



Perspectives on Second Homes, Climate Change and Tourism in South Africa

Gijsbert Hoogendoorn*

Department of Geography, Environmental Management and Energy Studies
University of Johannesburg
P.O. Box 524
Auckland Park
2006
Email: ghoogendoorn@uj.ac.za

Jennifer M. Fitchett

School of Geography, Archaeology and Environmental Studies
University of the Witwatersrand
Private Bag x3
Wits
2050
Email: jennifer.fitchett@wits.ac.za

*Corresponding Author

Abstract

Second homes tourism comprises an important component of the discourse in tourism geographies, since its re-emergence in the literature in the late 1990s. Second homes are often situated in amenity-rich areas within pristine natural environments along coastal areas, river banks and lakes. However, these 'untouched' environments within remote rural municipalities are often characterised by limited financial capital and thus a weakened adaptive capacity to adapt to the increasing threats of sea level rise, flooding, drought and storms, which are projected to amplify in severity and frequency under climate change. Second homes often involve large once-off capital investments, which coupled with their permanent physical location heightens the climate change vulnerability of the owners. We therefore argue that second homes tourism is particularly vulnerable to the threats of climate change. This article considers the potential impact of climate change on second homes in a variety of localities in South Africa, through a critical integration of the existing literature on both second homes and climate change and tourism for South Africa. Through outlining the key areas of concern, the researchers map out possible adaptation strategies for second home owners.

Key words: second homes, climate change, tourism, adaptation.

Introduction

Second homes are the foundation of tourism development in many locations globally (Müller and Hoogendoorn, 2013). Research into second homes tourism, as a contemporary form of tourism and migration, has seen significant increase in investigation globally since the late 1990s (Hall and Müller, 2004; Müller and Hall, 2018a). A substantial portion of this work has focussed on issues of the 'curse' or the 'blessing' of second homes; reflecting on the negative and positive



impacts on rural communities respectively (Coppock, 1977; Hoogendoorn and Visser, 2015). A key component of second homes research has been the classification of different types of mobilities and forms migration that second home owners take part in. Globally, second home tourism often involves migration during summer months to regions with a more ideal climate for outdoor activities; this includes British citizens with second homes in southern France and Spain; Americans migrating from the cooler northern states to southern states such as Florida, and Swedes spending their summers on islands such as Malta (Åkerlund, 2013; Müller and Hall, 2018b). Similarly, second home tourism can capitalise on seasonal weather conditions for recreational purposes, including vacation houses in mountainous regions for skiing during the winter months (Lundmark and Marjavaara, 2005). Weather and climate thus play an important role in the different types of second home oriented migrations and mobilities such as 'lifestyle mobilities' (Åkerlund, 2013), especially 'snowbird mobility' (McHugh and Mings 1996), as well as the selection of a second home location, and the timing of peak usage of the second homes. Second homes are often located in amenity rich areas along the coast, rivers, lakes and pristine natural environments with often more suitable climates than the owners' primary homes (Marjavaara and Müller, 2007). However, the topography of these locations and their reliance on climate as an amenity makes both the regions as whole, and the second homes in particular, vulnerable to the impacts of climate and environmental change.

Weather and climate are often mentioned in second homes literature, yet little work has directly explored the significance of climate and weather in second home tourism, nor reflects on the threats of climate change to the future of this tourism sub-sector. This is despite the concurrent growth of literature on both second homes tourism, and tourism and climate change (Hall, 2014; Fang, Yin and Wu, 2017). At the time of writing (April/May 2018) only two published papers investigate the influence that climate change may have on second home tourism. The first interrogates second home owners' perceptions of the threats of sea-level rise and coastal flooding in south-eastern France (Rey-Valette et al., 2015). The key findings explore issues around community mobilisation and a general lack of adaptive capacity (Rey-Valette et al., 2015). The second, more recent paper, explores the vulnerability of second homes to tropical cyclone events such as Superstorm Sandy in the United States (Cheong, 2018). While these papers do pick up on key issues around climate change and tourism, they focus on the more tangible impacts of sea level rise and extreme climatic events, and negate the slower and more insidious impacts of temperature gradually exceeding human comfort levels, changes in mean annual precipitation patterns, and changes in wind speed, that comprise some of the key concerns in climate change and tourism literature (Hoogendoorn and Fitchett, 2018). These longer-term impacts of climate change are often cited to occur outside of the lifespan of commercial tourism (Hoogendoorn et al., 2016), yet in the case of once-off capital investments for second homes, should represent issues of equal concern.

