also suggests that:

> *To be a tourist is one of the characteristics of the 'modern' experience. Not to 'go away' is like not possessing a car or nice house. It has become a marker of status in modern societies…* (2002 p.4)

Jackson (2009) would describe tourism (particularly international tourism) as an example of novelty consumption – a mostly unnecessary experience. While tourism is mostly unnecessary, it is often a catalyst for positive benefits such as preservation of heritage, cultural exchange between host and visitor, economic contribution, and revival of local culture (Cohen and Kennedy, 2007). But, tourism also tends to involve large scale consumption of finite resources and is a significant GHG emission contributor, especially long-haul international tourism as will be discussed in more depth throughout this chapter. International tourism has its origins in the 18th century with wealthy Britons taking the lengthy 'Grand Tour' of western Europe, through the south of France, Switzerland, and parts of Italy (Towner, 1985). This tour was the basis upon which the Thomas Cook travel company was built leading to increased growth of organised tourism in the latter half of the 19th century (Towner, 1985). Steam ship and rail transport innovations considerably accelerated the time-space convergence process allowing tourists to undertake trips over shorter periods (Knowles, 2006). But it was not until the introduction of jet air travel that long-haul travel became a commercial success. That innovation allowed mass tourism to spread across the globe. For the past 30 years westerners have flocked to popular destinations all around the world, and now tourism is becoming increasingly popular in the east. Urry (2002) expects the emerging Chinese middle class market to become the next major tourism development.

The thirst for travel in the developed world and increasing demand from China and other developing nations feeds predictions of sustained industry growth of up to 4.4% per annum to 2020 and beyond (WTTC, 2010). However, few industry growth forecasts take into consideration implications of peak oil and/or climate change. Therefore, despite a steadily growing desire for travel, global tourism appears to be at risk. In the absence of considerable technological advancement, the high levels of mobility that underlie the success of tourism will not be sustained in the transition to a low carbon future. And given the industry supports hundreds of millions of people worldwide, the implications of reduced mobility are significant.

Tourism is vulnerable to a variety of disturbances. Recent examples include; the 9/11 terrorist attacks in the US, the Severe Acute Respiratory Syndrome (SARS) and avian influenza outbreaks, and the 2008 global financial crisis. All these events resulted in significant temporary downturn of tourism activity, but the industry has proved to be resilient by recovering relatively quickly once conditions returned to a state of relative normality. However, the risk that peak oil and climate change pose are different from the perturbations mentioned above as they threaten to restrict mobility on a more permanent basis. While the impact of the recent global financial crisis was severe with over five million tourism industry job losses (WTTC, 2010), we can expect the impact of peak oil and climate change to be far more profound. But peak oil and climate change will not bring an end to tourism. A key aspect of the resilience framework outlined in Chapter 1 is that socio-economic systems can be vulnerable to disturbances and resilient at the same time provided there is capacity to adapt (Nelson et al., 2007). Tourism will continue, but will be considerably reconstructed in light of reduced mobility. As distance assumes increasing significance tourism will become more localised and as competition for market share increases, the successful destinations will be those with comparative advantage and those that are able to adapt to changing circumstances. While some adaptations will be intentional and planned, others will be unintentional.

Peak Oil

The previous section explained how high levels of mobility have allowed tourism to develop on a global scale. Transport innovations coupled with increasing affordability have brought destinations closer together for a growing number of people. The problem is, the vast majority of tourist transport is fuelled by oil which is a finite resource that is becoming increasingly expensive. In particular, all air transport is fuelled by oil. Given air travel is the dominant mode of international tourist transport, increasing scarcity of oil poses a significant threat. The following section explains the various aspects of peak oil and explores the implications for tourism.

What is peak oil?

First and foremost, peak oil is not about the end of oil, it is about the end of affordable oil. Peak oil occurs when global production rates reach their highest point and subsequently decline, or when demand for oil reaches its highest point and subsequently declines. The later situation is perhaps less likely given there is no indication that the upward trend in demand for oil will reverse before peak production occurs. Demand for oil is unlikely to abate unless governments intervene with demand reduction measures. While this is precisely what is required to start tackling climate change, progress towards instigating such measures is currently limited. This is perfectly understandable. To wean society of oil is a daunting task, almost like fighting the tide. Quite simply, oil is the lifeblood of modern day society supplying 37% of global energy demand (BP, 2010) including 94% of all transportation energy requirements (Gilbert and Perl, 2010). Oil demand continues to grow with ever increasing oil-fuelled mobility, especially in rapidly developing China, India and the Middle East (de Almeida and Silva, 2009, Fairey, 2009, Smith, 2010a). The US consumes one quarter of global production at 25.2 barrels annually per capita whereas India and China consume 2.3 and 6.0 respectively (Fairey, 2009). Given that China and India have a combined population eight times the size of the US, it would be impossible for oil production to keep pace with global demand if India and China consumed anything like the US does per capita (Fairey, 2009). Yet as the developing nation's economies grow, so do their energy requirements. For the above reasons it appears highly likely that supply constraints will cause peak oil.

Conventional and unconventional oil

In order to better understand the concept of peak oil it is necessary to explore the physical parameters of the resource. A vast quantity of oil lies in deposits beneath the earth's surface. Common estimates of the total quantity of recoverable oil are in the vicinity of 9,000 gigabarrels (Gb)[1] of which approximately 1,100 Gb have been extracted (Fairey, 2009, Sorrell et al., 2010b). Although large quantities remain, the oil quality and source vary widely (Smith, 2010a). As a principle, low cost high quality resources are used before low quality high cost resources (Hall and Cleveland, 2005, Verbruggen and Al Marchohi, 2009). The high quality and presently low cost oil is known as conventional oil. It is the portion of the resource that is mainly extracted using primary or secondary recovery methods (Bentley, 2002). Conventional oil is in liquid form and is located in porous rock under high pressure (Höök et al., 2010). The highest grade least viscous oil known as light crude oil sits above the heavier more viscous oil found towards the bottom of a field (Sorrell et

[1] A gigabarrel unit equals one billion barrels. A barrel of oil is approximately 159 litres.

al., 2009). The primary method of extraction simply involves drilling a well and using the natural pressure to force the oil out. The light crude is extracted first with relative ease and little energy input followed by the heavier oil which requires increasing effort and energy to extract (Wells, 2006). During the extraction process the pressure drops at a predictable depletion rate. Secondary methods are then used to maintain sufficient pressure by pumping material into the well (Kjärstad and Johnsson, 2009), but ultimately much of the oil is left in the ground. Production rates typically decline when approximately half the oil is recovered from a field although there is potential to extract more using enhanced recovery methods (Bentley, 2002, Fairey, 2009, Verbruggen and Al Marchohi, 2009, Sorrell et al., 2010b, Smith, 2010a). Enhanced recover methods reduce viscosity to allow extraction of approximately 10% more oil after primary and secondary methods have been employed (EPRI, 1999). Due to the costly nature of enhanced recovery methods, high oil prices are required to stimulate investment, and even then extraction success is often unpredictable (U.S. Department of Energy, 2011). High costs and unpredictability of results aside, enhanced recovery appears to have only limited potential to substantially increase yield (Kjärstad and Johnsson, 2009, de Almeida and Silva, 2009).

As supply of conventional oil becomes progressively constrained, prices will continue to increase which in turn provides growing incentive to extract the low quality high cost portion of the resource known as unconventional oil. This is the portion of the oil resource that has not become trapped in porous rock reservoirs and is migrating towards the Earth's surface. It is more plentiful than conventional oil but is comparatively more difficult to extract due to its high viscosity (Kjärstad and Johnsson, 2009). The largest known reserves are the Venezuelan extra heavy oil deposits and the Canadian tar sands deposits (Dusseault, 2001). Because unconventional oil does not flow, extraction is energy intensive and much refining is required to produce end use liquid fuel (Froggatt and Lahn, 2010). The energy intensive production process results in a low energy return on energy investment (EROEI) ratio – the ratio of usable energy acquired to the amount of energy expended to obtain it (Hall and Cleveland, 2005) – and an unacceptable degrading effect on the environment. Environmental concerns include significantly higher GHG emissions compared to conventional oil (Brandt and Farrell, 2007), inappropriate land use, waste disposal, high water use and associated waste water management, and air pollution among others (Verbruggen and Al Marchohi, 2009). Currently the production cost of unconventional oil is significantly higher than conventional oil. While the production of unconventional oil is expected to become gradually more economically viable as conventional oil prices increase, the environmental costs are undesirable. In particular, large scale production of unconventional oil works against the required transition to a low carbon future. The characteristics of unconventional oil mean that the focus of the peak oil debate is principally centred on the production of conventional oil. Unconventional oil may provide some mitigation around the peak of conventional oil but has limited potential for the reasons above (de Almeida and Silva, 2009).

Conventional oil supply constraints

While demand continues to grow, it is apparent that conventional oil is becoming more difficult to find and extract. Sorrell et al. (2010b) identify three main physical factors that constrain the supply of oil. First, an oil field will normally decline when approximately half the recoverable resource is

extracted due to falling pressure. Enhanced recovery methods may extend the life of an oil field but not significantly. Second, most oil is located in a small number of large fields. While there are about "70,000 producing oil fields in the world, approximately 25 fields account for one quarter of global production, 100 fields account for half of production and up to 500 fields account for two-thirds" (Sorrell et al., 2010b p.5291). Third, most conventional oil was discovered in the post World War II period between 1946 and 1980. From 1963 to 1980 15,000 wells found 1,500 Gb whereas 1980 to 2002 60,000 wells found half as much (Smith, 2010a). The majority of the giant fields are past peak production or nearing it (Fairey, 2009, Smith, 2010a, Sorrell et al., 2010b) and new fields are increasingly difficult to find as they are in final frontiers like deep-sea offshore, the Arctic, and some places on land with extreme conditions such as Siberia (de Almeida and Silva, 2009). Recent interest in exploring New Zealand's oil resources is another indicator that global supply is becoming tightly constrained. Until recently, New Zealand has been unattractive to oil producing companies. The majority of its oil fields are likely to be in deep-sea offshore locations making extraction expensive, and transportation costs are high owing to its geographical isolation. Despite this, there have been 70 oil exploration permits granted by the New Zealand Government in recent years (Knight, 2011). Natural and man-made disasters also hinder production. Examples include the Deepwater Horizon oil spill in 2010 which resulted in an embargo, albeit a short-lived one, on further exploration in the Gulf of Mexico (Calkins and Fisk, 2010) and Hurricane Katrina which caused significant damage to oil production infrastructure (Zwaniecki, 2005). The increasing prevalence of natural disasters due to climate change (IPCC, 2007a) is likely to result in further disruptions in the future.

Alongside the physical supply constraints, political factors often impact supply. This is especially the case in the Middle East and North Africa where it is estimated that 60% of conventional oil remains (Fairey, 2009). Political instability and corruption in this region can significantly impact global oil supply and present obstacles to further investment (Smith, 2010a). Even during writing this thesis, sharp increases in oil prices accompanied anti-government demonstrations and conflict in Egypt and Libya. Political events in the 1970s had a particularly pronounced effect on supply. The Yom Kippur War in 1972 led to an oil embargo the following year which tripled the price of oil (Kesicki, 2010). Prices mostly recovered after the embargo was lifted in 1974 but soon spiked again in the late 1970s/early 1980s in the wake of political turmoil in Iran which significantly curtailed production (Kesicki, 2010). High prices during this time prompted widespread energy conservation which had the effect of slowing demand recovery. This led to a significant oil surplus in the latter half of the 1980s which kept prices low for an extended period of time. However, by the early 1990s global demand for oil had recovered to pre 1979/80 crisis levels at approximately 66 million barrels per day (Kiernan, 2008). Since then demand has risen steadily to present day levels of approximately 86 million barrels per day (Smith, 2010a). The fact that conventional oil is a finite resource and because of the various supply constraints discussed above, production cannot continue to grow forever. Therefore, the question is: when can we expect oil production to peak?

When is peak oil likely to occur?

The oil able to be extracted from the Earth is commonly referred to as the ultimately recoverable resource (URR). The URR consists of cumulative production (the oil already extracted), reserves

(the quantity of proven and probable conventional oil that is economically feasible to extract) and the amount of oil that is economically recoverable from undiscovered fields (Sorrell et al., 2010a). An estimate of the URR is required in order to make peak oil date predictions. However, accurate estimations are problematic as oil reserves data are limited and the best data are often confidential for commercial reasons (Brandt, 2007, Sorrell et al., 2009). Peak oil experts often express suspicion of the stated reserves (Bentley, 2002, de Almeida and Silva, 2009) and in light of recently released US cables their suspicions may be valid. The cables uncover a concern that Saudi Arabia's oil reserves may have been overstated by as much as 40% (Vidal, 2001). Uncertainties aside, many organisations and individuals have estimated the size of the URR to be between 2000 and 4300 Gb. A recent review by the United Kingdom Energy Research Centre (UKERC) considered the validity of several contemporary URR estimates and found the US Geological Survey (USGS) estimate of 3345 Gb to be the most compelling (Sorrell et al., 2009).

Once URR estimates are established, models can be used to make peak oil predictions. The first and most straightforward peak oil model was devised by M. King Hubbert in 1956 (Bentley, 2002). Hubbert was a geologist concerned about population growth and energy consumption. He formulated a curve which predicted US oil production to peak in 1970 (Brandt, 2007). The prediction was reasonably accurate with the actual peak around 1971 (Bentley, 2002). The same curve can be applied to the global oil situation as is demonstrated using a conceptual bell-shaped production curve based on Hubbert's model in Figure 3.

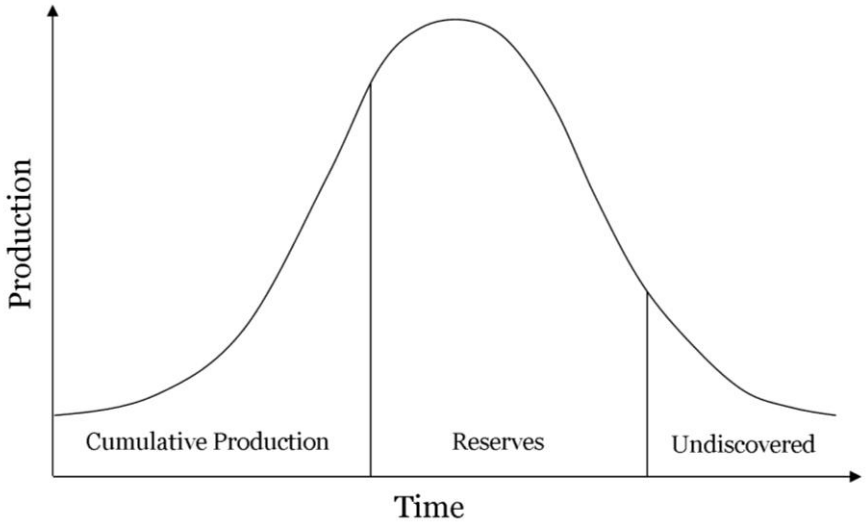

Figure 3: Peak oil curve

The symmetrical nature of the production curve in Figure 2 shows peak oil occurring when approximately half the URR is extracted. While this model fits the US production cycle, it may not be an overly robust method for predicting the global oil production cycle. After analysing the production cycle of 74 oil producing regions, Brandt (2007) found that while no model can fit all oil production cycles, asymmetric models are generally the best fit. These models find the rate of production increase exceeds the rate of decline. Curve fitting methods are useful but somewhat limited given they only consider geological variables. Likewise, prediction models relying solely on economic variables are limited. Accuracy improves when geological, economic and political variables are all factored in (Sorrell et al., 2009).

Like many resource scarcity debates, the peak oil debate has become polarised and contentious (Hemmingsen, 2010). Peak oil advocates generally rely on low URR estimates and point to the declining volume of oil being discovered, among other reasons, to present a case for a near term peak. On the other side of the debate are those that rely on optimistic URR estimates. They consider that higher oil prices will stimulate investment in exploration and production technology which will increase the amount of oil able to be extracted (Maugeri, 2006, Verbruggen and Al Marchohi, 2009). Their rationale extends the peak oil date further into the future. Given the polarised and contentious nature of the debate, the UKERC undertook a review of the evidence in relation to peak oil forecasts with the aim to establish the current state of knowledge, identify key uncertainties and improve consensus. They found that prediction methods that apply geological, economic and political variables can provide estimates with decadal accuracy (Sorrell et al., 2009). Using those models their review concluded "that a peak of conventional oil production before 2030 appears likely [and] there is a significant risk of a peak before 2020" (Sorrell et al., 2009 p.164). They also demonstrated that the size of the URR has relatively little effect on the timing of peak oil. A URR of 2500 Gb has peak production at 2009 and a URR of 4300 Gb has it at 2032. Therefore, an 80% increase in the size of the URR only delays the peak by 23 years (Sorrell et al., 2010b).

Given the complexity of predicting the timing of peak oil, an exact date will continue to remain elusive. Most likely, the date will only be able to be identified several years after it has past (Greene, 2004). Further complicating matters is the potential of an undulating peak as described by Smith (2010a). As oil production struggles to keep pace with demand the supply buffer reduces. The market response to this situation is to increase oil prices to avoid a supply shortfall. This in turn increases basic household costs such as transportation and food. Households cannot easily reduce spending on those items so are forced to cut back discretionary spending. Less consumption may bring about economic recession which in turn reduces demand for oil, increasing the supply buffer and lowering prices again. This cycle, known as the undulating or bumpy plateau of the peak, may continue for years before the inevitable decline towards depletion sets in. Dr Birol of the International Energy Agency predicts that there will be a supply crunch, as described above, within the next few years (Connor, 2009). The supply crunch will not be due to lack of investment – the oil is simply becoming harder and more expensive to find and extract (Smith, 2010a). When the bumpy plateau cycle ends and oil production begins to decline, it will create an energy shortfall. And if that shortfall is unable to be made up by production of suitable alternative energies something will have to give.

Transition to alternative energy sources

Approximately 84% of oil is refined into fuel which is used for heating, electricity production and transport (Becken, 2008, Smith, 2010a) and the other 16% is used in the production of plastic, medicine, pesticide, fertiliser, ink, fabric, food additives, detergent and synthetic rubber among other things. Of all these uses, transport is the most heavily reliant on oil. 94% of transport is oil-fuelled including all air transport (Gilbert and Perl, 2010). As discussed previously, air transport is a vitally important element of the tourism industry. In particular, long-haul overseas and continental travel depends upon it. Alternative transport modes over long-haul distances take up a prohibitively large portion of a traveller's time budget. In the absence of a viable alternative to fuel aeroplanes,

long-haul travel is destined to once again become a very exclusive activity. It is difficult to imagine such a situation at a time when air travel is more affordable and hence more popular than it has ever been. Nevertheless, it appears to be a realistic prospect.

Until recently oil has been affordable and plentiful and because of this there has been little mainstream interest in alternative forms of energy. But as the price of oil increases so will the incentive to invest in and develop alternatives. Indeed, the oil price increases of the past decade have resulted in a corresponding increase of investment in alternatives (Huang et al., 2010). Can we then expect a smooth transition in the switch from oil to alternatives? The short answer is no – at least not if we expect to maintain our current level of energy consumption. There is no combination of alternative energies that could fuel the way we live in the absence of oil (Greene, 2004). In particular, while there are a variety of alternative fuel sources available, none of them compare well to conventional oil in terms of fuelling motorised transport. Alternatives generally fall into two categories: liquid substitutes and energy for the production of electricity (Fridley, 2010). Alternative energies that generate electricity have limited use in transport (de Almeida and Silva, 2009). There are a wide range of issues associated with large scale electrification of transport. Fridley (2010) identifies several infrastructural changes that would be required including; retooling of factories to produce the vehicles, development of a large-scale battery industry, development of recharging facilities, deployment of instruments for the maintenance and repair of such vehicles, a spare-parts industry and more generation and transmission facilities to supply the additional electricity demand. Even so, large-scale electrification of land transport is possible, particularly if grid connected vehicles provide the majority of transport (Gilbert and Perl, 2010). Even small short-range aircraft can be powered by electricity. Passenger jets however require liquid fuels with high energy density.

The current prospects for a liquid substitute are synthetic fuels produced from coal, natural gas, gas hydrates, oil shale, or biomass. These can be divided into two categories: non-renewable synthetic fuels and biofuels. Synthetic fuels from both categories are produced today with varying degrees of commercial success but in small quantities relative to conventional oil (Speight, 2008). Like unconventional oil, non-renewable synthetic fuels have similar characteristics to conventional oil. The differences are mainly in the production process. The constituents of non-renewable synthetics do not occur naturally in free flowing liquid form (Speight, 2008). Consequently, significant cost, effort and energy is required to convert solids or gases to liquid. The result is a more expensive and carbon intensive end product meaning that the extent to which non-renewable synthetic fuels become a commercial reality not only depends on economic factors but also environmental acceptability. Furthermore, competition for supplies of raw materials which are used for other energy purposes, particularly coal due to recent massive demand in China, may also present an obstacle (Froggatt and Lahn, 2010). Biofuel is currently the only renewable liquid fuel available. The most common types of biofuels are ethanol, a crop based alcohol, and biodiesel which is predominantly made from vegetable oil (Speight, 2008). Typically, these fuels are blended with mineral fuel between 5-20% (Speight, 2008). In terms of energy production fundamentals, biofuels are significantly limited because of their low energy density. Energy density is the amount of energy contained in one unit of the energy form (Fridley, 2010). Oil has an energy density twice that of coal and substantially more than biofuel. Using an example from Fridley (2010), a coal-fired power plant

requires 1 to 4 km² of land, not counting land used to mine and transport the coal, to produce 1,000 megawatts of energy. In contrast, the equivalent amount of energy production from biomass would require 4,000-6,000 km² of land. Not only does biofuel production have a large footprint area, it threatens food supply and biodiversity, and increases water use, soil erosion and deforestation (Timilsina and Shrestha, 2011). Advanced biofuels produced from waste biomass (second generation biofuels) and microalgae (third generation biofuels) address some of the issues inherent in first generation biofuel discussed above. However, technical and economic constraints impede their mainstream production (Timilsina and Shrestha, 2011). Biofuels and non-renewable synthetic fuels have a variety of specific problems that inhibit their mainstream production, and there are also wider issues that are applicable to all synthetics. Fridley (2010) identifies and discusses several challenges to alternative energy in general of which the following are relevant to liquid substitutes for oil.

