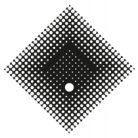

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Using a Regional Tourism Adaptation Framework to Determine Climate Change Adaptation Options for Victoria's Surf Coast

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Key Words: Climate change, adaptation framework, Delphi study, regional tourism destinations

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Introduction

Adaptation has been increasingly recognised as an important means for strategically dealing with the effects of climate change (IPCC, 2007; Scott & Simpson, 2008; Simpson, Gössling, Scott, Hall, & Gladin, 2008). Indeed the Intergovernmental Panel on Climate Change (IPCC, 2007) has indicated that all societies and economic sectors, including tourism, will inevitability need to adapt to climate change.

Whilst various general adaption frameworks exist (COAG, 2007; Lim, Spanger-Siegfried, Burton, Malone, & Huq, 2005), and some tourism adaptation frameworks exist (Simpson et al., 2008), none are reported that are specifically designed for regional tourism destinations. An exception is that proposed by Jopp, DeLacy and Mair (2010) who proposed a Regional Tourism Adaptation Framework (RTAF) model that was specifically designed to assist regional destination managers and policy makers deal with the inevitable impacts of a changing climate.

The aim of the RTAF model is to "provide a guideline for adaptation whereby the key vulnerabilities are assessed, and appropriate adaptation actions are identified and implemented, in order to increase the region's resilience and resistance to climate change risks, and increase readiness to capitalise on any opportunities presented" (Jopp et al., 2010, p. 599). This scoping paper reports on the application of the RTAF model to the Surf Coast region, within the state of Victoria, Australia, as a single case study, with particular focus on the process of identifying and assessing adaptation options.

This is achieved by reviewing the literature on tourism adaptation and climate change then summarising the RTAF model. The methods used to test the model in the Surf Coast region are then outlined. The paper then reports on an assessment of the Surf Coast's vulnerability and resilience by describing the destination's tourism system, establishing risks and opportunities and determining the destination's adaptive capacity. This is followed by summarising the results of a Delphi study on how to increase the Surf Coast's resilience, resistance and readiness to manage climate change impacts. Finally the paper summarises and discusses the results of applying the RTAF model to destination Surf Coast.

Climate Change Adaptation and Tourism

An overwhelming body of scientific evidence provides evidence that climate change is occurring and that this is almost certainly a result of an increase in greenhouse gases generated by human activities (Garnaut, 2008; IPCC, 2007; Stern & Great Britain Treasury, 2007). The travel and tourism industry is particularly vulnerable to changes in climate and impacts such as an increased global temperature, sea-level rise and increasingly intense and frequent storm events, as these are likely to cause significant bio-physical and socio-economic impacts (DeLacy, 2007). Impacts across both of these categories may affect the relevant attractiveness of a tourist destination.

The IPCC (2007) identifies two broad approaches to deal with climate change; mitigation and adaptation. Mitigation involves reducing GHG emissions in order to minimise any changes to climate, whilst adaptation reduces the vulnerability to climate change impacts by increasing the ability to cope with any potentially adverse effects. Traditionally, mitigation was seen as the best way to respond to the climate crisis, and it was thought that a coordinated global response to mitigate greenhouse gas (GHG) emissions would avoid any major negative consequences (Wilbanks et al., 2003). Mitigation was seen as key to the fight against climate change, and discussion of adaptation was kept in the background because it was seen as somewhat defeatist view, as it would only reduce the urgency of appropriate mitigation. However, adaptation is now recognised by the IPCC, and the majority of scientists and governments around the world, as a vital component of an integrated approach to tackling climate change.

Adaptation in the tourism sector

Climate change will impact all countries and all sectors to some degree, including tourism. Indeed, climate and tourism are inextricably linked, as it is the climate (hours of sun, amount of snow, etc.) which sets the boundaries of tourism potential at many destinations in terms of the range of activities that can be offered in order to meet tourist demand (Martin, 2005). As destinations do not

have the ability to relocate, clearly their ability to adapt to potential changes in climate becomes crucial. Moreover, if a tourism destination aims to remain economically, environmentally and socially sustainable it will need to adapt to climate change in order to minimise the potential risks and capitalise on potential opportunities.

Types of adaptation

Various types of adaptation suitable for the tourism sector are discussed in the literature (IPCC, 2007; Scott, de Freitas, & Matzarakis, 2006; Scott & Simpson, 2008; Simpson et al., 2008). Scott et al. (2006) describe three broad types of adaptation which are summarised in the following table:

Table 1. Adaptation types

Adaptation Type	What does It involve?	What does it require?	Examples
Technical Adaptation	This involves utilising technology and being innovative in order to determine methods of coping with climate change and vulnerability.	This often requires specialised equipment and/or the use of new technologies and innovations. Also, due to the cost and complexities of many technical adaptation options, this type of adaptation often requires government backing.	Desalination plants or snow-making machines.
Business Management Adaptation	Involves techniques used by tourism operators, regional governments and tourism industry associations to reduce vulnerability to climate change.	This may require destination managers to change their marketing approach to try and increase or decrease travel during certain times, and/or redirect tourists to different locations, or encourage them to engage in different activities.	Marketing techniques such as new pricing strategies, product/market diversification, and positioning can all be utilised.
Behavioural Adaptation	This form of adaptation is normally associated with the tourist, as they have the ability to decide on the tourism activities they engage in and where and when they do so. This ability for spatial, temporal, and activity substitution, subsequently provide tourists with tremendous adaptive capacity.	Although behavioural adaptation is generally conducted by the tourist, there are some strategies that destination managers can use to effect behaviour. This can be achieved by using the previous two types of adaptation (technical and business management) to manipulate the behaviour of tourists.	Adjusting the type of clothing worn, changing the activities engaged in, adjusting the timing of the visit, changing the destination altogether.

Adapted from Scott et al (2006)

Adaptation Models available

Although a large amount of literature exists that addresses climate change adaptation (inter alia: Becken & Hay, 2007; DeLacy, 2009; Fussel, 2009; H.-M. Fussel & Klein, 2006; Scott et al., 2006;

Simpson et al., 2008), most of these studies are either non-tourism specific, or are not designed for implementation at the regional level. Amongst these, only Simpson et al. (2008), Becken and Hay (2007), and Scott et al. (2006) have specifically developed models or frameworks for tourism adaptation. However, there is no report of their work being tested in or applied to regional tourism destinations, other than skiing destinations.