A substantial body of literature has accumulated over the past 15 years exploring second homes tourism in South Africa, spanning the social, economic and environmental dimensions (Hay and Visser, 2014; Visser and Hoogendoorn, 2015; Long and Hoogendoorn, 2013). However, as with the global literature, the environmental impacts of and threats to second home ownership have remained under-reported, and considerations of the role of climate are largely absent, this lack of research is possibly because researchers have been planners and tourism geographers not environmental scientists. The projected impacts of climate change both globally and local to South Africa include sea-level rise, extreme climatic events, changes in precipitation patterns, and mean temperature increases (Neumann et al., 2015; SAWS, 2017). These climate changes have an already tangible impact on tourism in South Africa (Hoogendoorn and Fitchett, 2018), and thus would necessarily impact second home tourism too. The researchers argue, however, that the impact is intensified in the case of second homes, where a large capital investment is made once-



off with the intention to return to the same location for many years to continue to enjoy a particular natural amenity. The adaptation strategies from the perspective of the tourist, which include changing of travel destination and timing following accounts of poor weather, are thus not an option (Giddy et al., 2017a). The adaptation possibly for large hotel chains, including installation of temperature control measures, building of retaining walls, and potentially moving location, is arguably not always possible to the individual property owner who often gains no income from the second home property. Moreover, in the South African context, the small towns that characterise many second home destinations are plagued by limited resources and capital infrastructure at the municipal level, and hence a lowered adaptive capacity to climate change threats on a regional scale (Hoogendoorn and Visser, 2016). A deliberate investigation into the threats of climate change to second home tourism in South Africa is thus imperative, both in determining the level of vulnerability for the individual second home owner, and in ensuring the financial sustainability of the small towns that are economically reliant on the seasonal expenditure associated with this tourism and the rates and taxes income.

South Africa does not have an official database of all its second homes as is the case in countries of the global North, such as Sweden (Hoogendoorn and Visser, 2011a; Hoogendoorn and Marjavaara, 2018). Therefore, it is not possible to conduct widespread modelling of second homes clusters across in the country, especially in terms of projected future climate change. Second homes research in South Africa has, for the most part, involved self-constructed databases compiled by researchers using municipal rates and taxes listings. This paper is therefore essentially an opinion piece attempting to merge current debates on second home tourism in South Africa with the current outputs on the impact of climate change and tourism.

Climate change and weather in South Africa and its impact on tourism

South Africa is situated at the interface of the sub-tropics and the temperature mid-latitudes, and bounded by the warm Agulhas Current of the Indian Ocean to the east and the cold Benguela Current to the West. Consequently, the climate of South Africa is highly heterogeneous, characterised by a winter rainfall zone in the southwest, a year-round rainfall zone along the southern coast, and summer rainfall conditions throughout the remainder of the country and a significant east-west reduction in precipitation amount (Fitchett et al., 2017). Temperatures are controlled by a complex combination of latitude, altitude, aspect and continentality, with the ocean currents further compounding the variability between coastal regions. The projected climate change for the region is therefore highly spatially variable. Although a net temperature increase is projected for the whole country, the magnitude of warming varies by approximately 2°C, with the maximum intensity of heating centred in the northwestern sector of the country, and the lowest intensity along the coastline (SAWS, 2017). Rainfall projections are more disparate, with a net increase in mean annual precipitation that is most intense in the north western sector of the country and along the east coast, while reductions in mean annual precipitation are projected for the remainder of the country, with pockets of high intensity reductions interspersed along the eastern interior (SAWS, 2017). A heightened frequency of extreme events is forecast for the region, including a greater frequency of floods, droughts, wildfires and high intensity tropical cyclones (Kasungaya et al., 2014; Fitchett, 2018). Concurrent to these direct, climatic fluctuations induced by climate change are the secondary effects of the warming trend on melting land ice, which in turn results in global sea level rise, which is estimated to exceed a ~1m increase in mean sea level by 2100 (Neumann et al., 2015).

Although relatively late in its emergence, research on climate change impacts on tourism in South Africa has explored many of the key threats outlined above (Hoogendoorn and Fitchett, 2018), although albeit with often small-scale, local case-studies rather than country-wide analyses.



These local case studies include the modelling of sea level rise induced flood risk to two coastal towns in the Eastern Cape Province (Fitchett et al., 2016a), tropical cyclone induced damage to property in the Mopani District Municipality of Limpopo Province (Fitchett et al., 2016b), and a more generic flood risk to small regions in Limpopo Province (Southon and Van Der Merwe, 2018). Where broader in reach, studies tend to focus on key tourist activities, such as white water rafting (Giddy et al., 2017b). In an effort to better quantify climate change threats to tourism at a wider spatial scale, and to integrate the South African research in global discourse, the application of Tourism Climatic Index modelling to South African tourism destinations has been conducted (Fitchett et al., 2017) and critically reviewed (Fitchett et al., 2016c).

A key research finding has been the disjunct between the perceptions of tourists and tourism operators, and between local and international tourists (Hoogendoorn et al., 2016; Giddy et al., 2017a), a point of concern in terms of efforts towards adaptation and the long-term mitigation of climate hazards. The research has also highlighted the flexibility of the modern tourist, and the impact of rapid access to information in allowing tourists to select a destination best suited to their needs, and to change their bookings during their trip due to poor weather (Fitchett et al., 2016b; Giddy et al., 2017a). Although model outputs indicate that the South African climate is currently 'very good' to 'ideal' for tourism, this arguable heightens the threat of climate change to the sector, due to the reliance on climate as a tourism asset (Fitchett et al., 2017). The frequent analysis of small-scale accommodation establishments, including guest houses, B&Bs and backpackers, highlights the role of a low income turnover, and low capital reserves in hindering both short term investment in small-scale adaptatory means, and long-term mitigation of progressive threats such as sea level rise (Fitchett et al., 2016a,b). Where adaptation is taking place, it is often at a scale inappropriate to prolonged climate change, or addressing issues which are relatively insignificant in the context of the potential hazards (Hoogendoorn et al., 2016).