Scalability, Timing & Commercialisation

Alternative energies must be able to be supplied when needed, at the required volume and at a reasonable cost. Development of any technology from conception through to commercialisation takes time. For example, the internet was invented in 1973 but did not come into mainstream use for approximately 20 years. Froggatt and Lahn (2010) advise that new energy technologies take 10-15 years from initial investment to the first production. But first production does not equate to large scale use. All the liquid fuel alternatives discussed above have been successfully produced at demonstration scale and some at slightly larger scale. In 2008 Air New Zealand flew a successful test flight in a Boeing 747-400 passenger aircraft using biofuel. While it may represent a positive action, it does not prove that production of biofuel can be scaled up to meet global liquid fuel energy demand. In terms of large-scale commercialisation of new energy technologies, Fridley (2010) considers the average time frame between demonstration of feasibility and mainstream use is 20-25 years. Subsequent to the 2008 global financial crisis many planned production projects have been cancelled or indefinitely deferred (Froggatt and Lahn, 2010). Even although the recent increases in the price of oil have led to more interest in alternatives, they still have to overcome production difficulties and economic competitiveness problems which are significant barriers to their fast take-up (de Almeida and Silva, 2009).

Relationship to Oil

Most experts would agree that as long as oil is cheaper than its potential substitutes, a large scale proactive shift away from its mainstream consumption is unlikely. In light of this, the viability of alternatives is often considered in terms of the price that oil would have to be to make the alternative cost competitive However, given the production of many alternatives rely on fossil fuel energy input – particularly oil – when oil prices rise, so do production costs of alternatives in most cases. Production of oil shale provides a good example of this phenomenon. Since the 1970s there has been an expectation that large scale oil shale production would become economically viable when the price of oil reached a certain level. Before the 1970s oil crises that level was thought to be $US2 a barrel and before the price of oil exceeded $US100 a barrel in 2008 that level was thought to be $US80-90 a barrel. This demonstrates high oil prices can be prohibitive for alternative energy

production. In order for alternative energies to achieve commercial success, they need to break their reliance on oil in their supply chain.

Net Energy

As explained previously, oil has a high EROEI ratio compared to other fuels. In other words, it has a high ratio of usable energy remaining after energy has been expended during extraction, transportation, refining and delivery. If the EROEI ratio for any fuel falls below 1:1, it becomes an energy sink rather than a net energy contributor. The EROEI ratio is a key indicator of a fuels "contribution to maintenance of social and economic complexity" (Fridley, 2010 p.10). Before mainstream oil fuelled energy was available, a far greater proportion of the human population were directly involved in energy production. The net energy surplus provided by oil allowed society and economic activity to become far more complex. In order to maintain the current level of complexity, the challenge is in being able to sustain similar energy surpluses. No liquid substitute fuels achieve particularly high EROEI ratios and even oil EROEI ratios are declining. In the 1930s the energy cost of extracting 100 barrels of oil was approximately one barrel – an EROEI of 100:1 – whereas today the ratio is more like 11:1 (Hall and Cleveland, 2005). Net energy, or rather lack of it, is the main reason why hydrogen is not a viable alternative energy. Hydrogen requires a significant amount of energy in its production and it may even be an energy sink (Greene, 2004).

Considering the unique problems associated with the individual synthetic fuels and the wider issues applicable to all alternative energies, liquid substitutes do not compare well to conventional oil. Nevertheless, once oil production passes the peak and begins declining towards depletion, liquid substitutes will progressively become mainstream fuels by necessity. However, they will not deliver the same level of energy that oil currently provides and neither will they be as affordable as oil currently is. It will be necessary to make behavioural changes in energy consumption as part of the transition to alternative fuels. In a study that considered the various ways the US could wean themselves off oil, Fairey (2009) found that demand reduction through behavioural changes and increasing energy efficiency would be more effective than supply-side solutions.

> *Only after we dramatically improve the efficiency with which we use energy should we invest in more costly options and alternatives—this only makes good economic sense* (Fairey, 2009 p.1255)

Implications for Tourism

The previous sections have explained that a peak in global oil production followed by a steady decline is inevitable and likely to occur before 2020. Supply of conventional oil is becoming increasingly constrained forcing oil producing companies to explore final frontier oil fields where production costs are significantly higher compared with traditional land-accessed fields. As supply becomes constrained, demand continues to grow particularly as China, India and Middle Eastern nations undergo rapid development. In terms of future mobility, Gilbert and Perl (2010) posit two possible scenarios. One scenario is a business as usual approach with continued predominant use of oil-fuelled transport systems. They argue that trying to sustain oil-fuelled transport systems would lead to the bumpy plateau cycle explained previously. Given oil consumption is strongly correlated to economic growth (Smith, 2010a), high oil prices in the future would ultimately lead to severe

economic decline, reduced mobility, widespread deprivation and intensified conflict (Gilbert and Perl, 2010). During a state of economic decline, making the transition to an alternative transport system would be more difficult than in favourable economic conditions due to lack of available funding (Fairey, 2009). Under this scenario the tourism industry would be particularly affected by increased cost of transport and reduced discretionary income. Some individuals may no longer be able to afford the cost of travel while others may not be able to travel as frequently. For those who continue to engage in tourism, more of their travel budget will be consumed by transport costs which would reduce expenditure. Furthermore, the traveller's holiday budget is likely to be reduced overall. As Smith (2010a) points out, oil demand is relatively inelastic. Because oil is fundamental to our way of life, people will have few options but to continue normal consumption patterns when oil prices rise or supply is interrupted. When oil costs more and everyday consumption remains the same the result is a reduction in discretionary income. Spending on unnecessary luxury items will be the first to be cut when the cost of our everyday oil-fuelled way of life increases. Travel falls into the luxury item category.

The second scenario is an alternative future that "would arise from transport revolutions that refashion the current tight linkages between mobility and oil-based energy sources" (Gilbert and Perl, 2010 p.2). This involves development and widespread use of non oil-fuelled transport systems, such as electrified rail, thereby reducing demand for oil ahead of supply constraints. This scenario offers some hope to maintain or perhaps even increase short-haul tourism activity. However, given there is significant risk peak oil will occur before 2020, there is little time to instigate the necessary transport revolution. While some regions already have low oil consuming transport systems in place – mainly in Europe and Asia – most countries have particularly oil intensive transport systems (Newman et al., 2009). That is certainly the case in New Zealand. Recent investment in motorway and airport extensions and a lukewarm commitment to rail are all indications that the existing oil-fuelled transport system is becoming ever more entrenched. But regardless of which future scenarios plays out, there will be little capacity for long-haul travel when the cost of oil becomes prohibitively expensive. In the absence of a viable oil substitute, peak oil will also bring about peak aviation (Hart, 2009b).

Climate Change

The previous section explained how a peak in conventional oil production is highly likely to occur within the next two decades and in the absence of a comparable liquid fuel source, mobility will become restricted. The following section explains how climate change mitigation also has the potential to restrict mobility.

Anthropogenic Warming

The Earth is warming up and the global average temperature is approaching a threshold beyond which the climate will shift into an unstable state with significant implications for life on Earth (Dawson and Spannagle, 2009). Despite widespread public scepticism there is strong scientific consensus that anthropogenic climate change is real and will result in significant impacts

(Gluckman, 2010). The following key findings of the Intergovernmental Panel on Climate Change (IPCC) 2007 Synthesis Report provide a concise summary of the situation:

- carbon dioxide (CO_2) and methane (CH_4) concentrations far exceed their natural range over the past 650,000 years;
- it is highly likely that most of the global warming over the past 50 years is due to anthropogenic GHG increases;
- certain areas are likely to be more affected than others;
- unmitigated climate change is likely to exceed the capacity of natural, managed and human systems to adapt;
- many impacts can be delayed, mitigated or avoided with investment in mitigation projects within the following two to three decades – later mitigation will be less effective.

The IPCC is often accused by selected climate scientists of being overly conservative in their reporting and that the situation is in fact considerably more dire. So far anthropogenic warming has raised temperatures by 0.8ºC, however because of a lag in global climate system feedbacks, we are committed to more warming even if emissions were reduced to sufficiently low levels tomorrow (Dawson and Spannagle, 2009). This takes us closer to the threshold temperature rise which has been set at 2ºC. This figure is somewhat arbitrary and as Gluckman (2010 p.4) suggests, it "relates to the reality that even with the most aggressive mitigation efforts, because of the latency phenomenon, this is the inevitable degree of rise predicted". It is no exaggeration that global warming is the single biggest challenge facing humanity and that mitigation is urgently required. The projected cost of doing nothing about climate change will be severe and the impacts on our environment, economy and society are likely to get steadily worse if greenhouse gas emissions are not reduced significantly over the coming decades (Stern, 2007).

The volume of and rate at which fossil-fuels are burned is the principle driver of the anthropogenic climate change over the past 50 years (Archer and Rahmstorf, 2010). That being the case, the formula to mitigate the extent and severity of global warming appears simple: reduce fossil-fuel consumption. While the formula is simple in theory, in reality it is a monumental task. Over the past century, economies have invested heavily in fossil-fuel energy systems and infrastructure which have gone on to shape our contemporary energy intensive lifestyles (Greene, 2004). This way of life has become entrenched in developed nations and is becoming increasingly so in developing nations. Although progress is being made towards a post Kyoto Protocol agreement on emissions reductions, the failed Copenhagen Summit in 2009 and only moderately successful Cancun Summit in 2010 indicates that an agreed commitment may yet be some years away (Goldenberg, 2011). Not surprisingly, the strongest resistance comes from the nations that produce the most GHG emissions per capita. The nations with the highest per capita fossil-fuelled energy consumption face having to rewire their entire economies; something that would be difficult to convince their citizens of because they have become accustom to a certain way of life. Nevertheless, by necessity humanity must rise to the challenge or face a potentially bleak future. One would hope that ongoing pressure from those nations already committed to addressing climate change will break the resistance of the less committed nations to enable suitable progress towards a low carbon future.

Implications for Tourism

The carbon intensive nature of tourism makes it susceptible to climate change mitigation measures if and when they are instigated. Estimates of tourisms contribution of global GHG emissions are commonly around 5% (Dubois et al., 2010). This may not appear to be significant in terms of the absolute contribution, however, emissions per tourist are particularly high. Furthermore, a relatively small number of trips – the trips by aeroplane – produce the majority of tourism's GHG contribution (Peeters et al., 2006). Sustained tourism growth means that GHG emissions from the industry are forecast to grow by over 3% per year up to 2035 (Peeters and Dubois, 2010). This upward trend must be reversed as part of a collective effort to avoid dangerous climate change. While most efforts to achieve environmentally sustainable tourism focus on destination activity, the most important aspect from a climate change perspective is transport (Perch-Nielsen et al., 2010). Tourist transport to and from the destination contributes 75-90% of the total GHG emissions of the entire visit (Dubois et al., 2010, Perch-Nielsen et al., 2010). The GHG contribution of air transport is of particular concern. CO_2 emissions from air transport are predicted to rise to more than 15% of total CO_2 emissions by 2050 if current trends continue (IPCC, 1999). Hodgkinson et al. (2007 p.4) suggest that if the "recommended reductions in carbon dioxide emissions from ground level activities … are achieved, and the growth in air transport projected by the IPCC materialises, then air travel will become one of the major sources of anthropogenic climate change by 2050". If the tourism sector is to play its part in achieving the necessary GHG emission reductions, several changes need to occur including; reducing GHG emissions per person kilometre travelled; shifting towards transport modes that emit less GHGs; reducing travel distances by promoting domestic and short-haul markets; and extending the length of stay (Peeters et al., 2006, Perch-Nielsen et al., 2010, Peeters and Dubois, 2010). Within tourism, air transport moves far fewer people compared to land transport but accounts for 75% of transport GHG emissions (Peeters et al., 2006). The sustained growth of air transport will need to be reigned in and reversed to achieve emission reduction targets. Although aircraft will become progressively more efficient, aviation growth will outweigh the benefits (Perch-Nielsen et al., 2010). Therefore, modal shift is more effective than efficiency gains.

There are significant barriers to modal shift away from air travel. Several studies suggest that public awareness of the impact of air travel on climate change does not correspond to behavioural changes (Becken, 2007, Hares et al., 2010, Higham and Cohen, 2010). These studies highlight an attitude-behaviour gap that exists in relation to travel decisions. When planning a holiday individuals either fail to identify the association between air travel and climate change or suppress it (Hares et al., 2010). So, even carbon conscious individuals will make trips they understand to be environmentally damaging. Becken (2007) suggests that individuals await collective action and in the meantime use scapegoats such as government and airlines to dissolve personal responsibility. Individuals will continue to prioritise travel above reducing GHG emissions while they are permitted. This suggests that measures to reduce air transport need to be enforced in order to achieve emission reduction goals. Such enforcement would however be difficult to instigate. Fuel tax on international flights is prohibited by international law (Monbiot et al., 2006). This leaves demand management measures such as limiting airport capacity, incorporating aviation into some sort of emission trading scheme, off-setting and/or rationing (Monbiot et al., 2006, Smith and Rodger, 2009). But prospects for

demand management remain uncertain especially given emissions from international aviation are excluded from the Kyoto Protocol. Nevertheless, urgent mitigation action is required and the aviation sector cannot rely on reductions from other sectors to compensate for its unsustainable performance (Peeters and Dubois, 2010). Monbiot et al. (2006) suggest that to achieve sufficient emissions reductions from aviation, the harsh reality is that a large proportion of the global fleet of passenger aircraft would be required to be grounded. It is difficult to imagine such an extreme measure given how embedded aeromobility is in the global fabric (Adey et al., 2007). But the prospect of restrictions being imposed on aviation increases as global pressure mounts to tackle climate change (Smith and Rodger, 2009). Similar to the predicted impact of peak oil, climate change mitigation measures have the potential to severely restrict mobility in terms of long-haul travel for all but the very wealthy. For tourism dependent nations like New Zealand, the implications are significant.

New Zealand Implications

The New Zealand economy is substantially reliant on export earnings from tourism, agriculture and manufacturing (Boven et al., 2010). The revenue generated by these industries is important as it is required to service the sizable foreign debt the country owes due a number of factors not least the propensity of New Zealander's to spend beyond their means. While agriculture has been a mainstay of the New Zealand economy for a long period, tourism has only recently become important. Prior to economic liberalisation reforms instigated in the 1980s New Zealand relied on Britain as its primary trading partner (Neilson, 1998). Exposed to the competitive international free-market, New Zealand looked to diversify its export portfolio which led to international tourism promotion initiatives (McClure, 2004). Since the mid 1980s tourism growth has been consistently strong (see Figure 4). In the early 1980s tourism accounted for 3.5% of GDP and provided 1 in every 20 jobs (Henshall, 1983). Today the industry is the country's second largest export, accounting for $15.1 billion or 8.7% of GDP and supports, directly and indirectly, 1 in every 10 jobs (Tourism Strategy Group, 2010).

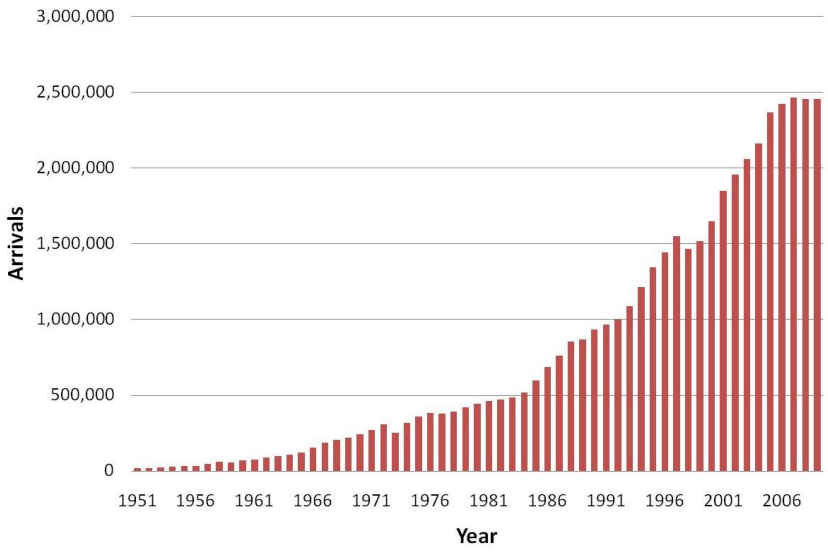

Figure 4: International visitor arrivals into New Zealand
Source data from the New Zealand Yearbook series

Herein lies the problem. While tourism earns a substantial amount of foreign currency, it is also particularly carbon intensive. New Zealand's absolute GHG emissions are small at 0.2% of global emissions (Ministry of Foreign Affairs and Trade, no date), but our per capita emissions are particularly high. And this does not take into account emissions produced transporting people and goods to and from the country. Because of the large distances between New Zealand and its markets, our actual per capita carbon footprint is larger than the domestic inventory suggests. Domestic emissions from tourism represent approximately make up a portion of the 20% GHG emissions from transport (Ministry for the Environment, 2011). But tourism's actual GHG emission contribution is much higher when emissions produced by the air travel of international visitors to New Zealand, and for New Zealand residents travelling overseas are taken into account (Smith and Rodger, 2009). In research that considers the implications of future collective action to mitigate air transport GHG emissions, Smith and Rodger (2009) assess the physical feasibility of several carbon offsetting schemes for short duration journeys to and from New Zealand. They found that no single scheme implemented within the country is physically and/or politically realistic and suggest that this "indicates the sheer size of these emissions, and the challenge that the international community faces for collective action on this matter" (2009 p.3446). In light of this issue, Tourism New Zealand perhaps ought to re-think their marketing strategy. The organisation has effectively promoted the '100% Pure' brand to the inbound tourist market since 1999 (Tourism New Zealand, 2009). However, it may be ill advised to continue with this approach given it is a contradiction of the reality of New Zealand inbound tourism. The New Zealand brand promises a pure tourist experience, but because of the distance separating New Zealand from its markets the reality is that the trip will be particularly carbon intensive.

While New Zealand may be less severely affected by the physical effects of climate change in the future, the impacts will still be significant including: higher temperatures (more in the North Island than the South Island), rising sea levels, more frequent extreme weather events such as droughts (especially in the east of New Zealand) and floods, and a change in rainfall patterns (higher rainfall in the west and less in the east) (Fitzharris, 2007, Ministry for the Environment, 2009). To limit the severity of these impacts, New Zealand must do its fair share to reduce GHG emissions. Accordingly, New Zealand is a party to the Kyoto Protocol and has agreed to reduce its GHG emissions in the first commitment period to 1990 levels or otherwise take financial responsibility for surplus emissions. New Zealand is actively participating in international climate change negotiations to assist in the development of a post Kyoto Protocol global agreement on climate change mitigation (Smith, 2010b). New Zealand reaffirmed its commitment to addressing climate change issues at the latest round of international climate change negotiations in December 2010 in Cancun, Mexico. These negotiations follow on from the Copenhagen negotiations in February 2010 where New Zealand signed up to the Copenhagen Accord on climate change. Overall the Copenhagen Accord endorses the continuation of the Kyoto Protocol and aims to set a limit on a global temperature rise of not more than 2°C. The regulations that are yet to come out of this process will no doubt make domestic emission reduction targets more onerous than those under the Kyoto Protocol. The Government has adopted a long term target for a 50% reduction in New Zealand's GHG emissions, compared to 1990 levels, by 2050 (Ministry of Economic Development, 2010). The Government also has a conditional 2020 target range of 10 to 20 per cent reduction in emissions below 1990 levels by 2020 (UNFCCC,

no date). Millar and Puckey (2008) would suggest that this commitment does not go far enough. They consider that:

> *At present there is a considerable disconnect between what scientists say is necessary and the level of change governments say they intend to carry out. There is an equally large disconnect between what governments say they intend to do, and the effects of their actions. Some actions, such as extending motorways and airports, will increase emissions. Others, such as promoting biofuels and carbon trading, look to be largely ineffective in reducing such emissions. The combination of these disconnects, represents a huge problem.* (2008 p.29)

There is an obvious tension between New Zealand meeting its international climate change obligations (whether they are adequate or not) and continuing to earn foreign currency by carbon intensive means such as tourism. Being a strongly export based economy changes in global interactions mean potentially large implications for New Zealand (Fitzharris, 2007). In terms of tourism, long-haul markets are most at risk from the impacts of climate change (Fitzharris, 2007).

New Zealand's long-haul tourist markets are also most at risk from the impacts of peak oil. New Zealand's isolation makes its tourist transport oil requirements particularly high. Depending on their country of origin, an international tourist will consume 90-98% of their total energy use of the visit on transport to and from New Zealand (Becken, 2008). Given this is at the high end of the scale for international tourist destinations, increases in transportation costs resulting from oil price rises are likely to reduce the number of arrivals into the country (Becken et al., 2009). In terms of oil consumption, Becken (2008) found that New Zealand's long-haul markets least exposed are Australia, China, Singapore and Taiwan. However, income is a more important factor according to Becken et al. (2009). As explained previously, higher oil prices lead to reduced discretionary income which in turn affects tourism. New Zealand tourism is dependent to a large degree on high income tourists of which there will be fewer when peak oil begins to take affect (Becken et al., 2009). Further, compounding this issue is the fact that the most of New Zealand's main tourist markets are oil importing nations which will be more severely affected by price rises compared with oil exporters (Becken et al., 2009). At the destination level, those tourist businesses that have a high percentage of fuel costs against total operating costs will be the most vulnerable to peak oil. These include transport operators and attractions such as jet boating and scenic flights.

While it is difficult to predict the future of New Zealand tourism in light of peak oil, current trends support the idea that Australia will become increasingly more important. From 1951 to 1996 the Australian market share of New Zealand's international tourists dropped from 61% to 28% as more distant markets gained in prominence. But since the mid 1990s the trend has reversed and in 2010 the Australian market share was 45%. Furthermore, with a reduction in international tourism we might expect domestic tourism to become increasingly more important. While international tourism produces significant foreign currency earnings, overseas travel by New Zealand residents reduces the balance of trade. New Zealanders make "1.9 million trips per annum or roughly one overseas trip per year for 50% of the resident population" (Smith and Rodger, 2009 p.3439). Therefore, the financial implications of fewer international tourists may be compensated by New Zealand residents

travelling less overseas and more domestically. Less overseas trips by New Zealanders would also help reduce aviation related GHG emissions of which we contribute significantly to per capita.