Of these models, the approach by Simpson et al. (2008, p. 35) appears to be the most comprehensive as it considers the sequence of events in adaptation as "an iterative cycle of problem definition, adaptation implementation, and evaluation of outcomes" whilst providing lines for feedback between the various stages. This model is also the most comprehensible of the models available, and detailed information on each of the steps is provided. This model does not however present information on the different types of adaptation available and this is where the work of Scott et al. (2006) is of additional benefit. Their approach includes discussion of the three main types of adaptation mentioned previously: behavioural, technical, and business management, which provides greater insight into adaptation options.

Furthermore, despite emphasising the importance of a participatory, multi-stakeholder approach Simpson's model does not consider the role of the tourist at any stage. Despite stating that "stakeholders should be sought, both those directly involved in the tourism sector or whose livelihoods are affected by tourism", tourists themselves are not included amongst the plethora of suggested stakeholders (Simpson et al 2008 p36). As tourists have been identified as having the greatest adaptive capacity of all the tourism stakeholders, it is necessary to have an understanding of how any adaptation implemented may impact on their perceptions of a destination, behaviour at the destination, or decision to travel.

The model presented by Becken & Hay (2007) differs from Simpson's, as it takes a risk science approach to adaptation. A risk science approach involves estimating the risk of various impacts, by determining the likelihood of exposure to various stressors, and the magnitude of consequences to such exposure, in order to determine risk profiles. A risk science (or risk management) approach has been widely used when examining adaptation strategies (COAG 2007, Australian Government 2007, 2005), and any adaptation framework would benefit from incorporating such an approach.

The report by Scott et al. (2006, p. 4) provides a valuable investigation of the types of adaptation available in the tourism sector. However, rather than providing a detailed framework for adapting to climate change impacts, they provide a conceptual framework for considering adaptation to changes in tourism climate.

As a result of these apparent gaps in the literature Jopp et al (2010), proposed a model for regional tourism adaptation to climate change that draws from the adaptation models previously mentioned. The following section provides a brief summary of this model.

The Regional Tourism Adaptation Framework Model (RTAF Model)

The RTAF model involves two major phases. The first assesses the vulnerability and resilience of the destination, and involves defining the tourism system, establishing the climate change risks and opportunities, and determining the adaptive capacity. The second details the process of identifying, evaluating, and implementing adaptation options in order to increase resilience, resistance and readiness (Jopp et al., 2010).

Although Figure 1 presents the framework in a linear fashion the entire process can also be considered cyclical, as the process of adaptation should be recognised as part of an ongoing approach to sustainable tourism development (Jopp et al., 2010). This is considered important as key elements of each stage of this process are likely to change over time. For example, the key stakeholders in the tourism system will undoubtedly evolve over time as various governments, departments and organisations come and go. Collective knowledge of potential risks and opportunities will also develop in time, as further research clarifies many of the uncertainties surrounding climate change impacts. Finally, the development of new technologies may increase a destination's adaptive capacity; likewise a change in local, state or federal government may see a change in political will to address the concerns of climate change.

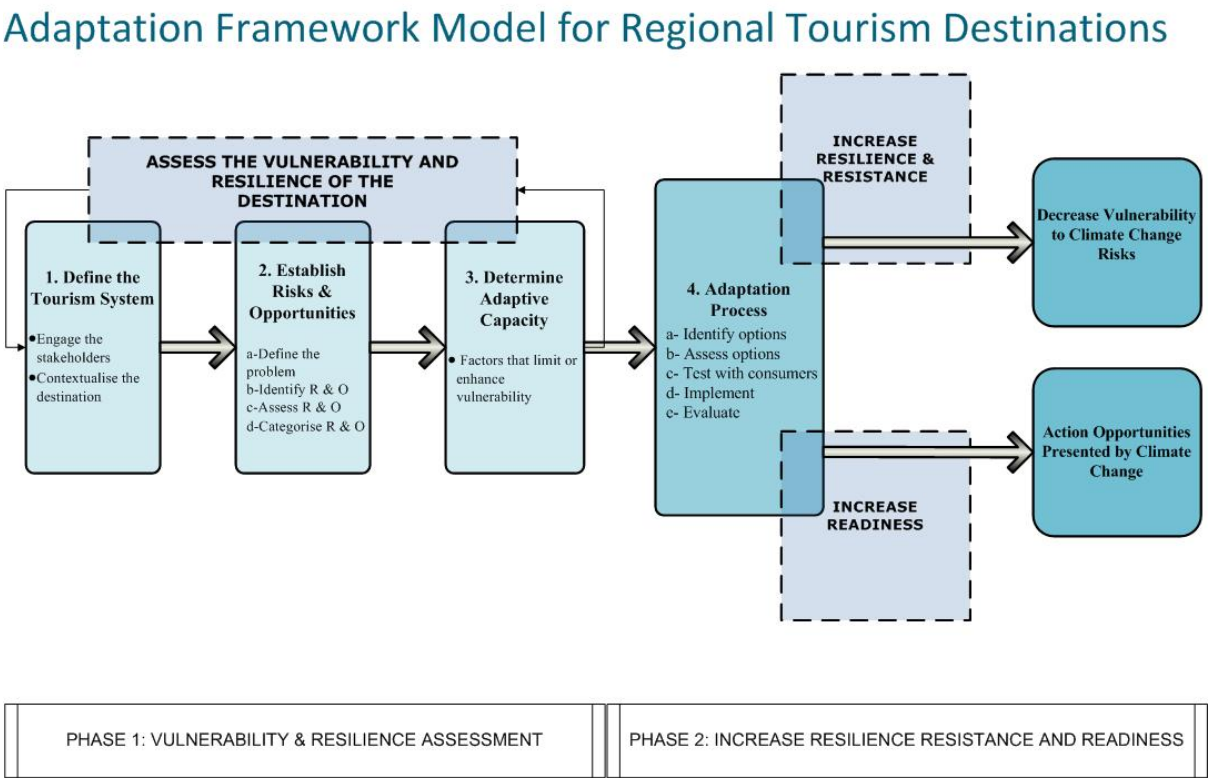

Figure 1. The Regional Tourism Adaptation Framework (RTAF) Model (Jopp et al., 2010)

Methodology

In order to test the RTAF framework it was applied to a single destination-specific case study: the Surf Coast region near Melbourne, Australia. Firstly, the vulnerability and resilience of the destination was assessed using the RTAF model and then strategies were recommended to increase the destinations resilience, resistance and readiness.

A descriptive case study such as this requires multiple sources of evidence (Yin 1993) therefore secondary data was sourced from regional/local tourism offices, local councils, local environmental/conservation officers, Tourism Victoria, and others, before primary research via stakeholder interviews and an expert Delphi study was conducted. This is important as case studies are designed to bring out the details from the viewpoint of the participants using multiple sources of data (Tellis 1997).