While many of the threats of climate change to tourism that have been identified in both the local and global literature arguably apply to second home tourism, a number of key distinguishing factors must be outlined. First, the literature on climate change and tourism increasingly highlights that the primary adaptatory response of a tourist to climate change is to alter the destination that they are travelling to in the long term, and to cancel or change their bookings in the short term (Bigano et al., 2009; Giddy et al., 2017a). Second home owners represent a group distinct to the average tourist in that rather than selecting a potentially unique destination for each vacation, they return to their second home, which is a necessarily fixed asset (Müller, 1999). Although a second home owner does arguably have the potential to sell their second home and buy elsewhere, a reduced climatic suitability of a second home destination prompting the owner to sell would likely devalue the property in the region. Thus, a second home tourist has a lowered flexibility in their choices, and a heightened financial cost associated with a reduction in climatic suitability. Second, second home infrastructure is unique from most tourism infrastructure in that it is used by the owner, and hence represents a cost rather than income source. The difficulties that small accommodation establishments face in raising the capital to implement adaptatory measures are thus similarly felt by second home owners, who additionally often do not benefit from deriving consistent income from the property to the extent of guesthouse income (Bieger, Beritelli and Weinert, 2007). Finally, much of the motivation for purchasing a second home lies in creating a retreat in a quiet, aesthetically pleasing environment, often with a small array of preferred outdoor activities on offer; for tourists who do not own second homes, vacation destinations can be more varied, and allow the tourist to follow their activity through a range of destinations (Vepsäläinen and Pitkänen, 2010). This again heightens the vulnerability to climate change, as potentially the motivations for selecting the destination could rapidly be eroded due to climate change.

Climate change threats to second home tourism across South Africa

As no empirical research has been conducted to quantify the climate change threats to second home tourism in South Africa, we explore the potential threats for a selection of second home dominated towns across the country (Figure 1) on the basis of a combination of their bioclimatic zones, the tourism assets, and the climate change projections. For background information on the history on the towns previously studied, please refer to Visser and Hoogendoorn (2015), and for the most comprehensive climate change projections see SAWS (2017).

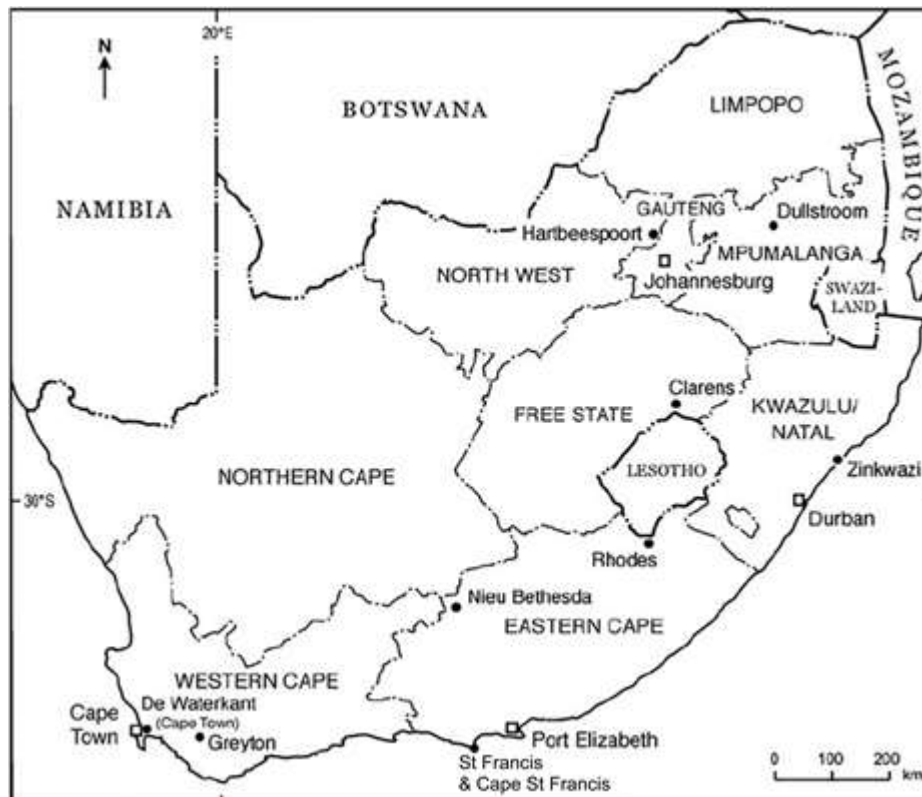


Figure 1: Map of second homes towns mentioned in this study (Source: Authors)

Rhodes Village, Eastern Cape

A key example of a town that will face a wide array of climate change threats is Rhodes village in the Eastern Cape. Second homes comprise the foundation of both the tourism economy, and the overall municipal income, of the village (Hoogendoorn and Visser, 2010b). This has induced a significant local reliance on tourism income, to a large extent derived through second homes. Over and above the income from rates and taxes income that bolsters the municipal economy, second home owners often employ permanent residents to look after their properties, maintain gardens and domestic workers are also employed. Second homes also offers rental accommodation to ski tourists and trout fishermen that visit this area on a regular basis. These tourists, comprising the second home owners, their guests, and short term leasees, will then spend money within the town during their stay on food, provisions and while partaking in local tourism activities (Hoogendoorn, Marais and Visser, 2009).