Because international tourism in New Zealand is highly carbon intensive and oil dependent, it is important to consider whether its benefits outweigh its negative effects. Boven et al. (2010) analysed the economic performance of New Zealand's tourism industry and found that although it is the country's second largest export earner and has grown rapidly in recent years, the labour productivity (output per unit of labour input) of the industry is low. This is partly because tourism requires fewer skills compared to other sectors. While tourism can help sustain export revenue and provide jobs for many low-skilled workers, Boven et al. suggest that "simply growing the share of tourism in the economy will not improve overall productivity" (2010 p.30). This is not conducive to the Government's goal of improving GDP. New Zealand has fallen well behind the OECD average following the economic liberalisation reforms of the 1980s and the Government wishes to realign New Zealand with the top performing OECD countries. Given tourism's economic position in New Zealand, is it worth continuing to invest in the growth of the industry? Boven et al. suggest that New Zealand would be better off investing in high value differentiated products and services. In doing so it is likely that the eco-efficiency of New Zealand's economy would improve. Eco-efficiency in this sense refers to generating greater economic value while using less oil and producing less GHG emissions.

Wicked Problems

Chapter 1 introduced the idea that peak oil and climate change are examples of wicked problems. Wicked problems are especially complicated problems that cannot be solved within the existing terms of reference but instead require paradigm shifts in thinking and behaviour in order to cope with them. The concept of wicked problems emerged out of the planning field in the early 1970s (see Rittel and Webber, 1973). Recently the concept has been adopted to frame and explore complex environmental issues such as urban planning, energy production, biodiversity loss, waste disposal and water resource management among many others. Rayner (2006) describes wicked problems has having six defining elements – a distillation of ten elements originally devised by Rittel. Table 1 lists Rayner's six elements and demonstrates how they relate to peak oil and climate change.

Table 1: Elements of wicked problems

Elements	Peak Oil	Climate Change
Characteristic of deeper problems	Reliance on finite fossil fuel resources to produce over 86% of global energy requirements (Millar and Puckey, 2008).	Over-consumption.
Relatively little room for trial and error learning	A transition to an alternative energy source would require an enormous investment of resources and capital. And time is running out.	We only have one planet and time is running out.

Unable to offer a clear set of alternative solutions	Many alternatives but not one capable of delivering the same level of energy density that oil currently does. The alternative solutions help define the problem.	Conflict exists between those who advocate technical solutions and those who advocate behavioural solutions. The alternative solutions help define the problem.
Characterised by contradictory certitudes	Different groups are certain of the solution to the problem but the solutions are irreconcilable with each other.	Different groups are certain of the solution to the problem but the solutions are irreconcilable with each other.
Contains redistributive implications for entrenched interests	Significant implications for the multitude of people with capital invested in the oil industry and related industries. One of those industries is tourism and therefore peak oil contains redistributive implications for tourist.	On a global scale it is the western type lifestyle that is causing the problem. Many people have become accustomed to that way of life.
Persistent and insoluble	Demand growth is continuous but we cannot increase the size of the resource	Consumption appears to be insatiable which leads us to finding ways to adapt to climate change rather than avoiding the problem.

In a resource constrained world the social, political, economic and environmental complexity of peak oil and climate change make tackling these problems extremely challenging. In devising solutions, the different world views from which people understand the problem causes confusion. In addition to the various elements of wicked problems, Rayner describes three categories of strategies commonly used to find solutions. The first are hierarchical strategies which simplify issues and apply routine, such as new forms of legislation. These solution strategies are preferred by "puzzle-solving scientists and of government bureaucracies" (Rayner, 2006 p.5). The second are competitive strategies which rely upon expertise to control resources, such as market-based mechanisms or use of incentives. The third are egalitarian strategies which open the problem to more stakeholders through participatory processes. Rayner suggests that:

> *each of these reflects a coherent organisational world view. Each of these responses itself shapes the definition of the problem – and this is part of what complicates wicked problems* (2006 p.5)

One of the main barriers to addressing peak oil and climate change – as with many wicked problems – is that while they have been identified by science, they are difficult to understand in many cases, and are not "directly apprehended by the public and by politicians" (Rayner, 2006 p.2). Gluckman (2010 p.5) suggests that there are many environmental problems where the "interface between science and society exposes different agendas and world views and these latter differences, rather than the science itself, becomes the point of focus". This is certainly true of peak oil and climate change. Although there is strong scientific consensus surrounding these issues, public opinion is divided due to various factors such as irresponsible media coverage. Because the public ultimately determine how society responds, it is vitally important that they receive the correct information. How that might be achieved however, is unclear. Even if society were equipped with correct information, there is no guarantee that the issues would be addressed. Jackson (2009) questions whether the economic system we operate within is capable of delivering society into a low carbon

future given its stability relies on continual growth and ever expanding material throughput. Accordingly, there is a strong tension between continuing economic growth and the need to reduce consumption. So far, recession has been the only situation even remotely successful at slowing down consumption. But system failure is not a desirable method of achieving required environmental outcomes.

Jackson suggests that the dilemma could be addressed by reconstructing the current economic model with an orientation towards appealing to our evolutionary desire for tradition, conservation and other-regarding behaviours; away from novelty seeking and self-regarding behaviour. In this new economic model, investment would encourage protecting and nurturing the ecological assets upon which humans depend on. Bailey and Wilson (2009) support this view and suggest that currently pursued technocentric pathways to solving these wicked problems present a particularly narrow and less effective response than ecocentric pathways offer. Although reconstructing the current economic model towards a system based on ecocentric values would arguably provide a framework capable of addressing peak oil and climate change, society is unlikely to proactively adopt an alternative to the status quo. Such a transition is generally viewed as radical and therefore practically and politically difficult (Bailey and Wilson, 2009). However, at some point resource constraints will forcibly restrict our relentless status driven consumption of novelty – of which tourism arguably forms a part.

Chapter Summary

This chapter explored various implications for tourism in the face of peak oil and climate change – the 'double whammy' challenge. The central premise of the argument presented is that peak oil and climate change threaten to restrict the high levels of mobility that underpin international tourism. Tourism has a future, but will need to be considerably reconstructed if the industry is to survive and prosper. Previous research suggests there will necessarily be a transition to short-haul, longer duration, land transport accessed tourism if no suitable oil substitutes are developed. Given New Zealand's geographical isolation and dependence on air transport to deliver tourists, its international tourism industry appears to be particularly vulnerable to the impact of peak oil and climate change. Faced with these challenges New Zealand, and hence Queenstown, could become a particularly peripheral tourist destination.

Chapter 3

Methodology

This thesis employs a case study approach to investigate local implications of global mobility restrictions. Qualitative research methods are the principal method of inquiry. The approach was guided to a large degree by instructive qualitative research manuals by Hay (2010), DeLyser et al. (2009) and Gillham (2000) among others. The following chapter describes why and how the research was undertaken. It details the methods used in each stage of the research including some reflection on the strengths and weaknesses of the adopted approach. It is not meant to be a complete description of the research process but provides an overview of the key elements of the methodology.

Research Approach

The basis of the decision to examine local implications of global mobility restrictions is the researcher's broad interest in the social and environmental effects of energy production and consumption particularly relating to transport. The specific research aim evolved during the proposal stage where a relatively wide ranging literature review brought to light the idea that tourist resorts may be particularly vulnerable to peak oil and climate change due to their dependence on high levels of oil-fuelled mobility. The link between peak oil and climate change first became apparent in reading a research article by Becken (2008) analysing the oil requirements of tourism. Becken broached the question of what tourism might look like in a not too distant future where oil is increasingly scarce and the financial costs of climate change mitigation are required to be met. The oil dependent and energy intensive nature of tourism means that the industry is likely to face substantial change during the transition to a low carbon future. Previously conducted research on this subject considers global and sometimes national scales of the issue with little consideration of implications at the community level. The apparent absence of research at the local scale prompted the decision to employ a case study approach whereby the research problem would be explored in the context of Queenstown. Case study methodology is a widely used research approach. It is particularly useful for producing "explanations of social phenomenon that are attentive to a variety of contextual influences at various scales" (Baxter, 2010 p.95). Done well, case study research can provide insights into wider issues – that is to say, case study research is often generalisable despite the opposite being its most common criticism (Flyvbjerg, 2006).

Queenstown was selected as the study area of this thesis for two reasons. First, Queenstown is for the most part dependent on tourism. Tourism provides the economic foundation that supports the community. Sectors of Queenstown's economy not directly involved in tourism only exist as a result of the flow on benefits of the industry. A significant and sustained downturn in tourism activity would affect the community as a whole. As this thesis is based on the premise that tourism dependent communities are particularly vulnerable to peak oil and climate change, it was important

to select a location where the visitor market is indispensable. Being a year-round tourist resort, Queenstown fits this description. The second reason Queenstown was selected is because the researcher has a good understanding and keen interest in the town having recently lived and worked there. The advanced appreciation of its context and setting was particularly helpful when establishing the primary aim of the research.

Further review of the literature uncovered a relevant area of scholarship concerned with concepts of vulnerability, resilience and adaptation. Together with the concept of wicked problems, these concepts provided a suitable framework to explore the implications of global scale problems at the community scale. From here the overriding research aim emerged rather naturally: to examine Queenstown's vulnerability to peak oil and climate change. Given the imminence of peak oil and climate change, it is timely for Queenstown to consider the various implications of these issues. Having established the research aim, refinement was necessary to limit the scope to a manageable level. A set of questions – outlined in the introductory chapter – was developed in order to focus the research. It was important to ensure that the questions were able to be answered which meant carefully considering which research methods to employ.

There was some initial thought of employing quantitative methods principally due to the researcher's previous experience with that type of research. However, data collection difficulties and time constraints meant this was not practical or achievable. In any case, qualitative methods are more appropriate. They permit in-depth understanding of complexities beyond the scope of quantitative methods (Gillham, 2000). Qualitative methods are also more suited to building initial understanding of little known about situations (Gillham, 2000), as is the case here. Studies relating to peak oil and climate change in respect of mobility more often than not employ quantitative methods which is a function of the scale of investigation. Because this thesis investigates vulnerability at the community scale, qualitative methods are more relevant.

Positionality

Researchers ought to acknowledge the position from which they ask questions and interpret data because the researcher's positionality will impact their research in some way (Mansvelt and Berg, 2010). Acknowledging positionality will not remove its influence on the research but it is important in understanding how it might affect the production of knowledge. The following is an attempt to write myself into the research process.

I have previously worked and resided in the Queenstown-Lakes District and have a personal interest in energy and transport. For approximately six years I was employed as a resource management planner first for a company who carried out the regulatory functions of Council and second for a private consultancy. As a planning professional I was involved in shaping the future of the District which necessarily exposed me to the wide variety of resource management issues – many of which were concerned with protection of the natural resources that the districts tourism industry relies on. It often occurred to me while thinking through various issues that there was little recognition of wider issues affecting the district. The questions raised in this study came to light as I began to think about Queenstown's sensitivity to global forces and how it might be affected by them. In part, my

motivation to study Queenstown came from a personally held perception that its tourism dependency made it vulnerable. I saw the energy intensive nature of its principal economic activity as a problem that required attention. In this way I brought a preconceived idea to the research. However, I was aware of this from the outset and have made a conscious effort to remain objective. There are advantages and disadvantages of previous knowledge of the case study area. My previous understanding of Queenstown certainly guided the research at times. Overall I consider this was an advantage.

The nature of my job meant I was introduced to many influential figures involved in the development of Queenstown including developers, politicians and professionals of various disciplines. The relationships I formed and the environment I interacted with helped me gain intimate knowledge of the social, political and business structure of Queenstown. This experience is invaluable to the research particularly as it provided access to the various networks that would assist the research. I was also previously acquainted with many of the focus group and interview participants. While an element of familiarity does not alone establish an open research exchange, I believe it was helpful in the context of my research. Impartiality may become an issue when research participants are friends or relatives of the researcher but that was not the case here. Previous contact with the participants (if any) was when I worked in a professional capacity as a resource management planner.

Data Collection and Analysis

The following section details the specific methods used to answer each of the four research questions. In addition to the specific research methods, a continual media review of relevant articles from the local newspapers was undertaken to keep up to date with developments throughout the research process.

Chapter 4 Methods

Chapter 4 seeks to answer the first two research questions:

- In what ways has the development of Queenstown's tourism industry reflected the availability of cheap oil?, and
- Are the contemporary Queenstown tourism patterns and processes creating vulnerabilities to peak oil and climate change in the future?

Answering the questions firstly involved uncovering various sources of information that would assist in piecing together the development of Queenstown from its beginning during the Central Otago gold rush to year-round international tourist resort. This was done primarily using historical information obtained from documents held at the Lakes District Museum. Particularly helpful were several reports specifically addressing aspects of Queenstown tourism development as they provided some longitudinal data. Analysis of the collected data involved identifying temporal changes in visitor markets, transport modes and attractions. In addition to historical documents, two unstructured interviews were undertaken to provide personal insights on Queenstown's

development as a tourist resort. The participants, Don Spary and Graeme Todd, were selected on the basis that they were longstanding members of the community with extensive knowledge on the subject. Mr Spary has a long association with Queenstown and tourism. His early involvement in helicopter deer recovery led to him founding one of the first scenic and heli-skiing operations in the South Island – The Helicopter Line. It was one of the three companies that became Tourism Holdings Limited which is one of the leading tourism companies in New Zealand. As the local Queenstown Director, Mr Spary was involved in the development of skiing, jet boating and rafting attractions. His contribution to the growth of the tourism industry in Queenstown was significant. Mr Todd has an equally long association with Queenstown. He moved there in 1981 but holidayed at the family bach from the late 1960s from his hometown Invercargill. Mr Todd is a lawyer with over 30 years experience. He formed the Macalister Todd Phillips Barristers, Solicitors and Notaries law firm in 1983 and recently established GTodd Law. His extensive professional experience includes acting on some of the largest environmental cases in the Queenstown area. He has an intimate understanding of Queenstown's tourism development.

A combination of quantitative and qualitative methods were used to analyse the contemporary situation. The quantitative data came from several data sets managed by the Tourism Strategy Group (formerly the Ministry of Tourism). The available online data only details recent activity with records dating to 1999. However, records have been kept for considerably longer for most data sets. Most online data covers the period from 2004 to 2009. In some cases 2010 records have been added to the database. The information available includes data from International Visitor Arrivals (IVA), the International Visitor Survey (IVS), the Domestic Travel Survey (DTS) and the Regional Visitor Monitor (RVM). The IVA provides monthly statistics on inbound travel by international visitors to New Zealand, including origin, purpose, length of stay, age, sex, port of arrival and mode of transport. The IVS provides quarterly national information on the characteristics, behaviour and expenditure of international visitors. The DTS provides quarterly information on the number and type of trips, characteristics, behaviour and expenditure of domestic visitors. The RVM is a partnership research project between the Tourism Strategy Group, Tourism New Zealand and six regional tourism organisations: Tourism Auckland, Destination Rotorua Tourism Marketing, Positively Wellington Tourism, Christchurch and Canterbury Marketing, Destination Queenstown and Tourism Dunedin. The six regional organisations are acknowledged by the Tourism Strategy Group as representing New Zealand's main tourist destinations. The RVM collects a range of visitor information, including motivations, expectations, planning and booking, activities, transport, accommodation, and environmental perceptions. In addition to these data gathered through Tourism Strategy Group online records, casual observational data from six years living in the community also proved useful. Reliability of data from the Tourism Strategy Group increases with higher numbers. I was advised to treat numbers small numbers with caution.

Analysis of these data mainly centred on attempting to establish whether Queenstown's tourism vulnerability is increasing or decreasing by examining visitor markets and their travel behaviour. Becken's (2008) tourism oil consumption indicators were a useful guide for the analysis. Other factors such as the influence of direct international flights and the local transport situation were also investigated.

In addition to the quantitative data collection and analysis described above, qualitative data pertaining to Queenstown's tourism corporate structure were gathered from the various company websites and from the New Zealand Companies Office. These data were analysed to get a sense of diversity within Queenstown tourism in order to examine industry resilience.

Chapter 5 Methods

Chapter 5 seeks to answer the following research question:

- What is the current level of awareness of the problem among the key stakeholders and are any preparations being made to address it?

Answering the third research question involved a two part approach. Part one involved a policy review, and part two involved a focus group and semi-structured interviews. The investigation aimed to gain an understanding of awareness and preparedness in relation to the research problem. The policy review component involved searching for international, national and local policy that might address peak oil and climate change in relation to tourism, particularly in respect of transport. Table 2 shows the various policies that were considered. Policies were initially reviewed for specific mention of peak oil and climate change or different terminology with similar meaning . If specific references were found analysis was carried out to ascertain the level of awareness and preparedness they would result in if properly implemented. Second, if there were no specific references, the policies were analysed in terms of whether they would reduce vulnerability by other means. Lastly, the review identified lack of policy where it might reasonably be expected.

Table 2: Policy review

Local	National	International
A Growth Management Strategy for the Queenstown-Lakes District 2007	New Zealand Energy Strategy 2010 – draft	Kyoto Protocol 1998
Wakatipu Transportation Strategy 2007	Energy Efficiency and Conservation Strategy 2010 – draft	Global Framework for Alternative Aviation Fuels
Urban Design Strategy for Queenstown-Lakes District 2009	New Zealand Tourism Strategy 2007	Davos Declaration 2007
Queenstown-Lakes District Plan 2010	New Zealand Tourism and Climate Change Plan 2008	
Otago Regional Land Transport Strategy 2005	New Zealand Transport Strategy 2008	

After obtaining ethics approval from the University of Canterbury Human Ethics Committee potential focus group and interview participants were contacted by email. The focus group participants were a selection of Council staff and politicians that had previously shown some interest in the subject. The group was to consist of three staff (two policy planners and a transport planner) and three politicians (two Councillors and the Mayor). However, the Mayor and one of the

policy planners could not make it on the day. While their absence was a drawback, the researcher had previously spoken to the Mayor about the research problem and noted his opinions, and the focus group still had policy expert representation. Although the focus group was small with only four participants, they all contributed enthusiastically. All the interview participants were selected on the basis that they were influential figures in Queenstown development or representatives of influential organisations (see Table 3). A number of the participants were known by the researcher through previous professional contact. Only Jetstar Airlines and a local developer declined to participate – Jetstar because they preferred not to and the developer because of a particularly busy schedule. It is acknowledged that the participant profile does not represent the general Queenstown population. The focus group and interviews were all conducted after the 4 September 7.1 magnitude Canterbury earthquake. This meant that participants were preoccupied with natural disasters rather than the human induced risks central to this thesis. However, with some prompting the participants focused on the subject of discussion.

Table 3: Interview participants

Participant	Organisation	Role
Ken Mathews	Skyline Enterprises	Chairman – been with the company since 1996
David Clarke	Lakes District Museum	Director – also a resource management hearings commissioner and former Arrowtown Ward Councillor
Alastair Porter	Remarkables Park Limited	Director – also Chairman of the Queenstown Chamber of Commerce
John Davies	Trojan Holdings	Director – also former Mayor of QLDC and CEO of the Queenstown Airport
Chris Read	Queenstown Airport	General Manager Aeronautical
Bruce Richards	New Zealand Transport Agency	Otago/Southland Regional Director
Dave Whitaker	Mount Cook Airlines (subsidiary of Air New Zealand)	Manager
Tony Everitt	Destination Queenstown	CEO – former CEO of the South Pacific Tourism Organisation

Interviews were conducted at the participant's place of work except one where a neutral venue was arranged. It was hoped that meeting participants in their place of work would help them feel at ease during the interviews. A core set of questions were asked of all the participants with additional questions tailored to suit each participant's area of expertise. On reflection, perhaps one or two unnecessary questions were asked of each interviewee. While this resulted in a considerable volume of less relevant material, it often provided helpful background information. The focus group and interviews were undertaken between September and October 2010. The intention was to hold the focus group first in order to draw out any additional questions not previously considered. Unfortunately, two interviews were carried out prior to the focus group session as a result of scheduling difficulties. As it turned out, the focus group session confirmed the line of questioning that had been developed.

The focus group session and interviews were transcribed verbatim to produce a paper record for analysis and for checking by participants if requested. It also ensured a careful second listening of the recorded material. To assist analysis the interview material was coded – that is: categorised, sorted, prioritised and interpreted to identify key themes in the data. Baxter (2010) points out that coding is something we actively practise in our everyday lives. Coding in "qualitative data analysis tends to be in a constant state of revision and fluidity" (Bryman, 2001 p.392). The nature of the process meant that many key themes and findings emerged while writing rather than in the initial analysis.

Chapter 6 Methods

Chapter 6 uses the findings of previous chapters and from the literature to explore how the problem might be addressed. There is no data collection or analysis per se, rather a discussion of recommendations which are a result of the research as a whole.

The Research Process

Research is a complex undertaking, particularly in respect of deciding what to study and how to go about it. Deciding the subject of research was rather straightforward, however, formulating it into something tangible proved to be a particularly challenging aspect of the process involving considerable contemplation. At the beginning of the research process it had been approximately six years since I had completed my undergraduate degree. During my time away from academia I gained practical experience and a wider perspective which certainly benefitted the research. However, many aspects of the research process required re-learning which proved time-consuming.

The research process was interrupted several times by significant earthquakes in the Christchurch area on 4 September 2010, 22 February 2011 and 13 June 2011. All three earthquakes caused widespread devastation and the recovery effort is still very much in its infancy. The earthquakes caused considerable disruption to the research process due to compromised and/or unavailable university services, continual relocation, and inaccessible research materials and equipment. More importantly, the circumstances surrounding the earthquakes affected my ability to concentrate on the task at hand. My parent's home was damaged beyond repair in the February earthquake and their predicament was never far from my mind. Although adequate time extensions were granted, the disruption caused by the earthquakes certainly affected my ability to undertake quality research. But while the earthquakes caused disruption, the experience also brought to light tangible examples of several concepts central to this thesis. The recovery of Christchurch arguably fits the criteria of a wicked problem and the concepts of resilience, vulnerability and adaptation certainly played out in the weeks and months following each event.