The Surf Coast region was chosen as a case study as it is vulnerable to a wide range of potential climate change impacts and is typical of many regional, coastal tourism destinations. For example, changes from impacts such as sea level rise, storm surge, erosion and inundation, are generalisable to most coastal tourism destinations. Although social, political and economic factors, as well as some impacts, will be destination specific, the common goal of developing an appropriate adaptation

framework will involve similar issues of sustainability, stakeholder consultation, tourist satisfaction, and policy development.

The Delphi technique, first developed by the Rand Corporation for the US Air force in the 1950's (Hasson, Keeney, & McKenna, 2000; Veal, 1997), and was applied to the second phase of the RTAF model to identify and assess the available adaptation options. The Delphi technique was chosen as it is an efficient method of producing creative solutions by combining individual responses in order to produce a pooled group response (Miller, 2001; Wedley, 1980). Simpson (2008, p. 43) also suggests that "Delphi techniques with key stakeholders and potential implementing partners can also be used to identify adaptation options."

The major advantage of the Delphi technique is that it keeps participants unknown to each other, and therefore individuals respond independently without influence from others involved. This reduces the effect of domineering personalities who may act as opinion leaders and influence the responses of others involved. The other advantage is that participants may be located in widespread geographic locations, as questions may be administered by phone, Skype, email, fax or post.

There are also limitations or weaknesses of the Delphi technique. These weaknesses as stated by Hsu & Sandford,(2007) include the potential for low response rates due to the multiple feedback process and the possibility of indentifying general statements versus specific topic-related information. As the expertise and knowledge of participants is likely to vary the Delphi technique is designed to provide a general perspective on an issue rather than a specific explanation.

Despite its limitations, the Delphi technique has been commonly adopted in medical, nursing and health services research (Hasson et al., 2000), as well as some areas of business and technological forecasting (Veal, 1997). It has also been used by various tourism researchers including Weber and Ladkin (2003), Miller (2001) and Tideswell, Mules, and Faulkner (2001).

The application and results of the Delphi study are outlined later in this paper.

Phase 1: Vulnerability & Resilience Assessment

As displayed in Figure 1 the first phase the RTAF model comprises 3 distinct stages: (1) Defining the tourism system (2) Establishing the risks and opportunities, and (3) Determining the adaptive capacity. The following sections will describe each stage of the vulnerability and resilience assessment for the Surf Coast region.

Defining the Tourism System

The Surf Coast Shire includes a major section of the Great Ocean Road, which is the fastest growing tourism region in the state of Victoria (www.parkweb.vic.gov.au, 2009). The Surf Coast as a destination is a product constructed from a composite of interconnected elements brought together by a variety of stakeholders, all of which will be impacted (either directly or indirectly) by climate-induced changes, fluctuations in resource availability and multi-scaled responses to these changes.

Every tourism system comprises the following five basic elements (Leiper, 2004):

1. *Tourists* – the essential human element;
2. *Tourist-generating Regions (TGRs)* – geographical place where a tourist's trip begins and usually ends;
3. *Tourist Destination Regions (TDRs)* – geographical places where a tourist's main visiting activity occurs;
4. *Transit Route Region* – transit routes and infrastructure tourists use to travel between tourist-generating Regions and Tourist Destination Regions; and
5. *Tourism Industries* – collection of organisations and businesses that facilitate the creation, management and delivery of the purchased tourism product.

The elements of the Surf Coast tourism system and their linkages are mapped out in Figure 2. This figure also provides information on a number of external environments within which tourism occurs. Changes in these environments may cause changes in the way tourism is provided and consumed (Richardson & Fluker, 2008). The model attempts to clarify the complex relationship between the various elements in the whole tourism system, whilst demonstrating that tourism does not exist in a vacuum and is affected by various environments, including climate.

Each element of the tourism system is embedded within a wider socio-political, economic and environmental context that shapes every aspect of the system from the tourist's desires and expectations through to legal parameters of travel (for example visa requirements, airline emissions standards and flight curfews), tourism planning policy and process structures, and economic revenue flows that run through the economic goods and services value chain.

Whilst tourism activity does centre on the Tourist Destination Region, the impact and consequences of severe "shocks" such as cyclones or bushfires, and more slow-onset "stressors" like global warming and sea-level rise, on one part of the system often reverberates throughout the entire system. Accordingly it is imperative to identify the main components that make up the Surf Coast

tourism system and to understand the interlinkages and relationships that exist between these elements, as well as the contextual environments within which the system operates.