Rhodes village is located in one of the valley-heads of the Eastern Cape Drakensberg Mountains, at the foot of slopes that comprise the Tiffindell ski resort, an attraction that brings tourist passage

through the town. Rhodes has attracted second home owners over many years through a combination of a pristine natural environment, the aesthetically unique mountain backdrop, and exciting fishing opportunities. This therefore represents a town which is highly reliant on climate for the continued sustainability of ski tourism at Tiffindell, outdoor tourism in the case of fishing, and for the aesthetic value of the rural countryside. Moreover, as a mountainous destination, the town experiences very cold winters, and is highly reliant on the local rivers for water supply. Heightened climate variability under climate change thus poses a further threat to sustained 'livable conditions' in the town, under compromised resource availability.

Rhodes village is located within a region that is projected to experience moderate increases in temperature, and a net reduction in mean annual precipitation over the coming half century (SAWS, 2017). The coupled drought probability and increase in temperatures poses a direct threat to trout fishing, an important component of the tourist economy of region (Du Preez and Lee, 2010). The Wild Trout Association manage the vast majority of the fisheries in the region, and host an annual four-day festival, usually in mid-March, for which period catch-totals are recorded (Figure 2). The impact of drought conditions on the catch numbers are notable, particularly during El Nino years. For example 2016, an extreme drought year in the Rhodes area, caused by one of the most severe El Nino events globally, anglers only caught 93 trout with an above average number of anglers attending the festival. By contrast, in 2013, a La Nina year with an above-average mean annual rainfall, 1726 trout were caught with less anglers in attendance than in 2016. Catch rates in general decrease throughout the year, and increased temperatures put trout under stress which essentially means that fewer anglers visit the region and as a result rent fewer second home bed nights. The size of trout also systematically declines in years of drought, which is unattractive to anglers who preferentially target trophy trout (Hoogendoorn, 2014). Under heightened climatic variability, which is posited to increase the severity of El Nino conditions, a mean annual reduction in precipitation and an increase in temperature, these patterns in contemporary catch totals present a worrying outlook for the sustainability of trout fishing in the region, and in turn the sustained tourist income. Moreover, for the second home owners who have invested in property in Rhodes Village specifically for the trout fishing activities, this may represent both a personal loss to their tourism enjoyment, and a financial loss though the devaluation of their property.

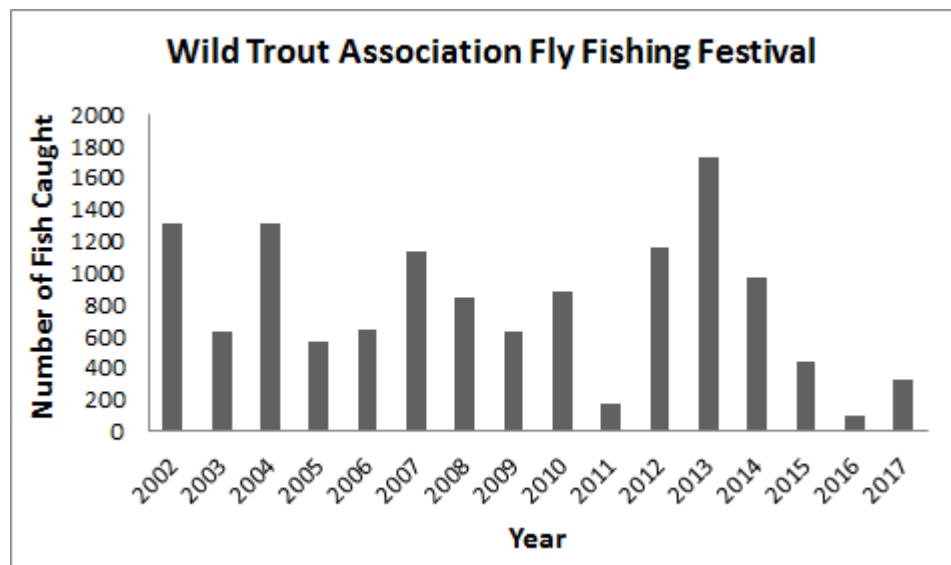


Figure 2: Annual Wild Trout Association Festival catch totals (2002-2017) (Source:Dave Walker)



The second climate change threat to second home tourism in Rhodes Village derives from the secondary income and tourism activities provided by Tiffindell Ski Resort. Tiffindell Ski Resort opened for business in 1993, was closed between 2010-2013 due to financial difficulties, and has subsequently been operating again. During the period of closure, a significant economic decline was felt in Rhodes Village (Hoogendoorn, 2010). Threats of climate change to snow tourism in this marginal alpine environment are thus of economic concern to both the second home owner, and the town as a whole. The increase in temperature and reduction in humidity resulting from the mean annual precipitation reduction hamper the process of artificial snow production, increase the rates of evaporation and sublimation of the snow, and thus are likely to reduce the length of the ski season. Although there are a range of more capital-intensive adaptational responses possible, such as snow factories, it may not be possible in the medium to long-term due to cost. The region has experienced on-going competition from AfriSki located in the Eastern Lesotho Highlands, which would represent a viable alternative for tourists who have not made capital property investments in the region. For second home owners who have invested in the region to allow frequent access to the ski slopes, this would represent a significant loss.