Chapter 4

Developing Vulnerabilities

> *Apart from any consideration of wealth to be derived from the mineral resources of the country, the existence of such lakes as are to be found in Otago, will we have no doubt, at some future day cause this part of New Zealand to be extensively visited for the mere purpose of viewing the grandeur of the scene. The view presented by the Lake Wakatipu – of 65 miles of water, surrounded by snow capped mountains, rising in places abruptly from the water's edge, 5 or 6000 feet – here sternly sterile – there covered with flowering shrubs – we must conceive, be magnificent, and well worth the journey of 150 miles to see; and no doubt, the day will come when a visit to the lakes of Otago will be as general by our neighbours in Australia as is that from the home country to the lakes of Switzerland… Before however, we can expect to receive tourists, many improvements must be effected in our means of communication with the interior…*
> (Otago Witness, 1860)

This prophetic account of William Rees, the founder of Queenstown, tells us that the Wakatipu region had obvious potential for tourism and that the main hurdle to realising it was overcoming access difficulties. Those access difficulties have progressively been overcome and the inherent potential for tourism has indeed been realised. In 2009, Queenstown hosted over 1.7 million tourists. However, in light of the issues raised in Chapter 2, we ought to consider whether Queenstown's success might also make it vulnerable to future mobility restrictions resulting from peak oil and climate change. The following chapter demonstrates that Queenstown's isolation and reliance on long-haul visitor markets makes it vulnerable but that it has built up resilience through comparative advantage and diversity within the tourism industry. The first three sections of the chapter analyse the development of tourism in Queenstown from domestic holiday spot to international resort and identify its contemporary situation in offering a product found nowhere else in the Asia Pacific region. The final section draws out the aspects of Queenstown's development that make it vulnerable and/or resilient to peak oil and climate change and considers the extent to which contemporary patterns and processes may be deepening vulnerability or strengthening resilience.

Early Queenstown Tourism Development

The basis of Queenstown's economy progressed from a short stint of gold mining to limited pastoral farming to tourism. The pastoral farming that began a short time before the gold rush and continues in a very limited capacity today has never been particularly successful in the Wakatipu. Nevertheless, pastoral farming was the staple economic activity in the area until Queenstown became established as a year-round resort. Gold mining in the Queenstown area during the 1860s laid the initial foundation for tourism. The infrastructure and buildings constructed to support the miners provided the first tourists to the area with basic facilities. These tourists, mainly from Dunedin and Invercargill, were

drawn by the inherent appeals of the Wakatipu area as communicated by William Rees. They must have been particularly adventurous because the journey to Queenstown was an arduous and often dangerous one. This was typical of travel into the inland areas of New Zealand at that time. The mountainous terrain and wide braided rivers of the South Island made progress slow and difficult (Pawson, 1992). Rees' first journey to the Wakatipu from Dunedin, via the Waitaki River and the Lindis Pass, took several weeks and became increasingly difficult the deeper into the interior he travelled due to the lack of a beaten track (de la Mare, 1987). Despite the access difficulties an awareness of the tourism qualities of the area began to emerge in the late 1860s (Ryan, 1971).

The opening of a rail line between Dunedin and Kingston in 1878 considerably reduced the cost and effort to reach Queenstown and soon after connections from as far away as Christchurch were available (Ministry for Culture and Heritage, no date). Before rail was extended to Kingston the only formalised access to Queenstown was via a wagon trail from Cromwell through the Kawarau Gorge. Queenstown was fortunate to have rail access as early as it did given its isolated location. The rail link was part of a region-wide agricultural network – it was not constructed with the intention of serving tourism in Queenstown. Difficult terrain prevented the Dunedin to Kingston line extending all the way to Queenstown. Therefore travellers would alight at Kingston and transfer to a lake steamer at for the last part of the journey along the southern stretch of Lake Wakatipu. The longest serving steamer, the TSS Earnslaw (see Figure 5), still operates tourist excursions and is one of Queenstown most popular attractions. Similarly, a historic steam engine, the Kinston Flyer (see Figure 5), was used as a tourist attraction on 14km of line between Fairlight and Kingston until financial issues closed operations in 2009 (New Zealand Press Association, 2009). From the late-1800s New Zealand Railways subsidised rail travel during the Christmas, Easter and school holidays throughout the country which no doubt encouraged increasing levels of domestic tourism. During this time, steam ship and rail journeys to Queenstown were specifically promoted in a public private partnership between New Zealand Rail and the two largest tourism operators of the time, the Union Steam Ship Company and Thomas Cook and Sons (Ministry for Culture and Heritage, 2007). This is how Queenstown received its first regular international visitors. Australians travelled from Melbourne by steam ship to Bluff and onto Queenstown by rail and lake steamer (Pawson and Brooking, 2002). This tourist route indicates the early stages of Queenstown becoming a global destination for the very wealthy.

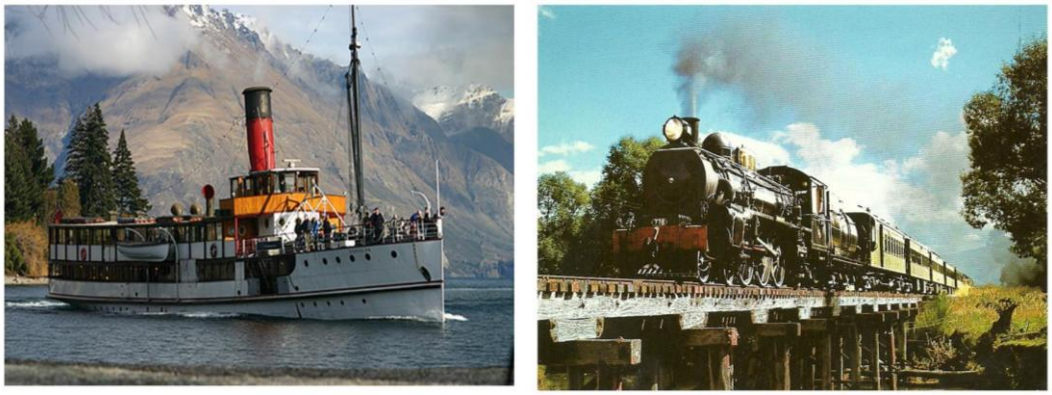

Figure 5: The TSS Earnslaw and Kingston Flyer
Source: TSS Earnslaw (personal collection) and Kingston Flyer (The Traveler's Drawer, 2010)

With improved access and incentive to travel, the number of visitors to Queenstown increased and the town became established as a summer holiday destination. In those early days of New Zealand tourism Queenstown was attracting more tourists than the South Island's other resort town Mt Cook, which can be attributed to its comparative ease of access (Pearce, 1980). The rail link from Dunedin – New Zealand's largest urban centre at the time – provided frequent visitors. But despite Queenstown's proximity to a major urban centre, visitor numbers remained modest (Ryan, 1971). With very few international tourists and a low domestic population, Queenstown's market was small. Furthermore, the tourist season was confined to the Christmas and Easter holiday periods leaving Queenstown unoccupied for the remainder of the year (Wigley, 1979). This provided a frustrating problem for the Mount Cook Company when they opened up motor vehicle passenger and freight services into the area via the Lindis Pass and Crown Range in 1912 – a continuation of the Fairlie to Mt Cook service they started in 1906 (Wigley, 1979). The seasonality of tourist traffic meant that when winter came they had to lay off staff and recruit in the summer. The company encountered the same problem during the early years of providing transport services to Mt Cook. To overcome the problem there they developed a ski industry. The attraction of an exciting winter activity proved to be effective in maintaining a viable year-round passenger service. However, the Tourist Department took over the hotel operation at Mt Cook in 1944 and showed little interest in promoting skiing. With the Mount Cook Company's winter services threatened, they looked to establish skiing in Queenstown. After some interest in the slopes on the Crown Range the company installed a ski tow on Coronet Peak and opened the field in 1947 (Wigley, 1979). The establishment of Coronet Peak ski field was a vitally important event in the development of the resort. It is interesting that its development was motivated by the desire of the Mount Cook Company to generate winter season passengers for their transport service rather than for the sake of skiing itself. Today the ski industry is central to Queenstown's tourism product. Ryan (1971) suggests that the development of the ski industry marked the beginning of Queenstown's dependence on tourism. Year-round attractions meant the town could become completely orientated to catering for tourists.

The majority of capital investment for transport links and development of amenities in Queenstown tourism development initially came from central government. The Government greatly assisted in providing access to Queenstown and incentive to visit there, and because of the small rate payer base the Government also helped finance improvements to infrastructure and amenities (Ryan, 1971). But while the Government provided financial assistance early on, the Mount Cook Company – led by Rodolph Wigley and later by his son Sir Henry Wigley – took tourism development to the next level. In a sense they took up where the Government left off and "offered an example of private initiative not seen on such a scale in Queenstown before, and it offered possibilities of considerably increasing the scale of tourism" (Ryan, 1971 p.25). Over the years the Wigley's established new companies under various names as their operations diversified. For the sake of simplicity, the various companies created by Rodolph and Henry Wigley will be referred to here on as the Mount Cook Group, as it has been registered since 1976. By 1930, Mount Cook Group had become the largest tourism company in New Zealand (Drake, 2010). Not only did the Mount Cook Group transform Queenstown into a year-round the resort with the establishment of a ski industry, they also paved the way for road transport

into the area. This form of transport gained in popularity following the opening of the lakeside road from Kingston to Queenstown in 1936 (Queenstown-Lakes 125th Anniversary Committee, 1991). However, it was not until the 1980s that road transport became mainstream following a reduction of import tariffs on cars into New Zealand. The resultant influx of used Japanese cars provided affordable personal mobility for both domestic and international tourists which has greatly influenced tourism growth in Queenstown. But it was the initial construction of the Kingston to Queenstown road that set in progress a steady decline in the rail and steamer services that had transported the majority of visitors up to that point. Less than a year before the opening of the road, Frankton Aerodrome (later Queenstown Airport) was awarded an operating licence (Queenstown Airport, 2010). The opening of the airport and the main roads into Queenstown are significant milestones in Queenstown's development history. From the mid 1930s onwards, air and road transport became the foundation of the growth model for Queenstown tourism.

Tourist Market Transition

Air services into Queenstown were initially limited until a runway extension in 1964 enabled Mount Cook Group to operate DC3 flights direct from Christchurch (Queenstown Airport, 2010). The Christchurch-Queenstown flight formed part of a national tourist route operated by Mount Cook Group that included Kerikeri, Auckland, Rotorua, Christchurch, Mt Cook, Queenstown and Te Anau. The first trans-Tasman flights were launched over a decade before the commencement of regular domestic flights into Queenstown. In June 1951 a regular Melbourne-Christchurch service began and a Sydney-Christchurch service followed in July 1954 (Statistics New Zealand, various dates). With the introduction of trans-Tasman flights the number of Australian tourists increased considerably. Previously a relatively insignificant market, Australians made up approximately 20% of all the 110,000 annual visitors to Queenstown by the mid 1960s (New Zealand Tourist and Publicity Department, 1967, Cant and Pearce, 1981). Although Queenstown was positioning itself for international tourism growth at this time, it remained a bach holiday location mainly for Invercargill residents (pers comm. Todd, 2010). Local domestic visitors dominated the Queenstown tourist market until the 1980s.

Rising international visitor numbers from the early 1950s resulted in an increasing popularity of organised bus tours which were first developed in the mid 1940s (New Zealand Tourist and Publicity Department, 1967). The opening of the Haast highway in 1965 created a South Island loop bringing even more visitors to Queenstown (Adamson, 2008). In the mid 1960s tourism in Queenstown was growing at a rate of 5% per year and the additional visitors put considerable strain on the basic accommodation and amenities. Commercial accommodation in 1967 provided only 1022 beds with the vast majority of accommodation found in campgrounds (New Zealand Tourist and Publicity Department, 1967). The seasonality of the resort was reducing with an expanding suite of attractions but there was no top grade hotel, very few restaurants and evening entertainment, and no golf course (New Zealand Tourist and Publicity Department, 1967). The lack of tourist facilities and amenities in Queenstown reflected the wider situation in New Zealand. As New Zealand welcomed the jet aircraft age and the influx of international visitors it brought, the Tourist Hotel Corporation (THC) was

established with the broad function to encourage the development of the hotel industry (McClure, 2004). It was a semi-independent Government funded authority run by businessmen. Free from previous bureaucracy under the Tourist and Publicity Department the THC took control of the Government owned hotels in places like Mt Cook and Franz Josef and co-operated with private enterprise to expand and improve the accommodation sector. The Tourist Accommodation Development Scheme was established in parallel which provided the THC with the ability to enter into joint venture hotel developments and/or guarantee mortgages. Under this scheme Queenstown's commercial accommodation expanded by over 75% during the late 1960s and into the 1970s (New Zealand Tourist and Publicity Department, 1974). At the same time, several attractions were developed to increase profitability and draw additional visitors. By the mid 1980s Queenstown was attracting approximately 440,000 visitors per year and for the first time in the resort's history the number of international visitors exceeded domestic visitors (Lakes-Queenstown-Wakatipu Combined Planning Committee, 1986). In 1984 Queenstown earned $90m from tourism (nearly $250 million when adjusted for inflation in 2011) and the accommodation capacity had expanded to 3,814 beds (Lakes-Queenstown-Wakatipu Combined Planning Committee, 1986). The period from the 1960s to the 1980s saw the transition of the resort from domestic holiday destination to international resort. The domestic visitor market remained important but the focus had switched to international visitors. Since the 1980s the industry has continued to grow at an incredible rate alongside rapid growth of international arrivals into New Zealand (see Figure 4 on page 21).

The challenge in the early days of Queenstown tourism development lay in providing access. This was first achieved with rail and steamer, and later with road and air transport. The challenge since the 1960s has been in responding to increased demand by expanding capacity to host visitors and enhancing the tourist experience. The rapid and sustained tourism growth in Queenstown has placed considerable strain on local government resources. Visitor growth has required significant investment to provide infrastructure and amenities to a suitably high standard. Council recognises that the local economy is "based on delivering a high quality experience to visitors" (Queenstown-Lakes District Council, 2007) but there is an ongoing tension between provision of high quality facilities and the means with which to fund them. The resort nature of the town means that demand for Council services comes from both residents and visitors. Some costs are covered by financial contributions levied on newly consented developments, but because Council does not tax visitors, the funding burden falls mainly on the rate-payer. The small rate-payer base means a shortfall occurs and is the main reason for current Council debt. In the past Council used land sales to help fund expenditure. In 1971 the Government approved a Council application to pass 40.4ha of commonage land into freehold for subdivision (Adamson, 2008). Subsequent land sale revenue helped Council finance major infrastructure projects such as roads and wastewater disposal networks.

The emergence of adventure activities – notably jet boating, rafting and bungy jumping – has drawn a new type of tourist to Queenstown, one motivated to participate in challenging outdoor pursuits (Cloke and Perkins, 1998). While 'traditional' more leisurely activities attract much higher participation, a sense of adventure has certainly shaped Queenstown's promotional image. Another significant development of recent times is the introduction of direct trans-Tasman flights into

Queenstown Airport in 1995 (Queenstown Airport, 2010). Direct international flights have secured a market which is predominantly interested in the Queenstown area rather than New Zealand as a whole. Today, three airlines operate direct services into Queenstown. These developments and others have helped Queenstown capitalise on the New Zealand tourism boom that has occurred since the beginning of the jet aircraft age. Figure 6 shows the growth in visitor numbers – both domestic and international – since Queenstown became established as a year-round resort.

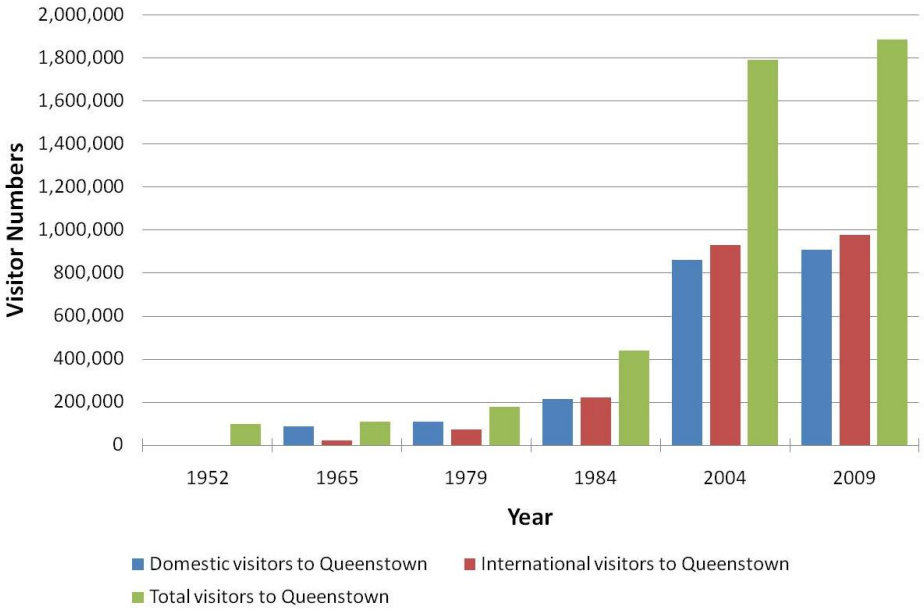

Figure 6: Growth of visitor numbers to Queenstown
Source data from New Zealand Tourist and Publicity Department (1967), Ryan (1971), Lakes-Queenstown-Wakatipu Combined Planning Committee (1986), Queenstown-Lakes 125th Anniversary Committee (1991) and the Tourism Strategy Group

Contemporary Situation

Overall, tourism development once established has been relatively unhindered in Queenstown. Tourism enabling transport infrastructure was established relatively early meaning Queenstown was well placed to receive visitors when jet aircraft services began to deliver increasing numbers of international tourists from the 1960s onwards. Initially efforts were directed at improving access and as the number of international visitors grew the focus switched more towards providing accommodation and attractions. The following section identifies contemporary aspects of the Queenstown tourism industry.

Visitor Profile

Today international visitors make up 52% all visits to Queenstown. This figure is significantly higher than the other major tourist destinations in New Zealand (see Figure 7). In fact, Queenstown is more reliant on international tourists than all New Zealand destinations except Milford Sound. While Queenstown's international/domestic tourist market share is fairly even in terms of total visits, international tourists stay longer and spend more. Approximately 75% of international tourists stay overnight during their visit compared to 46% of domestic tourists. Furthermore, international tourists

stay 3.37 nights on average whereas domestic tourists stay 2.90 nights. This translates to approximately 2.5 million international visitor nights and approximately 1.2 million domestic visitor nights and partly explains why domestic tourism only accounts for one quarter of total earnings – international tourists spent almost $690 million in 2009 and domestic tourists spent $185 million. In the mid 1980s tourism earnings were split more evenly owing to a shorter international tourist stay (2.5 days on average) and a longer domestic tourist stay (4.6 days on average) (Lakes-Queenstown-Wakatipu Combined Planning Committee, 1986).

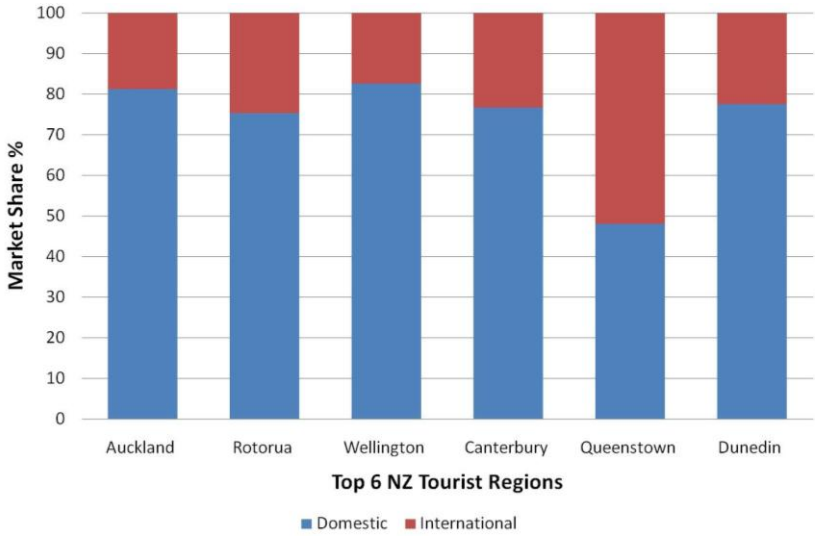

Figure 7: International/Domestic tourist market share
Source data from the Tourism Strategy Group

Today the dominant international tourist market is Australia. The Australian market share in Queenstown closely mirrors the wider New Zealand experience. In the 1960s, the lion's share of international tourists to Queenstown came from Australia. However, as Queenstown began to attract more distant markets (particularly from the UK, Europe and the US) the Australian market share reduced considerably through to the mid 1990s. In recent times Australia has become comparatively more important again increasing in market share from 32% in 2004 to 43% in 2009. Direct flights from Australia to Queenstown established in 1995 were quite possibly the catalyst for the resurgence. The flights were initially restricted to winter months targeting the ski market. As a result of the success in attracting Australian skiers, summer visitor numbers have progressively increased. Queenstown airport now receives 30 flights per week during the winter and 15 during summer compared with only a few winter flights per week when services commenced (pers comm. Read, 2010). During the winter, Queenstown Airport is the third busiest in the country.

Significant growth in the number of Australian tourists visiting Queenstown from 2004 to 2009 has compensated for declining numbers from the long-haul markets, and resulted in 5.4% overall international market growth over that period. Because of the dominance of the Australian market, the Oceania region supplies the most tourists to Queenstown followed by Europe, Asia and America (see Figure 8). The number of Asian tourists visiting Queenstown declined significantly from 2004 to 2009 reflecting large reductions in Japanese (-55%) and South Korean (-57%) visitors. Queenstown tourism promoters have been focusing efforts to boost Asian tourist numbers especially in light of new direct

air passenger services from Kuala Lumpur, Malaysia to Christchurch and Guangzhou, China to Auckland. Articles in the local Queenstown newspapers over the past eight months show that Queenstown tourism stakeholders are particularly keen to secure market share of the emerging Chinese middle class (Roxburgh, 2010, Chandler, 2010a, Fox, 2011). It appears the intention is that Asian tourist growth will compensate for declining UK and US visitors.