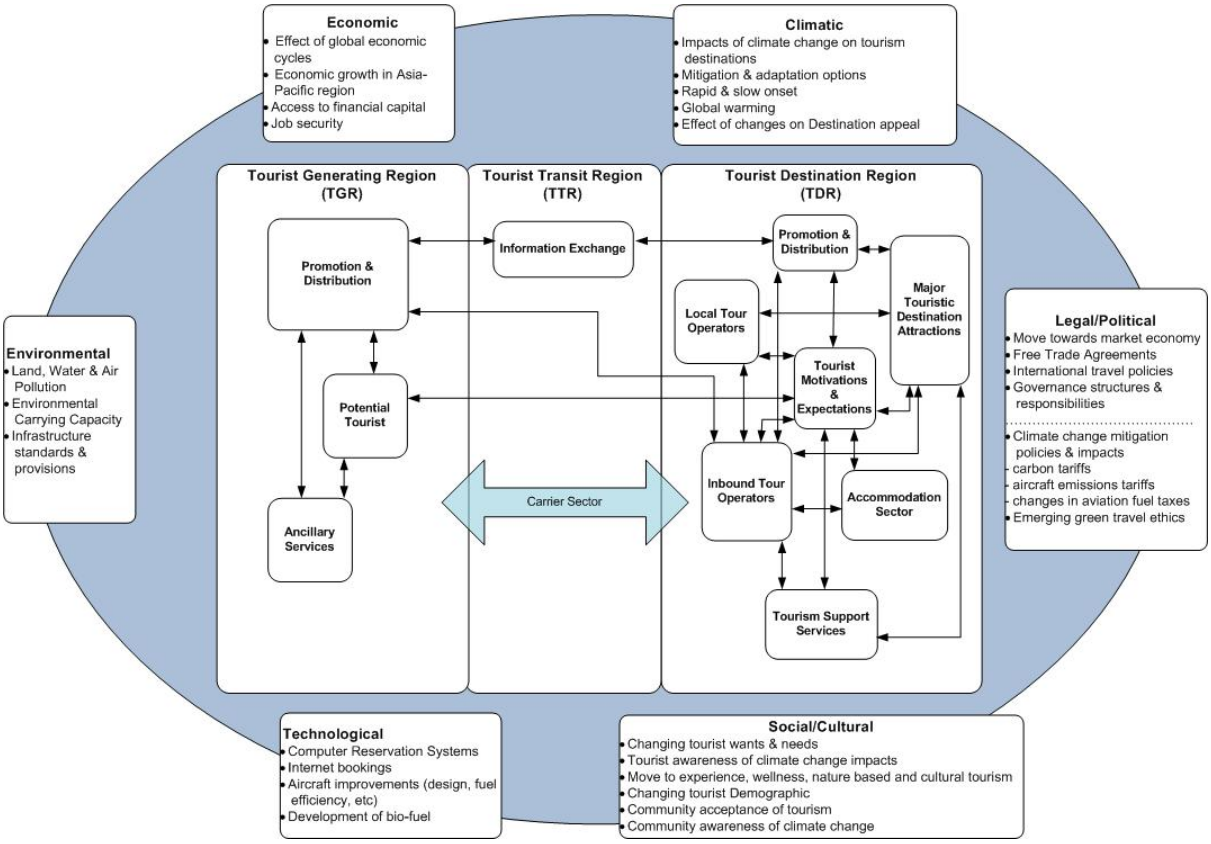

Figure 2. The Surf Coast Tourism System

Once the tourism system is defined at the relevant stakeholders engaged, the next stage involves evaluating the potential impacts of climate change on tourism within the Tourism Destination Regions.

Establish Climate Change Risks & Opportunities for Surf Coast Tourism

The Surf Coast region has been selected for this case study as it is considered a major tourist destination, receiving more than 1.3 million visitors each year (Tourism Alliance Victoria, 2008), and because it is vulnerable to a range of climate change impacts. The Surf Coast, like many Australian tourism destinations, has a coastal orientation. Australian tourism surveys (Henrick *et al*, 2000) indicate that, of the ten most popular attractions to international visitors to Australia, eight are within a coastal zone, including the Great Ocean Road (part of the Surf Coast). Coastal destinations are especially vulnerable to climate change related impacts such as storm surge inundation and erosion (Voice *et al*, 2006).

Tourism within the Surf Coast region is also very vulnerable to bushfires, which are forecast to become more frequent and intense as a result of climate change (Cioccio *et al*, 2007; DeLacy and Jago, 2007). Many of the Surf Coast's major coastal townships are bound by highly bushfire susceptible forests on their northern border.

The Surf Coast offers a "spectacular coastline, scenic rainforests and magnificent beaches, and is one of the major tourist draw cards of Australia" (Surf Coast Shire, 2008). The natural physiography of the region is a core attractor for many tourists, with a drive along the Great Ocean Road being on most visitors "must do list" when visiting Victoria. The natural environment and landscape of the region forms the essence of its appeal, and it is vital to the long term competitiveness of the Surf Coast as a destination that appropriate resource stewardship exists to protect such valuable tourism assets. This is largely the responsibility of public agencies such as Parks Victoria and the Department of Sustainability and Environment (DSE).

The Surf Coast region has a relatively high dependence on tourism, and is vulnerable to a range of different climate change impacts. In 2006, tourism equated to $258 million in tourist expenditure (Geelong Otway Tourism, 2007). This expenditure is estimated to directly support 800 full-time and part-time jobs, and indirectly support up to 1040 jobs (ibid). The review of vulnerability to climate change impacts is divided into two sections: (1) The bio-physical dimension which looks at environmental fragility, and changes to the natural environment, and (2) The socio-economic environment which looks at the vulnerability of different social groups and economic sectors such as transportation and accommodation.

Table 2 provides a summary of the key climate change impacts, both bio-physical and socio-economic, that are likely to influence the vulnerability of Surf Coast Tourism.

Table 2. Potential climate change impacts for Surf Coast Tourism

Climate Change Impact	Predicted outcome for Surf Coast Tourism
Bio-Physical Impacts	
Rainfall	*Rainfall*- Dependent on the rate of emissions average annual rainfall is expected to reduce by 4% to 12% (DSE, 2008). Furthermore, according to the DSE (2008) fewer rainy days are expected, with more droughts, however the intensity of heavy daily rainfall is likely to rise, impacting on soil erosion.
Temperature	*Temperature*- Victoria is expected to become warmer with more hot days and less cold nights (Australian Government, 2009). This will likely lead to more extreme heat days and fewer frosts. By 2030 average annual temperatures for the Surf Coast region will be approximately 0.8 degrees warmer (DSE, 2008).
Sea-level rise	*Sea-Level Rise*- Global sea levels are predicted to rise 0.18 to 0.59 metres by 2095 (DSE, 2008). The Victorian coastline is likely to see an increase in erosion of beaches and sand dunes, and inundation of fresh water systems (*ibid*).
Storm Surge	The frequency and intensity of storms and storm surges are predicted to increase (DSE, 2008) Increasing sea levels, combined with more frequent severe storms, are likely to impact on both environmental assets, and coastal infrastructure.

Bushfire	*Bushfire*- Climate change predictions by the CSIRO suggest that the Surf Coast region will become hotter and drier, creating perfect conditions for more frequent and intense fire storms (DSE, 2008).
Water	*Water*- Lower rainfalls and higher temperatures may also reduce water quality and accessibility.
Bio-diversity	Climate change will effect bio-diversity on many levels, from individuals to ecosystems (DSE, 2008). The most susceptible will be those with restricted or specialised habitat requirements, poor dispersal abilities, and small populations (*ibid*).
Socio-economic impacts	
Settlements	The aforementioned impacts will have numerous direct and indirect impacts on human settlements throughout the Surf Coast region. Impacts may include damage to infrastructure such as roads, lifeline infrastructure such as water and power, and beachside dwellings. The Australian Government (2009) suggests that the area of land subject to inundation due to sea-level rise and storm surge is likely to increase by 4-15% by 2030.
Destination Appeal	Favourable climatic conditions at tourist destinations are key to their appeal, particularly at beach destinations, which are still the dominating form of tourism. Changing climatic conditions can affect the appeal of a destination in either a positive or negative manner, as improved or deteriorated conditions affect seasonal demand. For example increasing average temperatures could lengthen summer seasons at beach locations across the Surf Coast, reducing seasonality issues. However, the increased threat of extreme weather events, such as bushfires, could negatively impact demand.
Consumer Behaviour	Increased public awareness and understanding of tourism's link with climate change may bring about significant changes in tourist motivations and behaviour. In particular in relation to emissions from long-haul flights.
Policy Response	Changes to national and international policy in regards to a carbon tax, and carbon trading, are likely to impact on the cost of air travel. A carbon tax on aviation fuel would particularly affect long-haul flights to Australia due to the high level of emissions.