St. Francis Bay, Cape St. Francis, Eastern Cape coast

Climate change threats to tourism in St Francis Bay and Cape St Francis have been explored in the context of registered accommodation establishments, primarily comprising guesthouses and B&Bs (Fitchett et al., 2016a; Hoogendoorn et al., 2016). While the concerns for these accommodation establishments are centered around their economic viability under climate change induced damage to property and tourism suitability (Fitchett et al., 2016b), many of the threats will be felt by second home owners too. The greatest threat to property is posed by sea level rise (Fitchett et al., 2016a). With a 2,798km coastline where the majority of South Africa's second homes are situated (Visser, 2006), sea level rise is a concern for second homes across the country. In the case of St Francis Bay and Cape St Francis, the low relief of the two towns, the close proximity of beachfront houses to the shoreline, and the network of canals throughout the town heightens the risk of sea-level rise induced flooding both directly and indirectly through storm surges (Fitchett et al., 2016a).

However, prior to flooding (which is anticipated within a 50-100 year time frame), the aesthetic quality and primary attraction of the towns as beach tourism destinations will be compromised through the associated coastal retreat and beach erosion (Hoogendoorn et al., 2016). Thus, as is the case for Rhodes village, the environmental characteristics which prompted second home owners to invest in the region and secure a regular vacation destination are likely to deteriorate, which will both compromise their vacation experience and potentially reduce their property value. On the basis of a similar coastal geomorphology, these threats are shared by a number of second-home towns along the southern coast of South Africa including Knysna and Plettenberg Bay.

Where sea level rise presents a tangible threat to property, a slower, less-visible change in the mean climatic conditions of the destination will also compromise the vacation experience in the years to come. St Francis Bay and Cape St Francis represent one of the few second homes towns for which the Tourism Climatic Index (TCI) has been applied. While the TCI returns scores in the category of 'very good', a net decline in climatic suitability for tourism is calculated spanning recent decades (Fitchett et al., 2017). Given the significance of ameliorable weather in facilitating beach tourism, the decline in climatic suitability should be carefully monitored as a point of concern. Moreover, TCI or similar climatic suitability indices should be modelled for a greater number of second home towns.



Nieu Bethesda, Eastern Cape

Nieu Bethesda is a small town in the rural western part of the Eastern Cape province situated in the semi-arid Karoo region with a strong second home presence (Irvine et al., 2016). The second home tourism in the town remains under-researched except for one study (Hoogendoorn and Visser, 2010a). Nieu-Bethesda is relatively unique in that, situated in the semi-arid Karoo, climate suitability was unlikely a primary motivation for investment in this town. Second home owners and permanent residents are relatively accustomed to high temperatures and aridity, and can therefore be assumed to have developed a certain level of resilience. It could also be argued that second home owners were well aware of heat in the Sneeuberg region, but nevertheless chose to purchase second homes in the town. The primary motivations for investment in second homes in this town were to break away from both the metropolitan centres within the region (eg. Port Elizabeth) and more major cities further away such as Durban and Johannesburg. A diverse range of rural outdoor activities are on offer, but horse-riding is the primary attraction (Hoogendoorn and Visser, 2010a).

Despite the perceived heat-tolerance of second home owners in Nieu-Bethesda, temperature increases in the range of 2-4°C, as are projected for the region within the half century (SAWS, 2017), would exceed human comfort thresholds for most months of the year. This in turn would result in a heightened reliance on infrastructure to resist the outdoor climate, including fans and air conditioning, and an increase in water consumption among both humans and animals. This presents what we envisage as the primary threat of climate change to second home tourism in the town - a heightened resource consumption. Resource consumption, here limited broadly to electricity and water, has direct impacts on second home owners through an increase in their municipal accounts during the periods of occupation. This heightened expenditure may yield an investment that once had affordable overheads increasingly too costly to maintain. The secondary impacts are through the current limitations in resource availability, which with a heightened demand could lead to blackouts and water restrictions on the one hand, and conflict with primary homeowners on the other. While new opportunities may emerge out of this climatic change, for example possibly desert tourism developing as a result of desertification (Hambira, 2017), such shifts in the climatic marketing for tourism and the adaptatory measures for its sustainable implementation should be carefully considered.