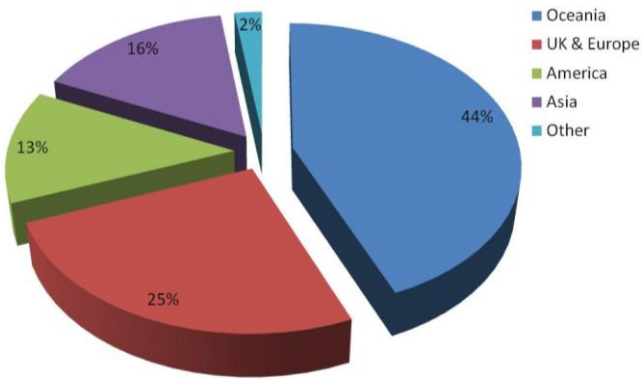

Figure 8: International tourist market share by region in 2009
Source data from the Tourism Strategy Group

Comparing Queenstown's tourism statistics with the other top six tourist regions (Auckland, Rotorua, Wellington, Canterbury and Dunedin) helps establish relative vulnerability and/or resilience within the New Zealand context. The annual number of international tourists per capita (of the destination resident population) provides an indication of Queenstown's comparative reliance on the international tourist market. Auckland receives 2 international tourists per capita, Rotorua receives 12 and Queenstown receives 50. In terms of economic contribution, international tourism in Auckland earns approximately $1,680 per capita annually, in Rotorua approximately $3,526 and Queenstown approximately $43,052. The high Queenstown value reflects not only the large number of international visitors per capita but also the high spend per visitor (see Figure 9). On average, visitors (international and domestic combined) spend more in Queenstown compared to all other top six tourist destinations (see Figure 9) – $158 more than Auckland which is the next highest.

International visitors to Queenstown stay shorter than the top six tourist regions average length of stay. The reason for this is because Queenstown receives a smaller percentage of tourists visiting friends and relatives (VFR) compared to the other destinations (particularly Wellington and Auckland). Tourists in the VFR category tend to stay longer in one location. The primary reason international tourists' visit Queenstown is for holiday as is the case in Rotorua. Queenstown and Rotorua are more similar in terms of their tourism characteristics compared to the other top six regions. Both are relatively low population regions with a particular tourism focus. Throughout the history of tourism in New Zealand, Rotorua has been considered the North Island equivalent of Queenstown. While the international visitors to Queenstown stay shorter than the top six average, they stay over one night longer than in Rotorua. However, Rotorua has retained a significantly higher domestic tourist market share being closer to metropolitan centres.

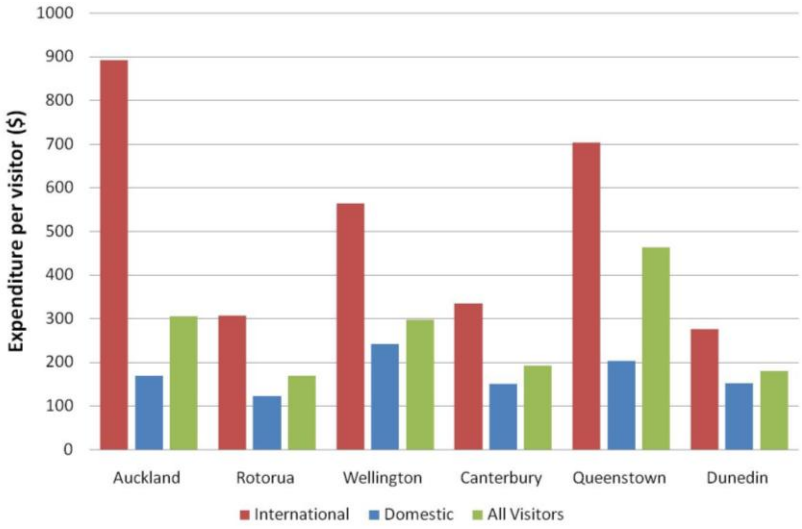

Figure 9: Expenditure per visitor
Source data from the Tourism Strategy Group. Data excludes international travel expenditure. Data reliability cannot be guaranteed as it is based on information gathered from visitors departing New Zealand via Auckland, Wellington and Christchurch. Modelling is carried out to estimate the Queenstown figures.

Tourist Transport

In order to reach Queenstown all international visitors necessarily travel by aeroplane for a large portion of the journey, except the few that travel to New Zealand by ship. Given New Zealand's relative geographical isolation in the global context, most travel to New Zealand is long-haul with the exception of a select few short-haul locations including the Australian eastern seaboard and some Pacific Islands. Some international visitors fly directly into Queenstown Airport whereas most make their way to Queenstown overland from their port of entry to New Zealand. Figure 10 shows the share of the various modes used to reach Queenstown from within New Zealand (both international and domestic). The IVS data that were used to create the graph is collected from a sample of visitors departing New Zealand from Auckland, Wellington and Christchurch. Therefore, the sample does not accurately account for those visitors who fly directly into Queenstown from Australia and do not require any transport within New Zealand. However, visitors who travel direct from Australia represent less than 6% of all international visitors to Queenstown. Therefore, the non-inclusion of a category representing 'direct entry/no transport' does not substantially affect the accuracy of the data displayed in Figure 10. In terms of travel within New Zealand, most domestic tourists travel to Queenstown by car and it is also the most popular mode of transport for international tourists. Very few domestic tourists travel by bus whereas it is a relatively popular mode of transport for international tourists. In terms of trans-Tasman arrivals into Queenstown Airport, numbers have steadily increased since 2004 following opening of additional routes (see Figure 11). The growth from 2009 to 2010 is particularly dramatic, most likely due to additional winter flights and added capacity from newcomer low cost airline Pacific Blue. There is also a suggestion that the increase in passenger numbers was at the expense of Australian arrivals into Christchurch International Airport (see Chandler, 2010b).

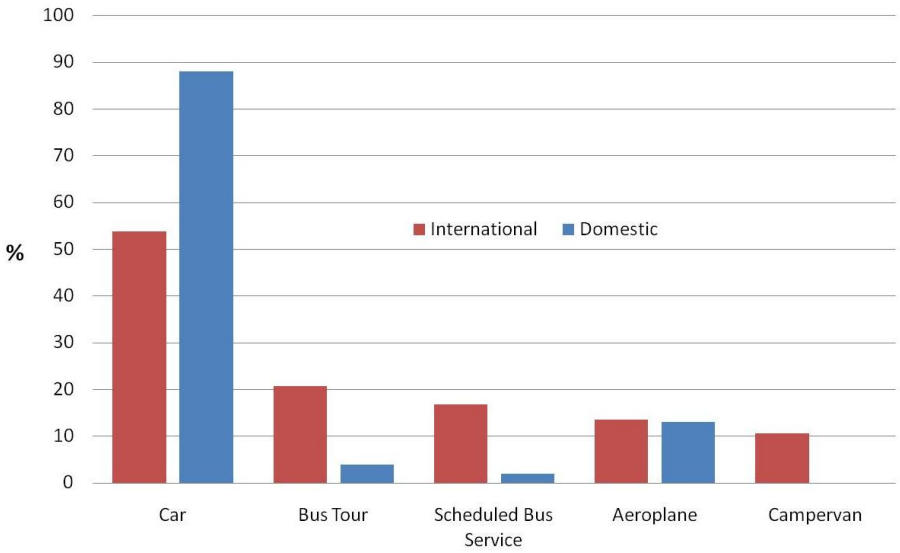

Figure 10: Transport modes used to travel to Queenstown within New Zealand
Source data from the Tourism Strategy Group – data for year ended 2010

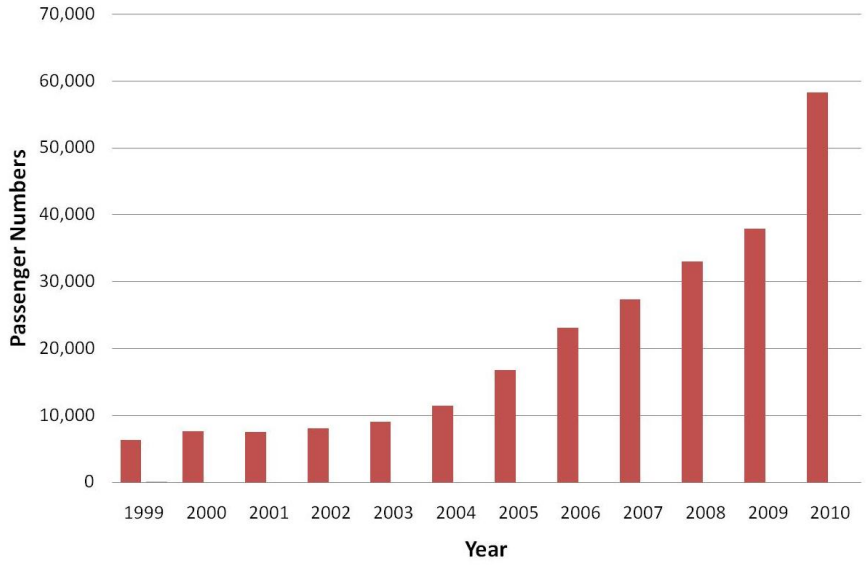

Figure 11: Arrivals from direct trans-Tasman flights into Queenstown Airport
Source data from Tourism Strategy Group

The development and expansion of international services to and from Queenstown Airport have been instrumental in bringing Queenstown closer to Australia. The time-space convergence comparison in Figure 12 below highlights the impact. Travel time between Queenstown and Brisbane has progressively reduced since the introduction of trans-Tasman air services. In 1955, Queenstown to Brisbane travel involved making connections at Sydney and Christchurch. One leg of that journey was removed in 1975 when direct Brisbane/Christchurch flights were launched. Today, tourists travelling to Queenstown can fly direct from Brisbane in 3 hours 45 minutes. Although Brisbane is over 2100km further away from Queenstown than Dunedin is, it only takes 15 minutes longer to travel between the two locations. Convergence between Queenstown and Dunedin has stagnated over the past 50 years in the absence of air services. Although only a small percentage of international visitors fly direct from

Australia, numbers are increasing steadily which suggests that those routes will become even more important in the future.

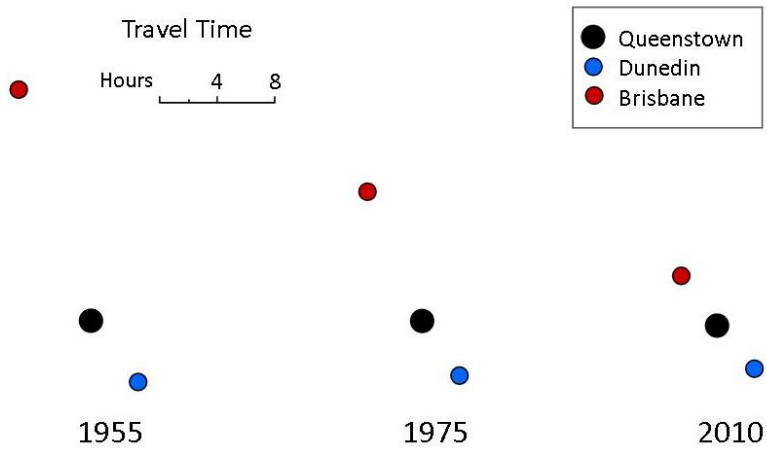

Figure 12: Queenstown time-space convergence
Data sourced from historical and contemporary travel timetables

Once tourists reach Queenstown there are a variety of transport options available to move around the destination depending on the individual tourist's choice of accommodation and activities. No data relating to destination transport was available that suited the purposes of this research therefore the following are the findings of observation. Visitors who arrive by tour coach generally stay in town and are transported in groups for excursions. Most domestic visitors arrive to Queenstown by car and are therefore likely to use the vehicle during their stay. The same applies for the international visitors who arrive by car. Visitors who arrive by air or scheduled bus service either hire cars or use the public transport network and/or other transport options such as transport provided by the various attractions (for example; the ski field buses, the Shotover Jet buses, the AJ Hackett Bungy buses and the Routeburn Track buses). Rentals cars are particularly popular – according to Chris Read, the Aeronautical Manager of Queenstown Airport, Queenstown rental companies hire out the second most number of vehicles in the country (pers comm. Read, 2010). So while there are alternative transport options available, cars are the most popular mode used to experience the wider Queenstown area. However, given the majority of accommodation and many Queenstown attractions are located in and around the town centre, much of what Queenstown has to offer is experienced on foot. The confining topography surrounding Queenstown has resulted in a particularly compact town centre.

Accommodation & Attractions

The accommodation sector is not directly relevant to this study because its energy requirements are satisfied with renewable sources – mainly from hydroelectric generation. However, the spatial distribution of accommodation does influence transportation and therefore oil requirements. The majority of visitors to Queenstown stay in hotels, backpackers and motels (see Figure 13) and these properties are mainly located in or in close proximity to the town centre. Private dwellings are the second most popular accommodation choice of domestic visitors. While these accommodations are

more spatially disbursed compared to the formal options, they are largely concentrated in urban areas often within walking distance of attractions and amenities.

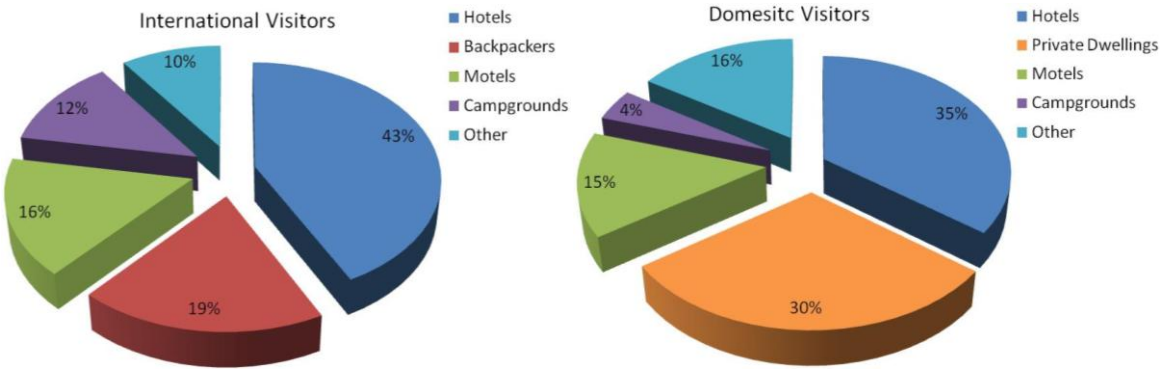

Figure 13: Tourist accommodation type
Data sourced from the Tourism Strategy Group

In terms of attractions, the Queenstown visitor is spoilt for choice. There are literally hundreds of activities offered, many based on the natural resources of the area. The most popular activities for both domestic and international visitors are walking, dining, sightseeing, shopping and boating. Snow sports are also in the top ten activities for both tourist markets. On the whole, the most popular tourist activities are passive and have relatively low oil requirements. While there are a number of activities that involve and rely on motorised transport such as flightseeing, skydiving and 4WD excursions, these mostly attract relatively niche markets. The main exception is jet boating which is a very popular high energy activity. Many of the most popular activities are concentrated in and around the urban nodes of the Wakatipu Basin. Time is also a limiting factor in respect of participating in activities. The average tourist stays about three days in Queenstown. When they have undertaken the most popular activities they have little time (and perhaps little budget) left to undertake other more energy intensive activities. However, the share volume of visitors through Queenstown means that those niche high energy operations remain commercially viable.

Corporate Structure

Before Queenstown became established as an international resort, the corporate structure of the tourism industry was simple owing to the fact that there were relatively few stakeholders involved. As outlined previously, the agents responsible for development early on were predominantly the Government and the Mount Cook Group. Today there are hundreds of stakeholders and consequently the corporate structure is rather more diverse. In general terms, the Queenstown tourism industry corporate structure reflects a triangle with a small number of large companies at the top and a large number of small companies at the base. The large companies generally do well whereas the fortunes of the smaller operators are more variable in the highly competitive Queenstown tourism environment. Government now plays a very minor role locally. From the 1980s onwards the Government's involvement in tourism development throughout New Zealand was progressively reduced as part of a wider economic reform process where corporations in commercially competitive markets were privatised (Scott, 1996). But while the Government is no longer involved in tourism development, it is heavily involved in promoting tourism through 'BrandNZ' – the umbrella national brand under which

the 100% Pure tourism marketing campaign is delivered (Hall, 2010). Queenstown has certainly benefited from the Governments concerted promotional efforts.

Table 4: Sources of capital investment in Queenstown tourism

The 'multiple' category contains companies that have a combination of shareholdings from both local and New Zealand wide, or New Zealand wide and international or all three.

Often one entity owns several companies such as the Accor Hotels group which owns the Mecure, Novotel, Sofitel, St Moritz and Base Backpackers, and Trojan Holdings which has shareholdings in Ulimate Hikes, NZSki and AJ Hackett Bungy.

Activities / Transport / Accommodation

Local	New Zealand	International	Multiple
Challenge Rafting	Kirra Tours	Crowne Plaza	AJ Hackett Bungy
Coronet Peak Tandems	Ritchies	Rydges	Kawarau Jet
Dart Stables	Stray	Hilton	NZSki
Double Decker Bus	Scenic Pacific	Mecure	NZONE
Skippers Canyon Jet	Rent-a-Dent	Sofitel	Kiwi Experience
Skyline Gondola	Jucy Rentals	St Moritz	Air New Zealand
Ultimate Hikes	About New Zealand	Novotel	
Nomad Safaris	Apex Car Rentals	Peppers Beacon	
The Helicopter Line	1st Choice Rental Cars	Oaks Shores	
Onsen Hot Pools	Tracknet	Millennium	
Wan-a-Car	Omega Rentals	Copthorne	
Network Car Rentals	Atomic Shuttles	Kingsgate	
Able Rentals	Naked Bus	Grand Pacific Tours	
Pegasus Rentals	Connexions	AAT Kings	
Connectabus	The Earnslaw	Budget and Avis	
	Dart River Safaris	Hertz & Ace Rentals	
	Shotover Jet	Thrifty	
	Queenstown Rafting	Europcar	
	G Force Paragliding	Pacific Blue	
	Heritage	Qantas & Jetstar	

In terms of development at the destination level, capital invested in the Queenstown tourism industry comes from a variety of sources. The accommodation sector is dominated by large offshore companies. This reflects the significant capital outlay required to establish and operate hotels – being

the most popular accommodation type in Queenstown for both domestic and international visitors. Aside from hotels, much of the remainder of the sector is supported by capital sourced either locally or from within New Zealand. In contrast to the accommodation sector, capital for attractions comes almost entirely from local investors reflecting the comparatively smaller start-up and operating costs. Capital invested in transport operations comes from a variety of sources. See Table 4 for an indicative representation of the Queenstown corporate structure. The activities in the table mainly represent the most popular activities sold through i-Site. The transport category includes tour operators, rental car companies and scheduled services, and the accommodations listed are entirely comprised of hotels. No attempt has been made to reference the other accommodation options available in Queenstown such as backpacker, motels and holiday homes as they are too numerous to account for. Each of the tourism sub-sectors rely on infrastructure and amenities provided by local, regional and central government. This includes service infrastructure, parks and reserves, walking tracks, and transport infrastructure. The Queenstown Airport was entirely owned by Council until recently when a 24.99% share was sold to Auckland Airport (Cannan, 2010). The partial sale was particularly controversial polarising community opinion and inciting a strong reaction from an influential group of local businessmen. The response reflects a desire to hold revenue generating activities in local ownership.

Vulnerability and Resilience

Having analysed Queenstown's development history and its contemporary processes, the following section examines what this means in terms of the resilience framework outlined in Chapter 1. In a broad sense, Queenstown's tourism dependence and reliance on carbon intensive transport to deliver visitors makes it vulnerable to peak oil and climate change. Compared to other New Zealand tourism destinations Queenstown attracts a larger proportion of overseas visitors which increases its vulnerability within the national context. Furthermore, over half its international market comes from long-haul origins. Overseas visitors stay longer and spend more than domestic visitors making them the mainstay of the industry. A significant decline in Queenstown's international tourist market would result in a potentially large shortfall to make up in order to maintain current levels of economic activity. A recent study estimated that Queenstown would lose $125 million on average per year between 2008 and 2026 if there was a 12% reduction in the number of international visitors over that period (Ascari Partners, 2008). Although that study was focused on tourism decline resulting from amenity degradation, the numbers are equally useful to give an indication of potential losses from mobility restrictions. The once the dominant domestic tourist market now only accounts for one quarter of total revenue. This reflects the way in which the resort has become progressively more focused on catering for the international tourist. Queenstown's inherent landscape appeal has drawn overseas visitors from the late 19th century and more recently the development of an extensive suite of attractions has added further appeal. Although Queenstown's appeal provides the motivation to visit, the principal drivers of international market growth have been advances in air travel and increasing affluence. These growth drivers are underpinned by cheap oil which is why Queenstown's development, particularly since the 1980s, strongly reflects the availability of cheap oil.

In creating a successful tourism industry, Queenstown has unintentionally developed both vulnerability and resilience to peak oil and climate change. Being a relatively peripheral location, significant effort was required to increase accessibility to Queenstown. Although it was initially a domestic destination, Queenstown was connected to Australia from a very early stage via steamer and rail which helped develop its international reputation. The transition from rail and steamer to automobile and aeroplane transport in the 1930s marked Queenstown's introduction to the oil age. However, while Queenstown was principally a domestic holiday destination its oil requirements remained low. Fast forward to the present day and its oil requirements are particularly high (even within the New Zealand context), mainly because of its reliance on long-haul overseas markets. International visitors inevitably consume a significant amount of oil energy travelling to and from New Zealand. The introduction of jet air transport provided the means to deliver international visitors to Queenstown and the industry very quickly capitalised on the market. From the 1980s onwards, Queenstown has been New Zealand's premier international resort. In fact, Queenstown was recently ranked the second best destination in the entire South Pacific behind Sydney (Andrews, 2011). Its full suite of attractions offers something for everyone giving Queenstown advantage over its competitors. The industry has been successfully constructed to convert the value in Queenstown's natural resources into monetary gain. It attracts higher levels of spending per visitor than elsewhere in New Zealand.