Although the negative impacts of climate change appear to outweigh the positive impacts, it is also important for destination managers to identify any opportunities brought about by climate change. Whether this is decreasing seasonality or an increasing number of suitable beach days, understanding the implications of climate change for tourism, both positive and negative, is necessary to gain a complete picture of possible impacts and therefore enable appropriate adaptation. The effect of various climate change impacts will also be largely dependent upon the regions ability to adapt, consequently the next section will examine the regions adaptive capacity.

Adaptive Capacity

Destinations such as the Surf Coast are limited in their ability to adapt, as unlike tour operators or tourists themselves, they do not have the ability to relocate (Scott et al., 2006; Scott & Jones, 2006). Whilst individual adaptation will be dependent on personal knowledge and values, a destinational adaptation approach is more complex, simply due to the number of stakeholders involved. The adaptive capacity of a destination incorporates diverse elements, including the capacity to limit exposure to risks associated with climate change, absorb and recover from losses stemming from climate impacts, and capitalise upon opportunities that arise through the process of adaptation (Simpson et al., 2008). The key elements determining the adaptive capacity for the Surf Coast tourism system include:

- High level of economic development
- Relatively high level of dependence on tourism for income and employment
- Highly climate dependent tourism resources (i.e. beaches and forests)
- High degree of seasonality
- Diverse tourism markets (intrastate, interstate, international)
- High level of access to technology and resources
- Committed and knowledgeable local and regional tourism departments
- Comprehensive tourism research and marketing programs in place
- Physical adaptation of Great Ocean Road somewhat restricted by natural landscape (ocean on one side, cliffs on the other)
- Strong relationships with other local and regional tourism regions, enabling the sharing of information and knowledge
- Moderate degree of flexibility in terms of available tourism product

Due to the dynamic and complex nature of tourism systems these elements cannot be easily quantified, however the factors outlined aim to provide a broader understanding of the context of the destination with the whole tourism system.

Phase 2: Increase Resilience, Resistance & Readiness

The second phase of the RTAF model involves the process of adaptation. Whilst the adaptation process displayed in the model (Figure 1) illustrates a 5 stage process; the remainder of this article will focus solely on the first two components of the adaptation process: identifying and assessing the adaptation options. Further research is planned to test the adaptation options with tourists and the implementation and evaluation components will be decided upon by destination managers and policy-makers based upon the overall findings of the research. Therefore the following section will discuss the use of a Delphi study conducted in order to first identify and then assess the adaptation options available for tourism within the Surf Coast region.

Delphi Study used to identify and assess adaptation options

In order to identify and assess potential adaptation options a Delphi technique was used. This involved consultation with relevant experts in the fields of climate change and destination management to assist in the initial development of adaptation strategies (Jennings 2001; Veal 1997). These experts provided an independent view on climate change and adaptation, which enabled the development of potential adaptation scenarios.

Group members were presented with an overview of the potential impacts of climate change on the Surf Coast region, as well as information on the current tourism system and the regions adaptive capacity, as identified in phase 1. This information was provided via an information portal (website)

designed specifically for the project. Each stakeholder was then asked to contribute ideas and opinions regarding the best options for adaptation. This approach entailed two stages in order to enable knowledge sharing between the various experts and encourage the generation of useful ideas (Jennings, 2001; Veal, 1997).

As a part of the process, the responses from earlier rounds were summarised and fed back to participants in consequent rounds. This process of controlled feedback was repeated until a consensus was reached (Hasson et al., 2000).

Selection of the expert panel

The selection of appropriate subjects for the expert panel is considered key to the success of the entire Delphi process as it relates directly to the quality of the results generated (Hsu & Sandford, 2007). Furthermore, in choosing the panel, it was necessary to have a balanced representation of experts with different backgrounds, who were able to provide a range of opinions (Miller, 2001). A list of potential panel members was initially developed from the existing networks of the Centre for Tourism and Services Research (CTSR) in Melbourne, Australia. Potential participants were then contacted by phone to determine their interest and availability to be involved in the project. Panelists were expected to have a solid working knowledge across at least two of the three following areas:

1. Climate change adaptation
2. Tourism
3. The Surf Coast Region

The purpose of this combination was to ensure a good balance of expertise and knowledge across the various fields being investigated. It was also necessary to ensure a good mix of backgrounds with no more than three participants sharing the same profession or geographic location. A total of nine experts consented to the study. They were chosen from various domestic and international organisations including, Universities, the United Nations World Tourism Organisation (UNWTO), the Intergovernmental Panel on Climate Change (IPCC), Tourism and Transport Forum (Australia), Tourism Victoria, and Geelong-Otway Tourism (the local tourism board). Each participant was sent an email containing information on the study, including the appropriate ethics clearance. As mentioned previously, panel members were also provided detailed background information on the study via the specifically designed information portal.

The Delphi Process

The first round of the Delphi study involved a semi-structured interview. These interviews were conducted in person where possible, otherwise telephone or Skype meetings were organised (three

of the panel lived outside Australia). The interviews lasted between forty minutes and an hour, which allowed participants to talk freely about their concerns and ideas for action. The aim of the first round of the study was for the participants to express what they thought were the main issues for Surf Coast Tourism as a result of climate change and what were potential adaptation options.

Initially a checklist of potential impacts was considered and any supplementary impacts discussed. This was followed by the interviewee proposing a list of adaptation options designed to manage both l climate change risks and capitalise on any potential opportunities.

Interviews were transcribed and coded in order to quantify the different climate change impacts and adaptation options mentioned. Once the first round results had been collected and collated, the second round survey was distributed to participants. Participants were asked to rate the potential effect of each of the climate change impacts discussed in the first round and then state whether they favoured or opposed the various adaptation options. A five point ~~likert~~ Likert scale was used. The survey involved the following three questions:

1. What sort of effect are the following climate change impacts likely to have on Surf Coast Tourism?
2. Please tell us your opinion of the following adaptation options for Surf Coast tourism considering the potential risks associated with climate change.
3. Please tell us your opinion of the following adaptation options for Surf Coast tourism considering the potential opportunities associated with climate change?

The rating of each potential climate change impact is presented in figure 3 where the likely impact on Surf Coast tourism is presented on a continuum between 1 representing 'No impact at all' and 5 representing a 'Severe Impact'. The top ten ranked impacts, in terms of their potential effect are provided, with the remaining impacts amalgamated, and presented in the bottom row titled 'Other'.

The second question aimed to determine how strongly panel members favoured or opposed the adaptation options aimed at minimising the risks associated with climate change. Unlike the first question, all eleven adaptation options initially discussed in round 1 are rated and included in this discussion. The scale used for this question ranged from 1 (Strongly Agree) to 5 (Strongly Oppose).