Clarens, Free State

Clarens, located in the Eastern Free State, arguably represents one of the more climate-change resilient second home locations in South Africa. Characterised by a temperate climate, the changes in rainfall and temperature within coming decades are unlikely to result in considerable changes to the net climatic suitability of the destination or induce severe resource restrictions. Moreover, unlike the majority of second home locations that are selected for outdoor attractions, the primary attractions in Clarens, and the principal motivation for investment in second homes, relates to retail and cultural tourism (Hoogendoorn and Visser, 2004; 2011c). Consequently, changes in temperatures can more easily be moderated infrastructurally due to the indoor nature of these activities, and the amount of rainfall, cloud cover and sunshine hours are less relevant than, for example, a beach destination. The unique tourist offerings moreover represent a niche sector, which is likely to protect the investment value of the second home properties through these climatic changes, and return a relatively consistent secondary income supply through rentals to tourist. A few outdoor activities on offer: include whitewater rafting that with water supplied by the Lesotho Highlands Water Project (LHWP) yielding a consistent, year round flow; hiking, although more strenuous under warmer temperatures, is likely to continue to attract tourists as the geological landforms provide a unique setting which is not climate-sensitive;



and activities such as trout fishing are marginal to the tourism economy of Clarens, and thus while recent droughts have had severe impacts on the tourism sector nationally, this town has not been affected to the same extent.

De Waterkant (Cape Town), Western Cape

De Waterkant has seen persistent research focus since the 1990s investigating leisure, second homes and degaying (Visser, 2016). Located in the City Bowl of Cape Town, De Waterkant is unique from the other second homes destinations in this paper, in that it is a suburb within a large city, rather than an isolated self-sufficient town (Visser, 2004). Consequently, the second home owners both benefit and detriment from shared resources. The drought of 2016-2018 has highlighted the well-documented vulnerability of the city to the relatively low water availability and rapid urbanization (Mukheibir & Ziervogel, 2007; Sorensen, 2017). Although not the most severe drought in recorded history, the population density in the city bowl, which is heightened by tourism, has resulted in a water crisis with governmental threats of a day zero for water availability in the city during 2018 announced prior to the seasonal summer rains (Wolski, 2018). Although desalination is being explored, the scale and size of desalination plants may not sufficient for water security to residents, let alone tourists and second home owners (Sorensen, 2017).

In addition to the stresses of water shortages and the water resource consumption amongst tourists, the mean climatic suitability of Cape Town for tourism is, quantitatively, among the worst for South Africa and declining. Tourism Climatic Index (TCI) scores calculated for the city demonstrate no net change over the period 1966-2015, yet recalculated for the most recent decade indicate a decline at 0.18 units per year (Fitchett et al., 2017). This decline in TCI scores is driven by a reduction in climatic suitability in both summer and winter; an progressive increase in summer temperatures is now more frequently resulting in conditions exceeding the human comfort level, while winter temperatures remain unsuitably cold coupled with rainy conditions, and a low number of sunshine hours (Fitchett et al., 2017). The impacts of progressive climate change on the climatic suitability is somewhat uncertain. Increased temperatures will further compromise the TCI scores for the summer months. However, if the summer rainfall that followed the 2016-2018 drought becomes a more frequent pattern, which is possible under sustained Antarctic sea ice retreat, the TCI scores for winter months may improve. Although Cape Town offers a wide range of outdoor activities, as metropolitan centre it could be argued that there would remain strong benefits to second home owners even under adverse climate conditions, and these properties relatively easily to standard rental to residents of the city bowl.

Greyton, Western Cape

The town of Greyton in the Western Cape province has shown significant change over its 160+ year history, and in recent years has become reliant on retirement migration, second home ownership and tourism (Donaldson, 2009). Following the fall of apartheid, the town experienced a property boom (Donaldson, 2018), resulting in an increased strain on the natural resources. The water usage is especially problematic because of persistent drought in the Western Cape threatening both the supply of irrigation and potable water in Greyton (Prins, 2017). While second homes contribute significantly to the economy of Greyton it can also be argued that the maintenance of water infrastructure for what can be argued is an 'inessential purpose' is problematic (Wolfe, 1977), especially if it effects local communities negatively. One of the most economically fruitful ventures in Greyton driven by both tourism and agriculture is the Saturday Morning Market (Hoogendoorn and Visser, 2010a). The agricultural community of Greyton and farmers from Overberg region supply different types of fresh produce to the markets and second home owners support this event. However, with persistent drought the consistent supply of fresh



produce may be put into jeopardy and this invariably negatively affects the tourism economy of Greyton.

Hartbeespoort, North West

Hartbeespoort presents yet another relatively unique example; in this case, second home owners are already noticeably affected by deteriorating environmental conditions. The Hartbeespoort Dam is the primary tourist attraction in the region, and was the motivation for investment in second homes with access to a range of water activities and amenities (Long and Hoogendoorn, 2015). These direct and indirect amenities have been compromised by severe water quality degradation, derived from pollution influx from the Jukskei river that flows through Johannesburg (Long and Hoogendoorn, 2014). This pollution, coupled with unmaintained sewerage systems and poor agricultural practices including the leaching of fertilisers has yielded a hyper-eutrophic classification for the water body, requiring substantial and regular capital input to restore and control the water quality (Hart and Matthews, 2018).

Although second home owners are already familiar with environmental threats to the quality of the vacation and the value of their property, climate change may worsen these effects. For the second home owners who have already considered selling their homes for over half a decade due to the reduction in the aesthetic value of the area and the hindrance to their water sport activities (Long and Hoogendoorn, 2013), climate change may accelerate this process, leading to a further devaluation of the market. Climate change threats to crop growth require an increased frequency and intensity of fertilizer use (Schlenker and Lobell, 2010). This coupled with a heightened incidence of severe storms (SAWS, 2017), creates the ideal conditions for frequent, high concentration nitrogen run-off into the dam, worsening the current eutrophication potential. These challenges play out at a destination for which not only outdoor attractions, but specifically water-based sports, present some of the sole motivations for sustained tourism and in turn economic sustainability.