As discussed in Chapter 2, peak oil and climate change will likely affect a transition to short-haul tourism in the future. In light of this, current market trends suggest Queenstown's resilience is increasing. While long-haul markets represent over half the international visitors to Queenstown, its overseas markets are shortening. Since the commencement of direct trans-Tasman flights into Queenstown in the mid 1990s, the Australian share of the international market has increased considerably. Time-space convergence between Australia's east coast cities and Queenstown over the past 50 years has brought them particularly close together. Because Queenstown offers a tourism product not found anywhere else in the Asia-Pacific region, it may continue attracting Australian tourists while other destinations experience decline in the transition to a low carbon future. A trend is developing where an increasing number of Australian tourists are visiting Queenstown and nearby destinations exclusively, whereas in the past Queenstown was almost entirely dependent on overseas tourists visiting as part of a nation-wide tour. While Queenstown remains reliant on visitors that have entered New Zealand via other ports, the direct market is growing steadily.

Queenstown's local transport environment increases vulnerability to mobility restrictions through high car use and at the same time promotes resilience through walkability. The high use of cars and relatively limited use of public transport in Queenstown reflects the wider New Zealand experience. The fact that most domestic tourists travel by car to Queenstown is unsurprising. Car ownership is particularly high in New Zealand and a large percentage of Queenstown's domestic tourists live within a six hour drive. The popularity of car travel for international tourists reflects the low cost of rental vehicles and fuel, and has contributed to a trend away from tour group tourism to independent travel tourism. Automobility of tourist transport has steadily increased since 1980s when Japanese imports flooded the market. Today New Zealand has second highest number of vehicles per capita in the world at 0.7 behind the US at 0.8 (Ministry of Transport, 2010). Also, the New Zealand fleet is older than

many developed nations which translates to more GHG emissions per vehicle kilometre. But while car use is high, pedestrian transport is also popular in Queenstown due to its compact urban form. Tourists are able to leave their hotels on foot and walk to the many attractions located within the town centre area.

Prior to the 1980s the Queenstown tourism industry lacked diversity. There were very few stakeholders and the Mount Cook Group dominated the market. Since the 1980s many companies (small and large) have invested capital into Queenstown tourism development having seen the value in Queenstown's inherent appeal and rapidly increasing tourist traffic. The substantial investment has enabled the establishment of a large range of accommodation, transport and attractions. Today the industry is highly diverse which arguably strengthens Queenstown's resilience to peak oil and climate change. Diversity provides protection against perturbations. On one hand, Queenstown is vulnerable to peak oil and climate change because it is tourism dependent. On the other hand, diversity within the industry provides a level of resilience.

Chapter 5

Awareness and Preparedness

Chapter 2 presented an argument that tourism is vulnerable to peak oil and climate change because they threaten to restrict the high levels of mobility that underpin the industry (particularly international tourism reliant on aeromobility). These challenges will likely result in tourists holidaying closer to home, staying longer at the destination, and travelling by overland modes rather than by aeroplane. New Zealand is geographically isolated and depends on air transport to deliver tourists. Queenstown tourism is particularly reliant on international markets making it more vulnerable than other New Zealand tourist destinations. On the other hand, as Chapter 4 shows, Queenstown has unintentionally built up resilience to peak oil and climate change through comparative advantage and tourism industry diversity. A series of interviews were conducted with a selection of key Queenstown tourism stakeholders in order to determine the level of awareness of the issues raised in Chapters 2 and 4, and what preparations (if any) are being made to combat them. One of the main themes drawn from interviews is encapsulated in the following quote:

> *we're constantly aware of [peak oil and climate change] but there's very little we can do about it. We're busy enough running a business. It's a problem everywhere … it's something that's beyond us all* (John Davies – Chairman Trojan Holdings)

On the whole, the participants demonstrated an appreciation of the problem but generally considered it to be beyond their control. In particular, the Council focus group participants considered that there was no direction from central government in respect of peak oil and climate change. In light of this, the chapter begins by reviewing the higher level direction set out in international and national strategies to determine whether those strategies provide guidance to key stakeholders at the local level.

International Awareness and Preparedness

In the absence of a global environmental authority with judicial and enforcement powers, tackling cross-border issues is particularly challenging. Strategies developed at an international level are the product of a complex process of negotiations between nations and other stakeholders which often results in significantly watered down versions of earlier drafts. The heterogeneous nature of politics worldwide means that strategies are unlikely to represent global consensus. Despite this, the issue of climate change is now firmly entrenched in the global agenda through the UNFCCC and negotiations for GHG emission reduction targets are ongoing. International policy documents such as the Davos Declaration produced by the United Nations World Tourism Organisation (UNWTO), readily acknowledge the challenges the tourism industry faces in terms of climate change. In contrast, this research failed to find any international level policy considering peak oil, even though the problem is commonly referenced in academic literature. One gets the impression that peak oil is a taboo subject

in the political realm. Although peak oil does not feature in the global agenda like climate change, the concept often appears under the guise of energy security – which is actually a much wider issue involving all forms of energy, not just oil. But where the Kyoto Protocol provides some sort of international framework for addressing climate change, there is no equivalent for peak oil. However, the International Energy Agency (IEA), of which New Zealand is a member nation, reports on oil markets and matters relating to energy security. Their most recent oil markets report highlights the continuing trend of rapid demand growth eclipsing sluggish supply growth. While there are no international level strategies that address peak oil, objectives to avoid dangerous climate change have potential to indirectly influence oil consumption. Because transport is a large contributor to GHG emissions, climate change policies encourage a shift away from oil-fuelled transport which has the potential to affect the timing and impact of peak oil.

The relationship between tourism and climate change was recognised at the first International Conference on Climate Change and Tourism in 2003 organised by UNWTO and several other United Nations agencies (UNWTO, 2009). The conference produced the Djerba Declaration on Climate Change and Tourism which documented the obligation of the tourism industry to reduce its GHG emissions. The second UNWTO conference in 2007 produced the Davos Declaration which includes a commitment to respond to climate change challenges (UNWTO, 2007). It sets out a range of actions for mitigation, adaptation and technology development. In terms of tangible targets, the Davos Declaration calls for tourism to be incorporated in the implementation of existing commitments under the Kyoto Protocol. And in recognition of the impact of the transport sector (particularly aviation), the Davos Declaration calls for governments to "collaborate in international strategies, policies and action plans to reduce GHG emissions in transport (in cooperation with ICAO [International Civil Aviation Organisation] and other aviation organizations)…" (UNWTO, 2007 p.3).

As discussed in Chapter 2, emissions from international aviation are excluded from the Kyoto Protocol. Where governments are responsible for domestic aviation emissions, the ICAO is responsible for pursuing GHG emission limitations or reductions in respect of international aviation. In a sector-wide agreement, the ICAO has set a goal of 2% annual aircraft efficiency improvements in the medium-term (2020) to long-term (2050) while recognising that industry growth will bring about an increase in absolute emissions over that timeframe. To achieve the annual 2% efficiency gain the ICAO encourages its 190 member states to submit action plans relating to fuel consumption. The organisation also proposes to investigate market-based measures to reduce emissions such as incentives. Alongside these objectives the ICAO has established the Global Framework for Alternative Aviation Fuels (GFAAF) which advocates for development of alternative fuels as a method of closing the gap between efficiency gains and overall emissions growth. However, even if alternative fuels could close the gap (which is highly unlikely) the aviation industry is already a significant contributor to GHG emissions and therefore needs to perform better than it currently does – even before predicted industry growth. The reality is that emissions from aviation will continue to increase if the industry continues to grow as predicted. The UNWTO recognises how critical transport is to tourism and that any "strong global emission policy for aviation would have considerable consequences for destinations depending on tourism and travel" (UNWTO, 2009 p.2) – destinations like New Zealand.

National Awareness and Preparedness

Concern that any strong global emission policy for aviation would have considerable consequences for New Zealand is not particularly obvious in the relevant national level policy. However, the 2008 New Zealand Tourism and Climate Change Plan does highlight the need to focus on emerging international agreements that may apply to international aviation and climate change mitigation. The focus of the plan, which was jointly drafted by the Government and industry stakeholders, is split between encouraging GHG emissions reductions within New Zealand and addressing threats to long-haul markets. The plan acknowledges that New Zealand tourism trades on its 'clean and green' image and therefore seeks to protect that image by combating negative perceptions that may arise. Interestingly, among the many actions proposed in the New Zealand Tourism and Climate Change Plan, there is one that seeks to 'convene a process to identify options and implications for New Zealand tourism should climate change constraints become more acute'. One option includes modelling a different geographic market mix, domestic tourism optimisation, new market segments, and regional alliances. This indicates that there is awareness that climate change could significantly impact New Zealand tourism in the future.

The 2007 New Zealand Tourism Strategy expresses a concern that increasing international awareness of climate change may start to affect visitor arrivals to New Zealand. It acknowledges that the industry is vulnerable because of New Zealand's distance from its markets but does not recognise the potential impact of high and volatile oil prices in the future and how to address this. The strategy considers that New Zealand needs to respond to climate change concerns and identifies the following options to reduce the carbon intensity of the industry:

- promoting holidays based in one region;
- encouraging the use of lower impact forms of transport such as coaches instead of planes;
- encouraging the use of public transport, bicycles, or walking;
- providing more fuel–efficient vehicle fleets; and
- introducing carbon offsetting mechanisms.

The strategy also seeks to encourage fuel efficiency, the use of bio-fuels and the adoption of new tourist transportation technologies. The industry will be able to monitor progress through the Tourism Environmental Indicators Set which includes indicators for transport and GHG emissions.

Besides the tourism policies discussed above, there are several non-tourism specific central government policies that identify and seek to address the issues raised in this thesis. The 2010 draft New Zealand Energy Strategy, the 2010 draft Energy Efficiency and Conservation Strategy and the 2008 New Zealand Transport Strategy collectively acknowledge that:

- New Zealand tourism and transport is oil dependent;
- Oil prices will continue to rise in the future and become increasingly volatile;
- New Zealand is particularly vulnerable to the impact of high oil prices;

- In the future oil will need to be replaced with local energy sources;
- Diversifying transport energy sources will increase resilience;
- The transport sector is a significant contributor to New Zealand's GHG emissions;
- GHG emissions from transport need to be reduced; and
- New Zealand's isolation makes it vulnerable as concern for growing GHG emissions from aviation increases.

The policies demonstrate an awareness of the challenges peak oil and climate change pose to the New Zealand tourism industry (without making specific reference of peak oil). The strategy proposed to address the issue on a national scale involves Government investment in renewable energy and efficiency improvements alongside the primary mechanism of implementing an Emissions Trading Scheme (ETS). Initially the Labour Government made a case for the establishment of the ETS in 2008. The Labour draft was amended by the National Government and established in November 2009. Broadly, the scheme is designed to simultaneously reduce emissions and enhance carbon sinks. Emitters that are caught by the scheme (several industries are exempt) are financially liable for each tonne of carbon emitted and forestry owners who participate in the scheme are financially rewarded for carbon sequestration. Several transition measures are currently in place to lessen the economic impact of introducing the scheme. These include a carbon price cap, a one-for-two carbon obligation (emitters are only liable to pay for one of every two tonnes of carbon produced), allocation of free credits to some sectors, and phasing in of various industries. The Climate Change Response Act 2002 requires a review of the ETS to be completed before the end of 2011. In a submission to the panel responsible for undertaking the review the Parliamentary Commissioner for the Environment, Dr Jan Wright, expressed a view that the ETS is the right framework for pricing carbon but conveyed concern about the transition measures, especially in regards to the subsidies given to large emitters (Wright, 2011). A recommending report by the Independent Review Panel has been submitted for the consideration of the Minister for Climate Change Issues which may result in amendments to the scheme.

Overall, New Zealand Government policy generally reflects the international climate change policy in that it acknowledges the magnitude of the issue and the need for an urgent response. Like the international policy, there is a technocentric bias in the solution strategies, with the exception of the ETS which has potential to encourage behavioural change. Developing new technologies and improving efficiency is one part of the solution but it will not achieve the required GHG emissions reductions. Nevertheless, that is the adopted strategy direction and it is unlikely to significantly change in the near future. In view of this, the following section investigates to what extent there is local level awareness of the problem.

Local Awareness and Preparedness

Despite the awareness demonstrated in higher level policy, there is no reference to peak oil and climate change in any Queenstown policy documents. This may be an issue of timing. Local authority

policy is guided to a certain extent by national policy and the latest round of Queenstown policy documents (see Table 2 in Chapter 3) were prepared prior to the national policy documents containing references to these issues. Consideration of climate change and energy security matters has only recently been introduced into national policy. Furthermore, current national level policy relating to these issues is fairly broad brush and does not contain strong direction on how local authorities ought to act. While current local policy lacks awareness of peak oil and climate change, many aspects of the policy contribute to building resilience to them. The Urban Design Strategy recognises the benefits of being resilient to future oil price increases by adapting towards more compact urban areas and the Wakatipu Transportation Strategy focuses on encouraging alternatives to car transport. However, the current policy and planning regime mainly focuses on protection of landscape character and amenity values, growth management, affordable housing, urban design and infrastructure capacity. Landscape protection considerations receive the closest attention which is understandable given Queenstown's tourism industry is largely reliant on the natural resources of the Wakatipu.

The interviews with the Queenstown tourism industry stakeholders (listed in Table 3 and hereon referred to as 'participants') drew out a variety of responses as was expected given the diverse interests that were represented. However, all the participants except one expressed some understanding of the issues facing the industry despite the complete lack of awareness of peak oil and climate change in local policy. When asked about potential impacts on Queenstown, two participants suggested that long-haul markets could potentially decline as a result of peak oil. Furthermore, a few participants expressed concern in respect of Queenstown's isolation and dependence on oil. Only Mr Read, the Aeronautical Manager of Queenstown Airport, dismissed peak oil and climate change as issues that have no relevance to Queenstown. The reason behind Mr Read's lack of concern relates to his strong faith that there will be a smooth transition from oil fuel to a viable alternative. His views were certainly not typical of those expressed by the other participants, however, it is probable that other stakeholders within the industry would share his opinion. Mr Clarke, the Director of the Lakes District Museum, expressed an interest in alternative fuels but was not confident of their potential as a viable substitute for aviation. Mr Whitaker, the Manager of Mount Cook Airlines (subsidiary of Air New Zealand), was realistic about the threat of peak oil acknowledging that the price of oil largely controls airlines and said that:

> *a lot of airlines have gone to the wall with regards to the high price of oil and certainly if oil remained at a high price of $180 for example, you wouldn't last long in the business.*

In respect of climate change, Mr Whitaker said that reducing carbon emissions is an important focus of Air New Zealand's planning which is part of the reason why it voluntarily opted into the New Zealand ETS. Its strategy to address peak oil and climate change centred on improving aircraft efficiency by maintaining a young fleet and adopting technology such as winglets which can significantly reduce consumption especially on long haul flights. They are also investigating and trialling alternative fuels.

Representing Remarkables Park Limited and the Queenstown Chamber of Commerce, Mr Porter is particularly keen to see more consideration of issues such as peak oil and climate change. He considers the current planning legislation in New Zealand (the Resource Management Act 1991) has the wherewithal to address these issues but is concerned that there is no structure in place that enables them to be brought to its consideration – that is, there is no organisation with suitable expertise tasked with identifying these sorts of issues. Specifically he lacks confidence in Council's ability to adequately identify long-term issues. This issue was touched on during the Council focus group. Mr Pannett, the Policy Manager, recalls raising the issue of peak oil in respect of land use patterns but not being taken seriously by developers and some politicians. Mr Pannett considered that policy support from the national level sways depending on which political party is in power. He indicated that Council received some policy support in terms of peak oil and climate change under the Labour Government but very little under the current National Government. Mr Mander, Transport Manager, mentioned that peak oil and climate change are often raised when discussing transport but that they never get any traction because:

> *there's the philosophy [in Council] that we can't get too far ahead of ourselves, that we're just the local authority and we have no influence on these national and international issues.*

There appeared to be a tension in the Council focus group between those wishing to address the issue now and those who wish to wait for clear government direction. Outside the Council focus group there was a consensus of opinion that responsibility for addressing the issue ought to be shared between the private and public sectors. The majority of the participants preferred a market driven response with government leadership. Mr Clarke also considered that local leadership ought to come from Council and other organisations such as the Queenstown Chamber of Commerce and Destination Queenstown. Mr Porter mentioned that the Chamber of Commerce has been lobbying Council in an effort to establish an 'Economic Futures Agency' that would specifically focus on addressing long-term issues. Destination Queenstown CEO, Mr Everitt, expressed caution in acting before better information became available. He said that Destination Queenstown keeps a "watching brief" on peak oil and climate change and considers that the issue:

> *could be very significant one day and it's probably almost inevitable that the nature of tourism as we know it is going to change as a result of these factors but hopefully it can be an evolutionary process.*

Mr Davies, Chairman of Trojan Holdings, shares this opinion. He considers the industry has the capacity to adapt gradually but is vulnerable to oil price shocks. Mr Everitt also considers the industry has good adaptive capacity because it consists:

> *of highly entrepreneurial and creative people … and has demonstrated its ability to be very responsive to challenges and take up opportunities.*

Mr Mathews, the Chairman of Skyline Enterprises, considers that tourism businesses with large financial debt are particularly vulnerable to the impacts of peak oil and climate change. Skyline Enterprises operates the Skyline Gondola, one of Queenstown most popular attractions. Mr Mathews

is confident that the company is well placed to adapt to changing circumstances because of its low level of debt and because it operates a very popular attraction. He considers that Skyline Gondola as well as the Earnslaw and Shotover Jet are examples of the 'must do' attractions that would remain viable in a significant downturn.

The participants were asked to think of any ways in which Queenstown's vulnerability to peak oil and climate change might be reduced. This question produced the widest variety of responses. Within the Council focus group, Councillor Macleod and Mr Mander considered that full implementation of existing policy, such as the Wakatipu Transportation Strategy, would increase resilience but see funding constraints as a significant barrier. Mr Richards of the New Zealand Transport Agency considered that developing low carbon destination transport would assist while acknowledging Queenstown has little control over origin-destination transport. Mr Davies and Mr Whitaker suggested that improvements in fuel efficiency would increase resilience. Mr Davies also suggested Queenstown might focus on attracting short-haul markets. Mr Mathews considered that Queenstown would need to adapt to suit market demand and if tourists numbers declined, businesses would need to re-organise resources (including trimming staff), reduce fixed costs and operate as efficiently as possible. Mr Porter's suggestion was to focus on less price-sensitive markets, be proactive and increase awareness. While the participants provided suggestions of ways to reduce vulnerability, they also conveyed a general sense that the issues were beyond their control.

Although this thesis is not interested in the physical effects of climate change, the issue was commonly raised during the interviews – and perhaps for good reason. A recently released National Institute of Water and Atmospheric Research report (Hendrickx and Hreinsson, 2010) considered the implications for snow depth at the individual ski field scale. It found that snow depth will reduce in the medium to long term and that lower elevations will be particularly affected. This supports a previous estimate that by 2030 there is likely to be 10-40% less snow cover in the Southern Alps. Furthermore, by 2030 there is likely to be a 33-50% loss of alpine plants (Fitzharris, 2007). These factors could lead to a reduction of alpine based tourism. Mr Clarke, Mr Davies, Mr Porter and Mr Read all raised the issue of climate warming affecting the ski season. Mr Read and Mr Davies were confident that snow making facilities would compensate for less natural snow as long as there were enough cold nights to allow for snow making. Mr Clarke questioned whether there would be cold enough temperatures to make snow and Mr Porter suggested that Coronet Peak's relatively low elevation and the Remarkables northerly aspect make Queenstown's ski industry vulnerable to warming. Mr Everitt identified climate change as a potential risk to the ski industry but considered Queenstown would still have a competitive advantage over other resort destinations. Mr Clarke and Mr Mathews expressed concern over the apparent increased frequency of flooding of Lake Wakatipu. Mr Mathews considered that the issue has:

> *the potential to significantly impact Queenstown's desirability as a destination because unfortunately the media will tend to want to report flooding and not qualify it, as was the case in the last event, and the market tends to want to stay away yet the effects are relatively minor.*

Nearly all the participants chose to comment on the physical effects of climate change even though no such questions were asked. This reflects a natural tendency of people to think of physical climate implications rather than other considerations. It is the physical effects of climate change that gain attention in the media. In particular, the idea that climate change might affect mobility was not immediately obvious to the majority of participants. On the other hand, the relationship between peak oil and mobility appeared to be a common logic. But this was only in respect of peak oil effecting increases in the cost of transport. The participants did not show any awareness that peak oil might also reduce discretionary incomes. The lack of in-depth understanding of the issues raised in this thesis was not unexpected. The issues were not raised during the six years the researcher worked in the District as a resource management professional. Indeed, this was part of the motivation for undertaking the research. But the fact that key industry stakeholders, including those with significant capital invested in the industry, lack in-depth knowledge of these problems only increases the risk.

Conclusion

This chapter reviewed policy relating to peak oil and climate change at three scales; international, national and local. The review found that there is an awareness of climate change issues at international and national level, limited awareness of issues relating to peak oil at the national level, and little understanding of either issue at the local level. On the whole, while some awareness does exist, it is not in the terms that give meaning to the issues raised in this thesis concerning future mobility restrictions. The key Queenstown tourism stakeholders demonstrated some grasp of peak oil and climate change issues but lacked in-depth understanding. The participants generally considered the issues as being beyond their control although several suggested ways that Queenstown could build resilience to peak oil and climate change. Furthermore, a few participants acknowledged the risk in waiting for direction from above as is demonstrated in the following quotes:

> *there's a risk in saying it's a national issue … we can't say it's not our problem and leave it to someone else to make the hard decisions for us.* (Denis Mander)

> *the nature of the problem is that it could come upon you very quickly but the solutions are time consuming.* (Alastair Porter)

Having analysed the nature and extent of the research problem in Chapters 2 and 4, and having examined awareness and preparedness in this chapter, the final chapter identifies potential ways forward.

Chapter 6

Where to Now?