The third and final question asked refers to adaptation options that could be implemented to capitalise on any potential opportunities that may arise as a result of climate change. This represented an important component of the research as many adaptation frameworks took a risk minimisation approach to adaptation, neglecting to recognise the potential opportunities that may arise. The scale used for this question was the same utilised for question 2.

Results of the Delphi study

The majority of impacts and adaptation responses discussed were in relation to the bio-physical environment; however socio-economic factors such as the effect on destination appeal and the need for greater awareness and education throughout the tourism system were also proposed. From a solely bio-physical perspective there was almost unanimous agreement that the Surf Coast's major threats were bushfire and coastal management issues. The most commonly identified climate change impacts likely to affect Surf Coast tourism were bushfire, coastal erosion, sea-level rise and storm surge.

Fire presented a major risk not only to property and human life, but also to destination appeal. Adaptation strategies suggested include opening up new or different tourism areas that are less vulnerable to fire, increasing fire-fighting capacity and developing awareness campaigns for tourists. Other adaptation responses included early warning systems, risk minimization strategies, and "no-grow" zones around properties. However, the most commonly identified adaptation options involved the use of controlled burning (reducing fuel load in low risk fire season) and fire breaks.

In regard to coastal management issues such as sea-level rise, increased storm surge and coastal erosion, a number of adaptation options were also presented, such as the construction of sea walls or the development of improved weather monitoring and early warning systems.

Finally, a range of opportunities resulting from climate change were identified. The three common suggestions were: (1) the ability to capitalise on the emergence of the so called "green" consumer; (2) the opportunity to take market share from competing coastal destinations, and (3) the potential to decrease seasonality and extend the peak summer season.

Discussion of the Delphi results

The first round of the Delphi study yielded a variety of responses in regards to potential adaptation strategies ranging from broad over-arching business management and policy responses to technical impacts and/or destination specific responses. Whilst, the second round largely confirmed the priorities regarding adaptation, several issues that were discussed broadly during the interviews were largely neglected during the online survey.

Interestingly, the top ten impacts identified as likely to have an effect on Surf Coast tourism all scored above 3, indicating that there was a consensus amongst the panel that each of the climate change impacts proposed in the survey would have at least a moderate effect on Tourism in the region. However, two of the potential impacts that were thoroughly discussed during the first round,

increased temperature and species loss, were not rated highly enough by the panel to be considered amongst the ten most influential impacts on tourism in the region.

Perhaps unsurprisingly bushfire was identified as potentially having the greatest impact on Surf Coast Tourism (mean = 4.25). This was also the most discussed impact during the initial interviews in round 1 of the Delphi study. The technical adaptations to counteract the increased risk of bushfire also rated highly, with the use of fire breaks and controlled burning, as well as the use of early warning systems both scoring an average score of 1.38. As described in Table 1 technical adaptations usually involve utilising technology and being innovative in order to determine methods of coping with climate change and vulnerability.

Storm surge and coastal erosion were also identified as potentially having a major impact on Surf Coast tourism; both averaging 4.0. This indicated that participants thought both impacts were likely to have a major impact on tourism at the Surf Coast. Adaptation in this area was seen as a priority due to the major role coastal attractions and activities play in forming the appeal of the Surf Coast.

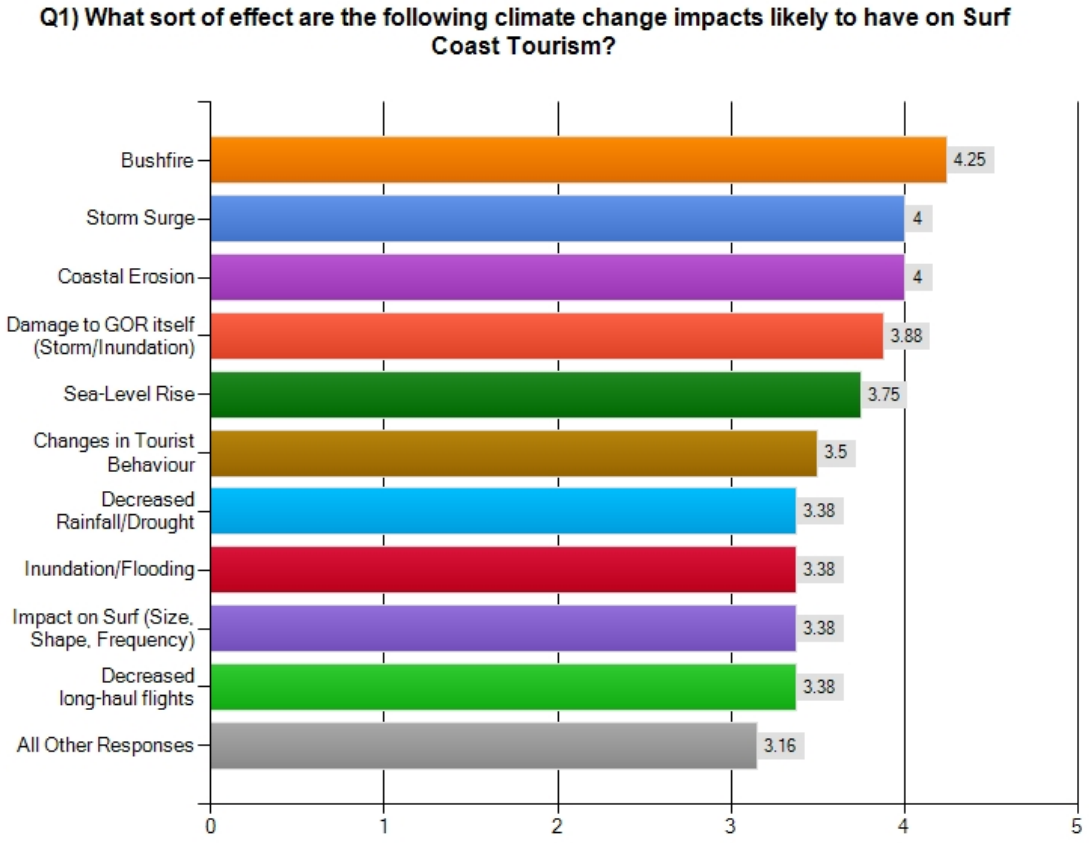

Figure 3. Rating of climate change impacts likely effect on Surf Coast Tourism.

As can be seen from figure 4 communication of likely impacts with various stakeholder, including tourists, along with the implementation of future planning that incorporates action planning and smart design were the most strongly favoured adaptation options, both receiving an average score of 1.12. Interestingly, both these options fall under what Scott et al. (2006) identify as Business Management forms of adaptation. These are techniques that can be used by tourism operators, regional governments and tourism industry associations to reduce vulnerability to climate change (See table 1).