Dullstroom, Mpumalanga

The tourism destination image of the 'Highlands Meander', and in particular the town of Dullstroom, is based around fly-fishing for trout (Butler, 2017; De Jager, 2010). With over 1200 trout dams in the Highlands Meander (Rogerson, 2002), an entire weekend migration economy has developed, spearheaded by second home owners and visitors from Johannesburg and Pretoria. Weekend migration, a form of second home ownership through Trout Syndication, has consequently become commonplace in and around Dullstroom where a group of second home owners buy properties with trout fishing available, and share properties in a type of timeshare or share block arrangement (Hoogendoorn, 2010). The very heavy reliance on fishing, an outdoor activity, and trout in particular, which have a constrained thermal threshold range, makes this form of second home ownership, and the economic sustainability of the town, particularly susceptible to climate change. With moderate temperature increases forecast for the region for the next few decades (SAWS, 2017), stocked trout face heat pressure, which with no opportunity for natural migration results in population stress and high levels of trout mortality. This is especially the case small dams that heat up quicker during short-lived heat waves, and will retain the heat over prolonged warmer periods. This, it could be argued, results in trout syndicates and trout lodges having to stock more regularly, which increases operation costs. Warm temperatures also make trout lethargic (Bear et al., 2007) which increases the difficulty to catch trout, which leads to a less enjoyable experience for anglers. Although larger dams will mitigate these effects in the short-run, albeit at large capital cost, continued warming will likely threaten trout survival in the long run. Coupled with these temperature increases is one of the most severe forecasts for net precipitation



reduction in the country. While this reduces the incidence of cloud cover and rainfall, factors which hamper the index quantified climatic suitability of a destination, particularly for outdoor activity, it is likely to progressively compromise both dam water levels and water resource availability in the town. Although the town is slowly diversifying into retail offerings, the significance of trout fishing poses a serious threat to the sustained success of the destination.

Zinkwazi, KwaZulu-Natal

Zinkwazi was originally developed in 1903 as a town exclusively for second homes for residents from Durban and Pietermaritzburg (Hoogendoorn et al., 2005). Situated along the eastern coast of South Africa, Zinkwazi represents one of the few second homes towns for which tropical cyclones present a threat. Although at the southernmost limit of the region that is affected by tropical cyclone landfall, trend analysis for the south west Indian Ocean demonstrates a distinct southward trajectory in the landfall of these storm systems, heightening the storm risk for locations along the South African east coast in future decades (Fitchett and Grab, 2014). Associated with tropical cyclone landfall are wind speeds in excess of 120km/hr, heavy rainfall and storm surges (Fitchett et al., 2016b). Coupled with the threats that sea level rise poses to coastal second home towns, and in particular beach-front properties, storm surges heighten and bring forward the timeline on flood risk. While TCI scores for nearby St Lucia and Durban indicate very good to ideal conditions, extreme events have more sudden and longer lasting impacts on regional tourism, and result in direct damage to property (Fitchett et al., 2016b). Preliminary, unpublished research for the town indicates a low level of climate change preparedness within the tourism sector, and a general lack of concern for climate change threats.

Feasible adaptation/mitigation measures for second homes in South Africa

Research on the environmental impacts of second homes have increased over the past decade (Huhtala and Lankia, 2012; Jeong et al., 2014). However, despite being worldwide phenomenon, linkages between second homes tourism and climate change remain scarcely reported, especially from an adaptation perspective. Certainly there is validity in Müller's (2004) point that second homes do not necessarily pose new environmental impacts, particularly in the case of converted second homes. However, the duplication of resources intrinsic in second home ownership undoubtedly contributes to greenhouse gas emissions, solid waste and wastewater production (Hiltunen, 2007:248) and heightened water consumption. Travel to and from second homes on a relatively regular basis, as would be necessary to derive benefit from this investment, further results in increased vehicular carbon emissions. Although the role of transportation in carbon emissions applies to most forms of tourism, this is especially relevant to second home ownership as the personal car is the main form of transport to second homes across the globe. Moreover, Hiltunen (2007:248) argues that the impacts of tourism on the natural environment coincide with second home tourism more broadly; arguing that there '*exists pressure on the natural resources in the form of energy and water supply, land use and soil erosion as well as that second home tourism could harm wildlife and habitats, and reduces natural diversity*'. There is thus a very strong imperative for second home owners both in South Africa and globally to implement of a variety of measures to both mitigate their role in contributing to climate change, and to adapt to the impacts that climate change may have on the climatic suitability of the town they have invested in, the sustainability of the primary attraction, and the resource availability. We present a few key adaptation strategies that derive from the broader climate change and tourism literature for the region.