> *You cannot solve a problem from the same consciousness that created it. You must learn to see the world anew* (Albert Einstein)

Responding to the Challenges of Peak Oil and Climate Change

The central premise of this thesis is that peak oil and climate change threaten to restrict the high levels of mobility that underpin tourism. They present a double whammy challenge. Aviation, so critical to tourism (particularly international tourism), is oil dependent and the main contributor to tourism's GHG emissions. Fuelling the global jet aircraft fleet on low emission alternative fuels is not realistic, at least in the foreseeable future, and therefore something has to give. Tourism must be reconstructed in order to survive in a low carbon future. To achieve sustainable tourism the industry must encourage a shift towards less frequent longer duration holidays to destinations closer to the origin, and a modal switch towards increased use of low carbon transport (Peeters and Dubois, 2010, Dubois et al., 2010, Peeters et al., 2006). Bailey and Wilson (2009) argue that an effective solution must "seek to elicit behavioural responses of a more ecocentric, demand-limiting nature". Hart (2009a) of the Australian branch of the Association for the Study of Peak Oil and Gas, suggests that survival of a sustainably sized aviation industry will require:

- *A structured downsizing of the aviation industry, ensuring the survival of the industry, whilst providing retraining for those employees affected by the downsizing and providing time for an increase in transportation capacity by other modes, particularly rail.*
- *The prioritization of infrastructure funding to rail and bus networks to replace the capacity lost by the downsizing of the aviation industry.*
- *Fostering co-operation rather than competition between airlines.*
- *Prioritizing support to the aviation industry based on the principles of need, energy efficiency and demand.*

While these measures seem a little idealistic, a planned downscaling of the aviation industry is probably the most effective way of ensuring the survival of the industry in the long-term. However, in a world of competing environmental and economic interests, current solution strategies predominantly focus on technological fixes rather than behavioural changes. The adopted ICAO strategy for addressing GHG emissions from aviation is to improve aircraft efficiency and encourage development of alternative fuels. But even the ICAO concedes that this will only partially offset predicted growth in aviation related GHG emission. Hodgkinson et al. (2007) suggest that "airlines should seriously consider supporting mandatory participation in an emissions offset market as part of a long-term strategy". An offset solution strategy does not preclude complementary measures such as

an emissions trading scheme. Many airlines including Air New Zealand and Qantas have voluntary offset schemes in operation, however, the effectiveness of these schemes is questionable (Gössling et al., 2007). Whether or not the industry proactively pursues demand management measures, air travel is still likely to decline in a post peak oil world. As Mr Whitaker (Manager of Mount Cook Airlines) suggested, airlines are controlled by the price of oil and as the price increases towards US$200 per barrel – a realistic short-term prospect according to Professor Paul Stevens of Dundee University (Macalistair, 2010) – many will struggle to survive.

In light of this, it would be prudent of New Zealand to take a lead in responding to peak oil and climate change rather than waiting on global agreements and the uncertainty that brings. Currently there is no international level strategy that seeks to address peak oil, and in respect of climate change the Kyoto Protocol has proved to be a weak framework for beginning the transition towards a necessary low carbon future. New Zealand's relative geographical isolation and dependence on air transport to deliver international tourists makes it particularly vulnerable to the impact of peak oil and climate change. Given the importance of tourism to the economy, there is a strong case for New Zealand to be proactive in responding to these challenges. While New Zealand has little control in respect of international aviation, the Government ought to consider advocating for a mandatory international aviation emissions offsetting scheme. A properly developed scheme, where revenue is directed to carbon sequestration projects, would allow visitors to New Zealand to reduce the impact of their origin-destination transport. The flipside of offsetting is its demand reducing effect. However, this may not necessarily be a disadvantage. An international tourist visiting New Zealand consumes a significant amount of oil and produces a significant volume of GHG emissions (especially those tourists travelling long-haul). Rather than striving for high volume commodity tourism, the objective ought to be attracting the less price sensitive/high-end niche tourist market. The commodity exports pathway is the traditional New Zealand approach, one that has been heavily criticised by many including Oram (2007) and Callaghan (2009). High value niche tourism can help reduce environmental effects while maintaining export revenue. Reducing the environmental impact of visiting New Zealand would also help protect the country's vitally important tourism product image. The 100% Pure brand has raised visitor expectations and it is important to deliver on the promise (New Zealand Tourism, 2009). If New Zealand cannot live up to the product image, export earnings could suffer.

Building resilience to peak oil and climate change involves reducing New Zealand's dependence on oil-fuelled transport. This represents an enormous challenge but a necessary one which would benefit more than just tourism. The Government may not have much influence in respect of international transport but it can exert significant influence in terms of national transport. It ought to be incentivising a transition to a predominantly non oil-fuelled transport system and discouraging growth in carbon intensive transport modes such as air travel. The New Zealand ETS provides the mechanism for discouraging carbon intensive transport but its effectiveness will be limited when used in isolation. As discussed in Chapter 2, demand for oil is relatively inelastic and therefore consumers absorb the rising cost of oil by spending less on discretionary items. In order for the ETS to be truly effective in reducing oil produced GHG emissions, viable low carbon land and water transport options

must be made available. Support for this is found in the 2007 New Zealand Transportation Strategy which recognises the challenges of peak oil (using the term 'energy security') and climate change. However, there is a disconnect between the strategy direction and current funding priorities. Low carbon transport modes only receive a small portion of the transport funding budget. A considerable shift in transport funding priorities is required because as long as low carbon modes of transport remain a secondary consideration, transport within New Zealand will continue to be oil dependent and carbon intensive.

To bring about change the first priority must be to raise awareness. This research revealed that even key stakeholders in the tourism industry had only a basic understanding of the potential implications of peak oil and climate change (and often the physical implications rather than the social implications). Industry stakeholders ought to be made aware that these challenges represent a wicked problem that cannot be solved within the existing terms of reference – a shift in thinking is required. A business as usual approach will only exacerbate the problem by increasing vulnerability. The objective must be to reconstruct a more resilient tourism industry. In order to do this the industry must understand the degree to which it is susceptible to change while remaining viable, and must build self-organisation capability and the capacity for learning (Nelson et al., 2007 p.399). In terms of understanding susceptibility to change, research is ongoing including recent studies by Becken and Simmons (2002), Becken et al. (2009), Becken (2008) and Millar and Puckey (2008) and this thesis. It is important that national level policy incorporates the knowledge that the relevant research produces. In terms of self-organisation, the industry appears to be well equipped. There are a number of players involved in organisation of tourism in New Zealand from the various industry associations to central and local government to regional tourism organisations. Their roles and responsibilities are well defined as set out in the 2007 New Zealand Tourism Strategy. The future challenge for this organisational structure will be in its ability to maintain effective communication and coordination as circumstances change. In terms of capacity for learning, New Zealand appears to be well placed. As Fitzharris (2007 p.164) suggests, New Zealand has a "relatively … educated population, a strong science base, and easy access to technology and sophisticated support institutions".

As identified in Chapter 2, there are three categories of strategies commonly employed to tackle wicked problems: hierarchical, competitive and egalitarian. Chapter 5 focused on hierarchical strategies whereas this chapter presents potential competitive and egalitarian strategies. While all three strategies are necessary to address the issues raised in this thesis, the competitive and egalitarian approaches are arguably more effective in terms of empowering local communities. They can be developed and acted on without having to wait for direction from above. In particular, egalitarian strategies aim to build capacity and capability for participatory decision-making which Nelson et al. (2007) consider is the most effective way of building resilience. The framework for this type of decision-making already exists in New Zealand by way of the Resource Management Act 1991. The Act promotes high levels of public participation and decentralised decision-making. But as Mr Porter suggested, while the Act could provide a suitable framework to address peak oil and climate change, these issues are not being brought to its consideration. Frame et al. (2009 p.192-194) consider it necessary to go beyond simply "broadening democratic participation to new processes of open

dialogue". They advocate the concept of 'futures studies' (or 'futuring') as a mechanism for better decision-making in respect of wicked problems. Futuring is the study of "the present reality from the point of view of a special interest and knowledge about the future [permitting] open discussion on contested topics" (Frame et al., 2009 p.193). It involves exploring medium to long term issues through plausible scenarios using rational analysis and subjective judgement. This thesis is a type of futures study. It provides a special interest point of view on mobility implications of peak oil and climate change, and provides knowledge about a possible future. It is important to ensure the Queenstown community take the opportunity to use this thesis to start an open dialogue and expand the knowledge base it provides.

Queenstown Specific Recommendations

The following question was posed in Chapter 1: Does Queenstown have the capacity to adapt to enable it to prosper in an impending low carbon future or will it choose to ignore changing circumstances and carry on with the traditional business as usual approach? The answer is arguably yes, it does have the have the capacity to adapt. So far, resilience to peak oil and climate change has been developed rather fortuitously. However, in light of the vulnerabilities examined in Chapter 4, it would be prudent of stakeholders to take deliberate steps towards building resilience to peak oil and climate change to ensure the ongoing prosperity of the community. The following is a discussion that suggests ways in which this might be achieved. It draws on elements of the resilience framework which promotes adaptation as a mechanism for reducing vulnerability to disturbances. Adaptation is "the decision-making process and the set of actions undertaken to maintain the capacity to deal with current or future predicted change" (Nelson et al., 2007 p.396). The actions range from incremental adjustments to system transformation. An example of an incremental adjustment is instigating water demand management measures in an area exposed to drought, and an example of transformation is making a transition from an economy based on primary production to one based on information technology and communication.

Transformation

At a broad scale, Queenstown's vulnerability comes from dependence on tourism. In an ecological perspective, diversity is the key for survival and this concept is equally relevant to the socio-economic elements of a community. If Queenstown relied on a more diverse range of economic activities, the impact of a tourism downturn may not be as pronounced. While there may be limited prospects to completely transform Queenstown's economy, there may be opportunities to create new and expand existing industries that are not tied to tourism – preferably industries that are not excessively oil dependent and carbon intensive. The creation of a viticulture industry in the Gibbston Valley over the past two decades is one successful example. Although the Gibbston Valley wine region has become a tourism attraction in itself, its main source of revenue is from primary production. The development of tertiary education institutions is another potential area of expansion. There are several tertiary education providers in Queenstown including foreign language schools, Otago Polytechnic (satellite facility) and the Queenstown Resort College. Otago University have recently introduced a Master of Entrepreneurship programme in Queenstown and are interested in establishing a campus there to run

programmes such as teacher training, rural health, geography, geology and business administration (Beech, 2011). Queenstown would significantly benefit from the establishment of additional tertiary education opportunities. Although tertiary education institutions attract transient populations, individuals remain in town significantly longer than tourists.

Incremental Adjustments

Because there is limited scope for transformation of the Queenstown economy, most of the resilience to peak oil and climate change must be built up within the tourism industry itself. In this respect there appears to be two areas of potential adaptation. The first involves developing Queenstown to be a low carbon destination. The second involves developing a more resilient market profile by targeting less exposed tourism markets.

Creating a low energy/carbon neutral Queenstown would not only increase resilience to peak oil and climate change but would also add to the uniqueness of it as a destination. It is something that would add significant appeal to the Queenstown brand. Tourism industry stakeholders do not have much control over how visitors travel to and from Queenstown but they can influence how they move around at the destination. Topography defines and limits the transport routes into the town centre. Frankton Road is the most direct route between Frankton and Queenstown CBD and Council is concerned that the road is nearing maximum capacity. The Wakatipu Transportation Strategy highlights the conflict between providing for car transport and the degrading effect that has on the tourist experience. A light rail link between Queenstown CBD and Frankton has previously been considered – it was an option presented in the 1995 version of the District Plan. While establishing a light rail link between Queenstown's two main commercial centres would be costly, the long-term benefits would be considerable. Funding for a transport infrastructure project such as this could be raised through various sources including a bed tax. Bed taxes have been successfully employed in other tourist resorts such as Whistler, Canada (Wilson, 2010). They have been considered before in Queenstown and rejected because of a perception that they would be an administrative burden for accommodation providers. Further analysis of a potential bed tax or other means of collecting revenue from visitors is recommended.

Another electric powered transport innovation that would benefit Queenstown are ski field access gondolas. This would not only enhance the ski experience at Coronet Peak and the Remarkables but also significantly reduce energy consumption. Two ski fields on the Wanaka side of the Crown Range already have resource consent to construct gondolas. Aside from electric powered transport, a Queenstown consortium has made a commitment to biodiesel by establishing a refuelling facility for commercial use (Carroll, 2010). The fuel used contains a 20% biodiesel and 80% standard diesel mix. This sort of initiative ought to be encouraged and supported as a step towards weaning local transport off oil; however, as discussed in Chapter 2, the prospects for large scale replacement of oil with bio-fuel are limited. One of the most effective ways of achieving a low energy destination is through cycle tourism. Cycle tourism is both transport and an attraction in one. The ongoing development of a 90km Wakatipu cycle trail (Stewart, 2011) provides a valuable resource for Queenstown and would be well complemented by the proposed Round the Mountain cycle trail. The proposed trail running

174km from Walter Peak to Kingston has received $4 million of funding from central government as part of their $50 million national cycleway initiative (Caldwell, 2011). Queenstown stands to benefit greatly as it will act as the start and end point of the trail. Cycle tourism has proved popular in the region after the Central Otago Rail Trail opened in 2000 (Otago Central Rail Trail Charitable Trust, 2009). Cycle tourism is encouraged in the 2005 national walking and cycling strategy. The strategy states:

> *Cycle tourists tend to stay longer than those using other modes of transport, thus supporting local economies—often in regional New Zealand.*

Creating a low energy/carbon neutral destination ought to be accompanied by a proactive strategy to increase resilience through targeting certain visitor markets. During an international visit to Queenstown, oil consumed and carbon emitted at the destination represents a small proportion of the total. The origin-destination consumption and emissions are the much larger part of the problem. In the future, travelling to Queenstown from long-haul origins is likely to become particularly expensive. Before jet air travel, Queenstown was a long-haul destination from Australia. As discussed in Chapter 4, the first international tourists from Australia to Queenstown represented a very wealthy niche market. As it did then, Queenstown can use its comparative advantage as the only resort of its kind in the Asia Pacific region as leverage to attract a niche tourism market, one that is not price sensitive and one that will bring high levels of spending to the resort. Queenstown is well placed to receive high-end tourists and continues to develop capacity. Recently, two five-star Hilton operated hotels were opened at Kawarau Falls (Roxburgh, 2011) and a resource consent was lodged for a $60 million luxury resort at Jacks Point (Anon, 2011). As well as targeting the high-end niche market, promoters ought to also look to increase the market share of the visitor markets close to Queenstown – domestic and the Australian east coast. Domestic visitors to Queenstown use less energy and have transport options that do not involve air travel. Australian visitors use more energy than domestic visitors but much less than those travelling from the northern hemisphere. Furthermore, it is likely that Queenstown's short-haul markets will expand as peak oil and climate change begin reduce long-haul travel.

Awareness and Learning

Before any progress towards building resilience can be made, it is necessary to raise awareness of the issues facing Queenstown. This thesis provides a starting point for community-wide discussions from which policy could be formulated to tackle the issues in a coordinated fashion. Any policy to fall out of such a process would likely strengthen existing Council policy with mutually reinforcing objectives. For example, the Wakatipu Transportation Strategy contains an objective encouraging a transport mode shift towards increased use of public transport. The reason for this objective mainly relates to efficient functioning and amenity protection – more cars on the road leads to inefficiency and an unpleasant environment. Policy promoting peak oil and climate change resilience might contain a similar objective but for a different reason.

To achieve successful outcomes it is important to consider the manner in which community discussions are conducted and how policy is formulated and implemented. In a study reviewing the effectiveness of governance structures and environmental management tools, Wilson (2010)

recommended that Queenstown adopt a systems-based decision-making framework to achieve a sustainable tourism industry – an objective which the author concedes is highly contested. That research was concerned with resource management at the resort level, rather than the wider problem of restricted mobility considered in this thesis. But the analysis of decision-making frameworks in that study has relevance here. Wilson found that 'The Natural Step' framework has been particularly effective in achieving sustainable outcomes in Whistler, Canada – a resort town with similar characteristic to Queenstown. The Natural Step is a four step strategic approach (Robèrt, 2002). The first step involves raising awareness of environmental issues. Steps two and three involve 'baseline mapping' and creating a vision, and the last step is the implementation phase. The vision is developed through a process of 'backcasting' (a concept is similar to futuring) which involves determining desired future conditions and defining steps to "attain those conditions, rather than to take steps that are merely a continuum of present methods extrapolated into the future and planned accordingly" (Holmberga and Robèrta, 2000 p.294). Another potentially appropriate decision-making framework is 'Transition Towns'. It is described as an international grassroots movement specifically designed to tackle the problem of peak oil and climate change (Hopkins, 2008). The Transition Towns framework adopts the following four assumptions:

- *That life with dramatically lower energy consumption is inevitable, and that it's better to plan for it than to be taken by surprise.*
- *That our settlements and communities presently lack the resilience to enable them to weather the severe energy shocks that will accompany peak oil.*
- *That we have to act collectively, and we have to act now.*
- *That by unleashing the collective genius of those around us to creatively and proactively design our energy descent, we can build ways of living that are more connected, more enriching and that recognise the biological limits of our planet.*

  (Transition Towns New Zealand, 2011)

It is a local level strategy designed to increase resilience and adaptive capacity by proactively creating a positive community vision for a low carbon future. The process is informed by anticipating future risks to the community by backcasting. Whether or not the Queenstown community choose to adopt The Natural Step or Transition Towns, it is important to have some sort of framework in place that promotes the type of open dialogue process Frame et al. (2009) advocates. It is this sort of process that will assist the community in redefining what constitutes progress, which is necessary in order to build resilience to peak oil and climate.

This thesis is the first attempt to examine Queenstown's vulnerability to peak oil and climate change. Further analysis would provide an increased understanding of the problem and therefore improve the ability of the community to respond. The following questions did not form part of this research but are worth exploring:

- What is the sensitivity of the various Queenstown tourism markets to increases in the price of oil and is there a threshold beyond which visitor numbers will begin to decline?

- Does Queenstown's comparative advantage mean tourists will continue to visit even when peak oil and climate change begin to take effect because it offers a unique product not available anywhere else in the South Pacific?
- Would domestic and Australian tourists who previously holidayed in long-haul destinations consider visiting Queenstown when peak oil and climate change prohibit them travelling long-haul?

Conclusion

This chapter has considered solution strategies for the peak oil and climate change problem at global, national and local scales. At the global scale, the tourism industry response ought to focus on encouraging a transition to short-haul tourism using low carbon modes of transport while maintaining a high value niche long-haul tourism market. Because jet air travel is likely to remain oil dependent and carbon intensive for the foreseeable future, demand management measures would be most effective at ensuring the long-term survival of this transport option. Current strategies which involve improving efficiency and encouraging development of alternative fuels will not substantially reduce the oil dependence and carbon intensity of the aviation industry leaving it vulnerable to peak oil and climate change. New Zealand is particularly vulnerable to the mobility implications of peak oil and climate change. It relies on aviation to deliver international visitors whose contribution to the national economy is very important. In light of this, New Zealand ought to be proactively employing strategies to increase resilience to peak oil and climate change. This research recommends that the Government advocate for a mandatory international aviation GHG emissions offset scheme, begin targeting the high-end niche tourism market and invest heavily in reducing the carbon intensity and oil dependence of national transport. At a local scale, Queenstown is also advised to target high value niche tourism over commodity tourism and invest in low carbon transport. To successfully tackle the problem it is imperative to first raise awareness. The most effective way to achieve this is through a framework that ensures an inclusive community-wide open dialogue process. Because of the wicked nature of the peak oil and climate change problem, the most successful solution will involve employing all strategies – hierarchical, competitive and egalitarian – and involve taking action at all scales – global, national and local. But New Zealand cannot afford to wait for global direction and equally, Queenstown cannot wait for national direction.

Re-writing the Research Problem

Part of my considerations as a reflective researcher is to consider the extent to which I may have influenced awareness of the research problem in Queenstown. It is likely that the series of interviews conducted during the research prompted consideration of the likely impacts of peak oil and climate change on Queenstown. The research process was/is an intervention in the problem it seeks to clarify. But simply making my thesis available to the Queenstown community may not substantially progress the research process. From experience, documents such as these generally end up on a shelf gathering dust. From the outset of this research project it was my intention to trigger community-wide

discussion around peak oil and climate change – issues that may appear in the media from time to time but do not obviously impose themselves in everyday life. My intention is to create the opportunity to feedback the results of this research by holding a seminar in Queenstown. The impression I got when undertaking the series of interviews was that the participants were very keen to learn more about the issues explored in this thesis. At the very least I hope this work begins a dialogue that leads to a heightened awareness.

Reference List

ADAMSON, I. 2008. *The Heart of the Queenstown Lakes District*, Irene Adamson.

ADEY, P., BUDD, L. & HUBBARD, P. 2007. Flying lessons: exploring the social and cultural geographies of global air travel. *Progress in Human Geography,* 31**,** 773.

ADGER, W. N. 2006. Vulnerability. *Global Environmental Change,* 16**,** 268-281.

ALEGRE, J., MATEO, S. & POU, L. 2010. An analysis of households' appraisal of their budget constraints for potential participation in tourism. *Tourism Management,* 31**,** 45-56.

ANDREWS, J. 2011. *Queenstown rates as world-class destination with millions of travellers* [Online]. Available: www.queenstown-nz.co.nz/Media/media-releases-blog-detail/index.cfm/2011/05/ [Accessed 5 May 2011].

ANON 2011. Jack's Point resort application lodged. *Otago Daily Times,* 19 July 2011.

ARCHER, D. & RAHMSTORF, S. 2010. *The climate crisis: an introductory guide to climate change*, Cambridge University Press.

ASCARI PARTNERS 2008. The case for Queenstown: An investigation into the sensitivity of tourism to changes in the built environment. *Report prepared for the Queenstown-Lakes District Council.*

BAILEY, I. & WILSON, G. A. 2009. Theorising transitional pathways in response to climate change: technocentrism, ecocentrism, and the carbon economy. *Environment and Planning A,* 41**,** 2324-2341.

BAXTER, J. 2010. Case Studies in Qualitative Research. *In:* HAY, I. (ed.) *Qualitative research methods in human geography*. Oxford University Press Canada.

BECKEN, S. 2007. Tourists' perception of international air travel's impact on the global climate and potential climate change policies. *Journal of Sustainable Tourism,* 15**,** 351-368.

BECKEN, S. 2008. Developing indicators for managing tourism in the face of peak oil. *Tourism Management,* 29**,** 695-705.

BECKEN, S., NGUYEN, M. & SCHIFF, A. 2009. Impacts of Oil Prices on New Zealand Tourism: An Economic Framework. Lincoln University.