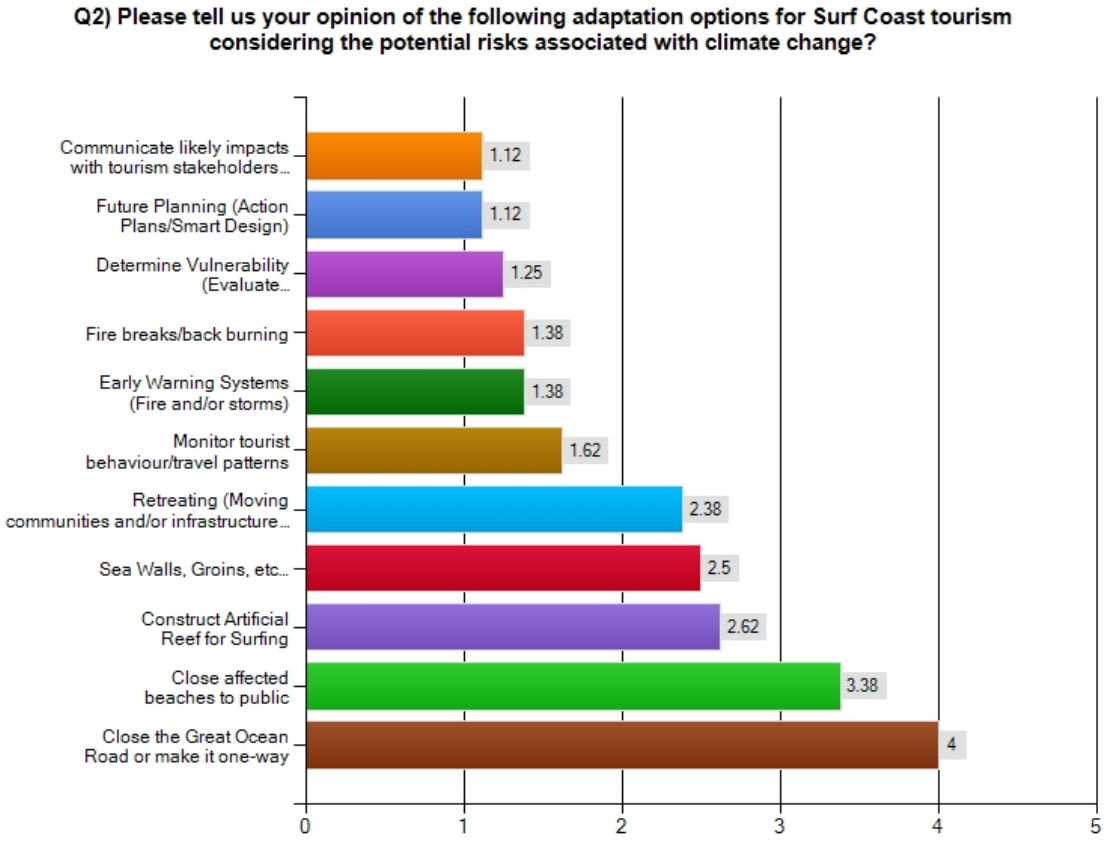

Figure 4. The popularity of various adaptation options.

The most strongly opposed adaptation options were clear, and both involved a reduction in amenity for potential tourists. Closing the Great Ocean Road (GOR) or making it one-way was the most strongly opposed adaptation option (Mean = 4.0). However, in hindsight this question may have been better worded, and perhaps the closure of the GOR given a timeframe and/or further explanation, as clearly the permanent closure of the road would dramatically impair tourism throughout the region. Similarly, given the relative importance of beaches for providing the

appropriate setting for many of the Surf Coast's major touristic activities such as swimming and surfing, it is not surprising that this adaptation was also opposed (3.38).

In terms of capitalising on potential opportunities brought about by climate change, the most strongly favoured adaptation option (1.38) focused on increased promotion of the tourism off season in order to decrease seasonality issues. It is a characteristic of most tourism destinations that demand fluctuates greatly between seasons of the year (Middleton, 2001), consequently it is perhaps not surprising that any potential ability to decrease seasonality is seen as an opportunity. This adaptation option initially arose through discussion of a warming climate and the possible extension of the peak summer period. Such an opportunity would certainly be influenced by other factors, such as the timing of public and school holidays. However, if the weather at either side of the traditional summer peak period was to improve, and conditions for popular activities such as swimming and going to the beach remained favourable, then potentially the region could reduce seasonality issues by encouraging tourists to visit during these shoulder periods.

Another highly rated adaption opportunity identified by the expert panel was the opportunity to position the region in order to capitalise on the growth of the so-called "Green Tourist". Debate over the existence of the green consumer has been widespread (Bergin-Seers & Mair, 2009; Straughn & Roberts, 1999; Swarbrooke & Horner, 1999) however there is no doubt that in recent years environmental issues such as climate change have come to the forefront of public debate (Bergin-Seers & Mair, 2009). As a consequence of this, there is little doubt that the public both here in Australia, and globally, are becoming increasingly knowledgeable and aware of climate change issues. Moreover, this is impacting on their attitudes and behaviour, which in turn represents both challenges and opportunities for producers and marketers of tourism products.

Indeed the influence of climate change on consumer behaviour can be seen as an extension to so-called 'Green Tourism' whereby tourists became more environmentally aware, and consequently the tourism industry began supplying 'environmentally friendly' products marketed towards this new segment (Andereck, 2007; Straughn & Roberts, 1999; Swarbrooke & Horner, 1999). Furthermore, recent research predicting that climate change will influence tourist behaviour and choice of destinations (Amelung, Nicholls, & Viner, 2005; Berrittella, Bigano, Roson, & Tol, 2005; Hamilton, Maddison, & Tol, 2005; Hamilton & Tol, 2004; McEvoy, Cavan, Handley, McMorrow, & Lindley, 2008) presents destination managers with new marketing opportunities and challenges. This provides strong evidence to support the assertion by Jopp et al. (2010) that possible adaptation options should be tested with consumers before being implemented.

It could also be argued that the high degree of support for developing new target markets (1.62) could be associated with the potential to capitalise on the so called 'green tourist'. However, further research is needed to determine if there are other potential market segments, that the Surf Coast is currently not targeting, that may warrant greater attention given the potential impacts of climate change.

Undoubtedly adaptation may not only be used to minimise the risks of adverse climate change impacts, but also to capitalise on opportunities that may present themself. Furthermore, these opportunities will become more apparent as the uncertainty surrounding climate change impacts dissipates. Moreover, improved climate change science, along with continued research into the potential effects on tourist behaviour, will undoubtedly realise further opportunities that will help offset the many challenges brought by climate change.