Second homes that are situated in coastal destination, especially those with sea, river or lagoon frontage face primary threats from sea level rise. Retaining walls present a valuable intermediary solution to adapt to future storm surge events and progressive sea-level rise induced flooding and inundation (Hoogendoorn et al., 2016). However, property-based retaining walls not only reduce the aesthetic appeal of the sea front property, but are often insufficient to prevent long-term flooding (Hoogendoorn et al., 2016). Government intervention at the municipal scale is thus necessary to afford an adaptatory approach that is viable in the longer-term. Such approaches could include the installation of a South African invention, the *Dolos*, to create barriers between the ocean and coastal communities, including second home owners, and the reinforcement of road and bridge infrastructure (Fitchett et al., 2016a,b). None of these infrastructural adaptations will protect against the coastal retreat and progressive reduction in beach size and quality that occurs prior to property flooding (Fitchett et al, 2016a). Fortunately, a large proportion of the South African coast as it is relatively well guarded against sea level rise because of the rocky of shorelines (Bustamante and Branch, 1997).

The most severe impact as a result of climate change for second home ownership and the economies surrounding this type of tourism is drought. A large proportion of South Africa is set to become more arid by 2050, concurrent with increases in temperatures (SAWS, 2017). This paired with a heightened frequency of severe climatic events, complex relationships between South African climate and ENSO, and a reduction in Antarctic sea ice extent, results in a significant threat of frequent and severe drought events across the already water scarce areas of the country, many of which include second home destinations. Because second home tourism is a consumptive phenomenon, there is an ethical imperative on second home owners to rapidly change their water consumption methods to include rainwater tanks, greywater systems and low-flow technologies (Hoogendoorn et al., 2015), particularly in areas where the water security of local communities areas affected. Indeed, in South Africa the use of drinking water for other uses such as gardening and for sanitation is highly problematic. Beyond the implications of drought to water consumption, it could be argued that if second home owners purpose-built their properties to take part in particular water based activities they may need to consider changing the purpose of their second home. Many second home owners across the country acquired second homes for investment purposes, the threats of climate change on the economies of these tourism towns may compromise the investment and resale value. The development of low-water intensive, alternative leisure activities is thus key in adapting to climate change in a socially and environmentally responsible manner.

The third threat to second homes is in the progressive reduction in the climatic suitability of destinations as a result of progressive temperature increases under climate change. These impacts are certainly more acutely felt for destinations that rely on a particular temperature threshold. The case of the snow tourism industry at Tiffindell is the most severe, yet temperature increases beyond human comfort thresholds will progressively hinder the amount of outdoor time at a wide range of destinations, and in turn the attractiveness of full-day outdoor tourism activities. Second home towns that offer a combination of outdoor and indoor activities are arguably less susceptible to temperature increase associated climate threats, yet this assumes that they have the means to moderate indoor temperatures. As South African building design is seldom climatically sensible, the moderation of indoor temperatures relies heavily on fans and air conditioning in the summer, and heaters in the winter, which increase the pressure on the electricity networks. In South Africa in particular, a reliance on electricity is closely tied not only to the consumption of an over-stressed resource, but to carbon emissions through coal fired power stations. It can be argued that mitigation requires serious attention not only in second homes research but also in second home owners behaviour. Previous studies in the South African context indicate that second homes are occupied an average total of 126 days per year, by both



homeowners and their guests (Hoogendoorn and Visser, 2010a). Although the electricity and water consumption is relatively low for the remaining 239 days a year, these resources are still used in this time for the maintenance of alarm systems and gardening (Pienaar and Visser, 2009). Under climate change, the imperative to reduce resource consumption is heightened, and small scale changes such as solar geysers should be implemented wherever possible to lessen the footprint of the second home (Hoogendoorn et al., 2015). This could lead to what arguably can be considered as the conceptual blurring between adaptation and mitigation against climate change. For example, when second home owners rely on rainwater tanks for their own use, they relieve already struggling water reservoirs, which allows for greater water storage by authorities. However, under scenarios of climate change with increased drought and temperatures, second home owners relying on their own water may be a more sustainable option to exercise their lifestyle options than relying on state provided infrastructure. In simple terms what is considered mitigation at present, becomes adaptation by 2050 and 2100. While it may not be practical to conceptually blur the concepts of adaptation and mitigation at present, it may be more useful in future to efficiently address climate change threats (Wilbanks et al., 2003).

Conclusion

This article represents the preliminary attempt to integrate the science of climate change on second home tourism. Many of the climate change threats to tourism apply to the second homes sub-sector. The researchers argue that the difference lies in the heightened vulnerability and lowered adaptive capacity in the case of second homes that derives from the significant capital input into the home, the low to absent income derived from the home, and the fixed nature of the second home, and thus of the vacation destination. Moreover, this is a relatively unique case in which the tourist is both active and passive in the adaptation process, acting as the accommodation establishment owner and the tourist simultaneously, and thus requiring enjoyment while keeping costs limited. On the basis of the analysis in this article on the possible climate change threats to second homes in towns across South Africa, the researchers argue that this represents an important intersection within the existing tourism literature that requires further empirical research both to address this academic research gap, and to protect the economic sustainability of the small towns that they form a part of (Hoogendoorn and Nel, 2018). A clear understanding of the number, locality and size of second home ownership is crucial for adaptive and mitigative strategies and behaviours regarding this phenomenon, to allow for wide-scale modelling of climate change risk.

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