BECKEN, S. & SIMMONS, D. G. 2002. Understanding energy consumption patterns of tourist attractions and activities in New Zealand. *Tourism Management,* 23**,** 343-354.

BECKEN, S., SIMMONS, D. G. & FRAMPTON, C. 2003. Energy use associated with different travel choices. *Tourism Management,* 24**,** 267-277.

BEECH, J. 2011. University starting classes in resort. *Otago Daily Times,* 19 July 2011.

BENTLEY, R. W. 2002. Global oil & gas depletion: an overview. *Energy Policy,* 30**,** 189-205.

BOVEN, R., BIDOIS, D. & HARLAND, C. 2010. A Goal is not a Strategy: Focusing efforts improve New Zealand's prosperity. The New Zealand Insitute.

BP. 2010. *Statistical Review of World Energy 2010* [Online]. BP. Available: www.bp.com/productlanding.do?categoryId=6929&contentId=7044622 [Accessed 31 March 2011].

BRANDT, A. R. 2007. Testing Hubbert. *Energy Policy,* 35**,** 3074-3088.

BRANDT, A. R. & FARRELL, A. E. 2007. Scraping the bottom of the barrel: greenhouse gas emission consequences of a transition to low-quality and synthetic petroleum resources. *Climatic Change,* 84**,** 241-263.

BRYMAN, A. 2001. *Social Research Methods*, Oxford and New York: Oxford University Press.

CALDWELL, O. 2011. Council commits $7m to cycle track. *Otago Daily Times,* 14 July 2011.

CALKINS, L. B. & FISK, M. C. 2010. Deepwater Drilling Ban Lifted by New Orleans Federal Judge. *Bloomberg,* 23 June 2010.

CALLAGHAN, P. 2009. *Wool to Weta: Transforming New Zealand's culture and economy*, Auckland University Press.

CANNAN, D. 2010. Deal better than debt: QAC chief *Otago Daily Times,* 20 November 2010.

CANT, G. & PEARCE, D. 1981. The Development and Impact of Tourism in Queenstown. University of Canterbury.

CARROLL, J. 2010. 'World is watching' NZ's first biodiesel refuelling facility. *Otago Daily Times,* 13 May 2010.

CENTRE FOR ASIA PACIFIC AVIATION. 2011. *IATA forecasts 3.3 billion pax by 2014; shift eastward with 1 billion expected in Asia* [Online]. Available: www.centreforaviation.com/news/2011/02/15 [Accessed 8 June 2011].

CHANDLER, P. 2010a. Chinese visitor numbers surge sparking tourism boost. *Mountain Scene,* 22 December 2010.

CHANDLER, P. 2010b. Strewth, mate - it's an Aussie bonanza. *Mountain Scene,* 14 October 2010.

CLEMENT, B. 2006. CAA report: 'Poor have not gained from budget flight boom'. *The Independent,* 16 November 2006.

CLOKE, P. & PERKINS, H. C. 1998. "Cracking the canyon with the awesome foursome": representations of adventure tourism in New Zealand. *Environment and Planning D,* 16**,** 185-218.

COHEN, R. & KENNEDY, P. M. 2007. *Global sociology*, New York University Press.

CONNOR, S. 2009. Economist's warning: Oil supplies are running out fast. *The New Zealand Herald,* 3 August 2009.

CRESSWELL, T. 2006. *On the move: mobility in the modern western world*, CRC Press.

CRUZ, A. & PAPADOPOULOS, L. 2003. The Evolution of the Airline Industry and Impact on Passenger Behaviour. *Passenger behaviour,* 32.

CWERNER, S., KESSELRING, S. & URRY, J. (eds.) 2009. *Aeromobilities*: Routledge.

DAWSON, B. & SPANNAGLE, M. 2009. *The complete guide to climate change*, Taylor & Francis.

DE ALMEIDA, P. & SILVA, P. D. 2009. The peak of oil production - Timings and market recognition. *Energy Policy,* 37**,** 1267-1276.

DE LA MARE, A. 1987. *Early Queenstown*, Queenstown and District Historical Society.

DELYSER, D., HERBERT, S. & AITKEN, S. 2009. *The SAGE handbook of qualitative geography*, Sage Publications Ltd.

DEPARTMENT OF INTERNAL AFFAIRS. 2011. *localcouncils.govt.nz* [Online]. Available: http://www.localcouncils.govt.nz/lgip.nsf/wpg_URL/Profiles-Councils-Queenstown-Lakes-District-Council-Main?OpenDocument [Accessed 18 January 2011].

DICKEN, P. 1992. Global shift: The internationalization of economic activity.

DRAKE, D. E. 2010. Wigley, Henry Rodolph - Biography. *Te Ara - the Encyclopedia of New Zealand.*

DUBOIS, G., PEETERS, P., CERON, J.-P. & GÖSSLING, S. 2010. The future tourism mobility of the world population: Emission growth versus climate policy. *Transportation Research Part A: Policy and Practice,* In Press, Corrected Proof.

DUSSEAULT, M. 2001. Comparing Venezuelan and Canadian heavy oil and tar sands. *Canadian International Petroleum Conference.*

EPRI 1999. Enhanced Oil Recovery Scoping Study. Palo Alta, California: Advanced Resources International.

FAIREY, P. 2009. Drilling, alternative fuels and efficiency: Can the United States wean itself from imported oil? *Energy Policy,* 37**,** 1249-1256.

FITZHARRIS, B. 2007. How vulnerable is New Zealand to the impacts of climate change? *New Zealand Geographer,* 63**,** 160-168.

FLYVBJERG, B. 2006. Five misunderstandings about case-study research. *Qualitative inquiry,* 12**,** 219.

FOX, R. 2011. Chinese focus of tourism bid. *Otago Daily Times,* 21 March 2011.

FRAME, B., GORDON, R. & MORTIMER, C. (eds.) 2009. *Hatched: the capacity for sustainable development*: Landcare Research.

FRIDLEY, D. 2010. Nine Challenges Facing the Alternative Energy Industry. *In:* HEINBERG, R. & LERCH, D. (eds.) *The Post Carbon Reader*. California: Watershed Media.

FROGGATT, A. & LAHN, G. 2010. Sustainable Energy Security: Strategic risks and opportunities for business. Lloyd's and Chatham House.

GILBERT, R. & PERL, A. 2010. Transportation in the Post-Carbon World. *In:* HEINBERG, R. & LERCH, D. (eds.) *The Post-Carbon Reader*. California: Watershed Media.

GILLHAM, B. 2000. *Case study research methods*, Continuum.

GLUCKMAN, P. 2010. Integrity in Science: Implications from and for the Climate Change Debate (Speech at Victoria University of Wellington). Office of the Prime Minister's Science Advisory Committee.

GOGIA, N. 2006. Unpacking corporeal mobilities: the global voyages of labour and leisure. *Environment and Planning A,* 38**,** 359-375.

GOLDENBERG, S. 2011. Ban Ki-moon ends hands-on involvement in climate change talks. *The Guardian,* 27 January 2011.

GÖSSLING, S., BRODERICK, J., UPHAM, P., CERON, J. & BRAMWELL, B. 2007. Voluntary carbon offsetting schemes for aviation: Efficiency, credibility and sustainable tourism. *Journal of Sustainable Tourism,* 15**,** 223-148.

GOTTDIENER, M. 2001. *Life in the air: surviving the new culture of air travel*, Rowman & Littlefield Pub Inc.

GREENE, G. 2004. The End of Suburbia: Oil Depletion and the Collapse of the American Dream.

HALL, C. & CLEVELAND, C. 2005. EROI: definition, history and future implications. *ASPO-US conference* Denver.

HALL, C. M. 2010. Tourism destination branding and its effects on national branding strategies: brand New Zealand, clean and green but is it smart?

HARES, A., DICKINSON, J. & WILKES, K. 2010. Climate change and the air travel decisions of UK tourists. *Journal of Transport Geography,* 18**,** 466-473.

HART, P. 2009a. *The National Aviation Policy: Flight Path to the Future?* [Online]. Available: http://anz.theoildrum.com/node/5161 [Accessed 26 June 2011].

HART, P. 2009b. *The National Aviation Policy: Flight Path to the Future?* [Online]. Available: anz.theoildrum.com/node/5161 [Accessed 2 June 2011].

HAY, I. 2010. *Qualitative research methods in human geography*, Oxford University Press Canada.

HEMMINGSEN, E. 2010. At the base of Hubbert's Peak: Grounding the debate on petroleum scarcity. *Geoforum,* In Press, Corrected Proof.

HENDRICKX, J. & HREINSSON, E. O. 2010. The Potential Impact of Climate Change on Seasonal Snow Conditions in New Zealand. Christchurch: NIWA.

HENSHALL, B. D. 1983. *A strategic analysis of tourism in New Zealand : tourism for tomorrow,* Wellington, The Association.

HIGHAM, J. E. S. & COHEN, S. A. 2010. Canary in the coalmine: Norwegian attitudes towards climate change and extreme long-haul air travel to Aotearoa/New Zealand. *Tourism Management,* In Press, Corrected Proof.

HODGKINSON, D., CORAM, A. & GARNER, R. 2007. Strategies for Airlines and Aircraft Emissions and Climate Change: Sustainable, Long-Term Solutions. Hodgkinson Group Working Paper.

HOLMBERGA, J. & ROBÈRTA, K. H. 2000. Backcasting from non-overlapping sustainability principles—a framework for strategic planning. *Ecology,* 7**,** 291-308.

HÖÖK, M., BARDI, U., FENG, L. & PANG, X. 2010. Development of oil formation theories and their importance for peak oil. *Marine and Petroleum Geology,* 27**,** 1995-2004.

HOPKINS, R. 2008. *The Transition Handbook: From Oil Dependency to Local Resilience*, Dartington.

HUANG, A. Y. H., CHENG, C. M., CHEN, C. C. & HU, W. C. 2010. Oil Prices and Stock Prices of Alternative Energy Companies: Time Varying Relationship with Recent Evidence.

IPCC 1999. *Aviation and the Global Atmosphere: A Special Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press.

IPCC 2007a. Climate change 2007: Impacts, adaptation and vulnerability. *Contribution of the Working Group II to the Fourth Assessment report of the Intergovernmental Panel on Climate Change.*

IPCC 2007b. Climate Change 2007: Synthesis Report.

JACKSON, T. 2009. Prosperity without growth? The transition to a sustainable economy Sustainable Development Commission.

JANELLE, D. 1968. Central Place Development in a Time Space Framework*. *The Professional Geographer,* 20**,** 5-10.

JANELLE, D. 1969. Spatial reorganization: a model and concept. *Annals of the Association of American Geographers,* 59**,** 348-364.

KESICKI, F. 2010. The third oil price surge - What's different this time? *Energy Policy,* 38**,** 1596-1606.

KESSELRING, S. 2006. Pioneering mobilities: new patterns of movement and motility in a mobile world. *Environment and Planning A,* 38**,** 269-279.

KIERNAN, G. 2008. *What price peak oil?* [Online]. Infometrics. Available: http://www.infometrics.co.nz [Accessed 28 March 2011].

KJÄRSTAD, J. & JOHNSSON, F. 2009. Resources and future supply of oil. *Energy Policy,* 37**,** 441-464.

KNIGHT, K. 2011. What lies beneath. *Sunday Star Times,* 29 May 2011.

KNOWLES, R. D. 2006. Transport shaping space: differential collapse in time-space. *Journal of Transport Geography,* 14**,** 407-425.

LAKES-QUEENSTOWN-WAKATIPU COMBINED PLANNING COMMITTEE 1986. Queenstown Living with Tourism.

LASSEN, G. 2006. Aeromobility and work. *Environment and Planning A,* 38**,** 301-312.

MACALISTAIR, T. 2010. Lloyd's adds its voice to dire peak oil warnings. *The Guardian,* 11 July 2010.

MANSVELT, J. & BERG, L. 2010. Writing Qualitative Geographies, Constructing Geographical Knowledge. *In:* HAY, I. (ed.) *Qualitative research methods in human geography*. Oxford University Press Canada.

MAUGERI, L. 2006. Two cheers for expensive oil. *Foreign Affairs,* 85**,** 149-161.

MCCLURE, M. 2004. *The wonder country: making New Zealand tourism*, Auckland University Press.

MILLAR, S. & PUCKEY, A. 2008. *A Brief Introduction to Climate Change and Peak Oil for New Zealanders,* Auckland, Sean Miller.

MINISTRY FOR CULTURE AND HERITAGE. 2007. *Holidaymakers - rail tourism* [Online]. Available: www.nzhistory.net.nz/culture/rail-tourism/holiday-makers [Accessed 2 December 2010].

MINISTRY FOR CULTURE AND HERITAGE. no date. *Full steam ahead for Kingston Flyer* [Online]. History Group of the New Zealand Ministry for Culture and Heritage. Available: www.nzhistory.net.nz/page/full-steam-ahead-kingston-flyer [Accessed 13 May 2011].

MINISTRY FOR THE ENVIRONMENT. 2009. *Climate change impacts in New Zealand* [Online]. Available: www.mfe.govt.nz/issues/climate/about/impacts.html [Accessed 5 May 2011].

MINISTRY FOR THE ENVIRONMENT 2011. New Zealand's Greenhouse Gas Inventory 1990–2009.

MINISTRY OF ECONOMIC DEVELOPMENT 2010. Draft New Zealand Energy Strategy 2010.

MINISTRY OF FOREIGN AFFAIRS AND TRADE no date. Developed Country Mitigation Workshop: New Zealands 2020 Emissions Reduction Target.

MINISTRY OF TRANSPORT 2010. The New Zealand Vehicle Fleet - Annual Fleet Statistics 2009.

MONBIOT, G., PRESCOTT, M. & SHAW, J. 2006. *Heat: How to stop the planet burning*, APS.

NEILSON, D. 1998. State Autonomy and the Mode of Political Regulation: Neo-Liberal Restructuring in New Zealand. *Studies in Political Economy,* 57**,** 45-71.

NELSON, D., ADGER, W. & BROWN, K. 2007. Adaptation to environmental change: contributions of a resilience framework.

NEW ZEALAND PRESS ASSOCIATION 2009. Kingston Flyer grinds to halt. *Otago Daily Times,* 27 August 2009.

NEW ZEALAND TOURISM 2009. Celebrating 100% Pure New Zealand. *Pure As*. New Zealand Tourism.

NEW ZEALAND TOURIST AND PUBLICITY DEPARTMENT 1967. Queenstown Tourist Survey 1966/67.

NEW ZEALAND TOURIST AND PUBLICITY DEPARTMENT 1974. Queenstown Tourist Study.

NEWMAN, P., BEATLEY, T. & BOYER, H. 2009. *Resilient cities: responding to peak oil and climate change*, Island Pr.

ORAM, R. 2007. *Reinventing paradise: how New Zealand is starting to earn a bigger, sustainable living in the world economy*, New Zealand: Penguin Books.

OTAGO CENTRAL RAIL TRAIL CHARITABLE TRUST. 2009. *Central Otago Rail Trail* [Online]. Available: www.otagocentralrailtrail.co.nz [Accessed 1 August 2011].

OTAGO WITNESS 1860. *Otago Witness,* 31 March 1860.

PAWSON, E. 1992. Time-Space Convergence in New Zealand: 1850s to 1990s. *New Zealand Journal of Geography,* 94**,** 14-19.

PAWSON, E. & BROOKING, T. 2002. *Environmental Histories of New Zealand*, Oxford University Press.

PEARCE, D. 1980. Tourist development at Mount Cook since 1884. *New Zealand Geographer,* 36**,** 81-84.

PEETERS, P. & DUBOIS, G. 2010. Tourism travel under climate change mitigation constraints. *Journal of Transport Geography,* 18**,** 447-457.

PEETERS, P., GOSSLING, S. & BECKEN, S. 2006. Innovation towards tourism sustainability: climate change and aviation. *International Journal of Innovation and Sustainable Development,* 1**,** 184-200.

PERCH-NIELSEN, S., SESARTIC, A. & STUCKI, M. 2010. The greenhouse gas intensity of the tourism sector: The case of Switzerland. *Environmental Science & Policy,* 13**,** 131-140.

QUEENSTOWN-LAKES 125TH ANNIVERSARY COMMITTEE 1991. *Queenstown Lakes Touring Guide*, Lakes District Museum

QUEENSTOWN-LAKES DISTRICT COUNCIL 2007. A Growth Management Strategy for the Queenstown-Lakes District.

QUEENSTOWN-LAKES DISTRICT COUNCIL 2010. Queenstown-Lakes District Plan.

QUEENSTOWN AIRPORT 2010. Queenstown Airport Time Line.

RAYNER, S. 2006. Wicked problems, clumsy solutions: Diagnoses and prescriptions for environmental ills. *Jack Beale Memorial Lecture on Global Environment*.

READ, C. 2010. *RE: Interview with Chris Read.*

RITTEL, H. W. J. & WEBBER, M. M. 1973. Dilemmas in a general theory of planning. *Policy sciences,* 4**,** 155-169.

ROBÈRT, K. H. 2002. *The Natural Step story: Seeding a quiet revolution*, New Society Publishers.

ROXBURGH, T. 2010. Resort courting Chinese travellers. *Otago Daily Times,* 15 December 2010.

ROXBURGH, T. 2011. All part of Hilton strategy. *Otago Daily Times,* 25 June 2011.

RYAN, S. 1971. *The Development of the Tourist Industry in Queenstown*. Master of Arts, University of Otago.

SCOTT, G. C. 1996. *Government Reform in New Zealand*, Intl Monetary Fund.

SHELLER, M. & URRY, J. 2006. The new mobilities paradigm. *Environment and Planning A,* 38**,** 207.

SMIT, B. & WANDEL, J. 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change,* 16**,** 282-292.

SMITH, C. 2010a. The Next Oil Shock. Parliamentary Research Paper.

SMITH, I. J. & RODGER, C. J. 2009. Carbon emission offsets for aviation-generated emissions due to international travel to and from New Zealand. *Energy Policy,* 37**,** 3438-3447.

SMITH, N. 2010b. *New Zealand's National Statement to COP 16: Cancun, Mexico* [Online]. Available: http://feeds.beehive.govt.nz/speech/new-zealand039s-national-statement-cop-16-cancun-mexico [Accessed 21 April 2011].

SORRELL, S., MILLER, R., BENTLEY, R. & SPEIRS, J. 2010a. Oil futures: A comparison of global supply forecasts. *Energy Policy,* 38**,** 4990-5003.

SORRELL, S., SPEIRS, J., BENTLEY, R., BRANDT, A. & MILLER, R. 2009. Global Oil Depletion: An assessment of the evidence for a near-term peak in global oil production. UK Energy Research Centre.

SORRELL, S., SPEIRS, J., BENTLEY, R., BRANDT, A. & MILLER, R. 2010b. Global oil depletion: A review of the evidence. *Energy Policy,* 38**,** 5290-5295.

SPEIGHT, J. G. 2008. *Synthetic fuels handbook: properties, process, and performance*, McGraw-Hill Professional.

STATISTICS NEW ZEALAND various dates. New Zealand Official Yearbook *Government Printer. Wellington*.

STERN, N. H. 2007. *The economics of climate change: the Stern review*, Cambridge Univ Pr.

STEWART, M. 2011. Enthusiasm for Queenstown's $5m cycle trail. *Otago Daily Times,* 25 May 2011.

THE TRAVELER'S DRAWER. 2010. *NEW ZEALAND (South Island). "Kingston Flyer" AB Class Steam Locomotive* [Online]. Available: travelerdrawer.blogspot.com/2010/11/new-zealand-south-island-kingston-flyer.html [Accessed 3 May 2011].

TIMILSINA, G. R. & SHRESTHA, A. 2011. How much hope should we have for biofuels? *Energy,* 36**,** 2055-2069.

TODD, G. 2010. *RE: Interview with Graeme Todd.*

TOURISM NEW ZEALAND 2009. Pure As: Celebrating 10 years of 100% Pure New Zealand. *100% Ten Years Young*.

TOURISM STRATEGY GROUP 2010. Key Tourism Statistics. Ministry of Economic Development.

TOWNER, J. 1985. The Grand Tour. *Annals of Tourism Research,* 12**,** 297-333.

TRANSITION TOWNS NEW ZEALAND. 2011. *What are Transition Towns?* [Online]. Available: www.transitiontowns.org.nz [Accessed 23 July 2011].

U.S. DEPARTMENT OF ENERGY. 2011. *Enhanced Oil Recovery* [Online]. Available: http://www.fossil.energy.gov/programs/oilgas/eor/index.html [Accessed 25 March 2011].

UNFCCC. no date. *Appendix I - Quantified economy-wide emissions targets for 2020* [Online]. Available: unfccc.int/meetings/cop_15/copenhagen_accord/items/5264.php [Accessed 2 June 2011].

UNWTO. Year. Davos Declaration: Climate Change and Tourism Responding to Global Challenges. *In:* Second International Conference on Climate Change and Tourism, 2007 Davos, Switzerland.

UNWTO 2009. From Davos to Copenhagen and Beyond: Advancing Tourism's Response to Climate Change - UNWTO Background Paper. United Nations World Tourism Organisation.

URRY, J. 2002. *The tourist gaze*, Sage Publications Ltd.

VERBRUGGEN, A. & AL MARCHOHI, M. 2009. Views on peak oil and its relation to climate change policy. *Energy Policy,* In Press, Corrected Proof.

VIDAL, J. 2001. WikiLeaks cables: Saudi Arabia cannot pump enough oil to keep a lid on prices. *The Guardian,* 8 February 2011.

WELLS, B. 2006. All Pumped Up. *The Petroleum Age.* The American Oil and Gas Historical Society.

WIGLEY, H. 1979. *The Mount Cook Way: The First Fifty Years of the Mount Cook Company*, Collins.

WILSON, C. 2010. *Tourism Resorts and Sustainability: a comparative study of the public policy techniques of Whistler, British Columbia and Queenstown, New Zealand.* Master of Arts, California State University, Fullerton.

WRIGHT, J. 2011. Emissions Trading Scheme Review. Parliamentary Commissioner for the Environment.

WTTC 2010. Progress and Priorities 2009-2010. London: World Travel and Tourism Council.

ZWANIECKI, A. 2005. *Economists Assess Hurricane Katrina's Economic Impact* [Online]. America.gov. Available: www.america.gov [Accessed 22 February 2011].