Figure 5 demonstrates the relevant popularity of each of the adaptation options, in terms of their ability to capitalise on potential opportunities for Surf Coast tourism, as a result of climate change.

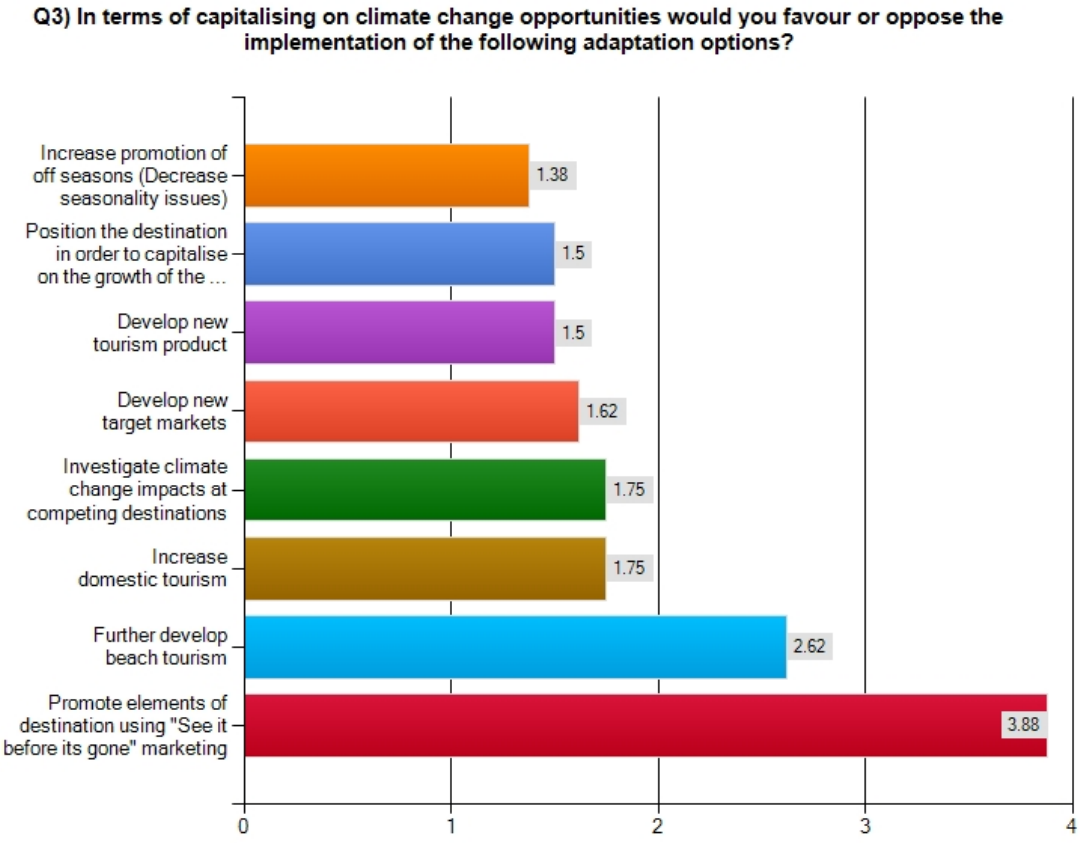

Figure 5. The popularity of various adaptation options that capitalise on climate change opportunities.

Conclusions

The various impacts resulting from climate change are a major concern for the development of regional tourism destinations. Lack of attention to these possible impacts may lead to a degradation of the very resources that the destination relies upon to attract visitation. Changes across the entire tourism system may permeate through to the destination itself, justifying the need to take a holistic approach to adaptation. Furthermore, climate change may indeed present opportunities for tourism destinations, and adaptation that capitalises on these opportunities may assist in off-setting the negative impacts associated with climate change.

This paper has applied the RTAF model to the Surf Coast region and through this process identified numerous adaption options, both bio-physical and socio-economic. The model provided a step-by-step guide to increasing a destinations resilience and resistance to climate change impacts whilst also increasing readiness to capitalise on potential opportunities. The iterative process of gathering information, both qualitative and quantitative, provides decision makers in the tourism industry a means of improving their preparedness for, and subsequent management of, consequences that are a result of climate change. Indeed, the implementation of any chosen adaptation option would need to coincide with appropriate marketing strategies. This is where research into consumer attitudes towards various adaptation options would be invaluable in both helping to understand the preferences of different groups and in creating targeted promotional campaigns.

Upon a review of the literature it was determined that the Delphi technique was the appropriate tool for identifying and assessing appropriate adaptation strategies to assist with the management of potential climate change impacts, as it allowed for the major issues to be identified and clarified. Whilst the results do not provide a definitive answer as to the correct adaptation option/s to implement, they do provide valuable insight into the potential opportunities, and would likely assist decision makers in planning for a sustainable future. Tourism destination management is already a complex area, involving an array of stakeholders, and the introduction of climate change provides yet another challenge for both managers and policy-makers. Consequently the development of a regional adaptation framework for tourism destinations to evaluate and incorporate the range of adaptation options is deemed to be of valuable contribution to knowledge. However, before decisions are made regarding adaptation strategies, the options identified through the application of the Delphi study must be tested with consumers. Ultimately, it is the tourist who decides whether or not to visit a destination, and as a consequence it would be ill-advised to implement any major adaptation strategies without investigating their potential impact on destination choice.

Limitations & Further Research

The limits of this research largely involve the incomplete application of the RTAF model. Whilst all components of the model were discussed, the focus of this paper was largely on identifying and assessing potential adaptation options for the Surf Coast region. This meant that the final three components of the adaptation process described in the RTAF model, test with consumers, implement, and evaluate, were unable to be tested. As such, this is a scoping paper that reports on the first part of a larger study. Therefore future research has been planned whereby the adaptation options put forward by the Delphi panel are tested with the consumer. Whilst this research is planned for late 2010, any resulting implementation of the suggested adaptation strategies would remain a matter for destination managers and policy-makers responsible for Surf Coast tourism. The authors intend to work with destination managers to this end during 2011.

It is also recognised that although the Delphi study involved a range of experts with knowledge of both climate change and the Surf Coast region, it may also be beneficial to conduct further community consultation, in order to gain an all-inclusive view on potential adaptations. This could involve surveying residents and/or conducting focus groups of business owners living in the region for more than five years.

A further limitation that could be posited is the lack of research into the regions adaptive capacity. It is recognised that the adaptive capacity of the region would play a significant role in deciding upon the eventual adaptation strategies, and consequently before advancing to the implementation stage further research in this area would be warranted.

Finally, whilst this research found the RTAF model an effective and useful guide to adaptation in destination Surf Coast, the model will need to be applied to other tourism destinations to ascertain its generalisability.

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