CHAPTER 9:
IMPACTS ON TOURISM IN THE KAROO

Second Order Draft for Stakeholder Comment

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Experience indicates that mining and tourism invariably end up in conflict with each other. This is a serious concern for the assessment area as the tourism business sector currently has the most enterprises of all business sectors and a loss of 20% of the tourism enterprises in the assessment area could result in a loss of more than 2600 employment opportunities and some R500 million in economic value addition. A higher percentage of these jobs are likely to be associated with semi-skilled local people and women are particularly well represented in the tourism sector. The relative importance of this sector is predicted to increase as it is also the fastest growing sector - in most towns and their surrounding areas the number of tourism enterprises is increasing much faster than total enterprise growth.

Tourism in the assessment area has diversified in recent years and provides many different tourism offerings. As a consequence growth has occurred in towns as well as rural areas where agritourism has been replacing the declining role of traditional farming in the economy. There are three groups of tourists visiting the assessment area: 1. Those seeking unique Karoo experiences ('getting away from it all', adventures, heritage sites, Karoo food, festivals, etc.), 2. Those travelling through, and 3. Business travellers and people visiting friends and family in towns.

Tourism is not evenly spread across the assessment area and based on their enterprise profiles two groups of towns have been distinguished: a cluster that has an average lower than 16% of enterprises in the tourism sector and a cluster that has an average of more than 37% of enterprises in the tourism sector.

Due to the growing rural dispersion of tourism facilities and the dispersed nature of shale gas production, the whole of the assessment area is considered to have a medium sensitivity to potential negative impacts of gas production. Towns vary in their sensitivity to potential negative impacts on the tourism sector. Tourism specialist towns including Nieu-Bethesda, Prince Albert, Graaff-Reinet, Sutherland and Colesberg are highly sensitive to disturbance, the next grouping which includes Cradock and Beaufort West have a have a high sensitivity and the rest are regarded as having a medium sensitivity.

Negative impacts on tourism of shale gas exploration and production are expected from: noise and visual disturbances; traffic densification and road degradation (and associated changes to the road surface from dirt to tar might which might impact the remote character important for some tourists); increased pressure on existing accommodation thereby crowding out of tourists, potential water pollution, earthquakes and loss of tourism enterprises. These impacts could seriously degrade the

Karoo's growing tourism brand and tourism's role in local economies, especially in the towns with high sensitivities. A challenge is to find ways and means whereby the impacts of gas exploration and production on tourism could be mitigated. This approach has been applied in the Waterberg Biosphere Reserve, Limpopo and in regions in Queensland, Australia. Mitigation of negative impacts, which will require cooperation between the mining and tourism industries, is possible by: 1. using exclusion zones to reduce visual and noise impacts, 2. declaration of an access route to the assessment area (e.g. the N9) as a tourist route and barring shale gas traffic from it, 3. strict control of and sanctions with regard to water pollution, and 4. the possible establishment of an officially empowered Tourism Agency to manage and support tourism across different provincial borders and eventually funded by a levy on gas producers.

It should be noted that this was a desktop assessment which used the best available data but that there is currently a lack of information about many important aspects of the tourism sector in the assessment area (and Karoo), including a more detailed picture of the dispersed tourism enterprises of the Karoo, their tourist offerings and vulnerability to impacts which should be addressed by adequate baseline studies.

CHAPTER 9: IMPACTS ON TOURISM IN THE KAROO

9.1 Introduction and scope

Mining and tourism are important sectors of the South African and Australian economies, yet invariably they end up in conflict (De Klerk & Heath, 2015; McLennan et al., 2015). Tourism in the Karoo and shale gas development might, therefore, be irreconcilable (Ingle & Atkinson, 2015). This chapter analyses the potential impacts of shale gas exploration and production, if implemented, on tourism in the assessment area (see Figure 1.x in chapter 1). A lack of standard tourism information (such as bed nights sold and tourist spend) in the assessment area necessitated the use of quantified empirical information about tourism enterprises in the assessment area to examine the potential impacts. Four different scenarios: no exploration, exploration only, small-scale production of shale gas and large-scale production of shale gas (see chapter 1) are considered. Potential mitigation of negative impacts is also considered.

The management of tourism in South Africa is complex. The Department of Tourism guided by the Tourism Act of 2014 (Government Gazette, 2014) is primarily responsible. The Act addresses issues such as the promotion of quality tourism products and services and enhancing cooperation and coordination between all stakeholders. It seeks to avoid negative economic, environmental and social impacts, and promotes involvement of local people in tourism.

The South African Tourism is an agency tasked with marketing the country as a tourism destination. The SA Tourism Review Committee (2015) remarked: "There is a planning hierarchy in government which serves to clarify and position the mandate that SA Tourism carries, starting with the National Development Plan which identifies tourism as an essential part of our economy into the future. Tourism is a key sector contributing to Outcome 2 (decent employment through economic growth) in the state's Medium Term Strategic Framework for 2014 – 2019. The Department of Tourism is charged with developing and implementing the National Tourism Sector Strategy which sets the overall framework for how the country plans to grow the tourism economy.

What is tourism?

Tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes (Go2HR, undated)

Tourism is a large world-wide industry and its international receipts in 2014 were worth US$1.245 trillion (United World Tourism Organization, 2015). Even in arid and semi-arid areas it has become an important economic driver, e.g. in Egypt, Dubai, Oman and Israel desert tourism is a growing industry (Hobbs and Tsunemi, 2007; Ryan and Stewart, 2009; Zekri et al., 2011).

In the Karoo, farm stays, game farming and hunting, all of which tap into alternate markets, have become key sources of externally derived income (Hoogendoorn & Nel, 2012).

This in turn creates the context within which SA Tourism's Tourism Growth Strategy spells out the strategic approach to the marketing effort."

Several policies and strategies impact upon tourism in the assessment area. These are implemented by different authorities and government agencies, a situation that is adding to management complexity (Atkinson, 2016). At the national level, guidance is provided by the National Planning Commission (2011), the Marketing Tourism Growth Strategy for South Africa (South African Tourism, 2010) and the National Tourism Sector Strategy (Department of Tourism, 2011). The Rural Tourism Strategy (Department of Tourism, 2012) highlights the importance of rural areas for tourism and emphasises the fact that rural areas contain important tourism attractions.

At provincial and regional level there is an Integrated Tourism Development Framework (Western Cape Department of Economic Development and Tourism, 2006), an Eastern Cape Tourism Master Plan (Eastern Cape Department of Economic Development and Economic Affairs, 2009) and a Northern Cape Tourism Master Plan Review (Grant Thornton, 2014). The NGO, The Karoo Development Foundation, produced a Karoo Tourism Strategy (Karoo Development Foundation, 2012) and Kyle Business Projects (2009) produced a Camdeboo Responsible Tourism Sector Plan. In essence the strategies of these organisations are to: develop and market unique tourism products; grow domestic and international tourism arrivals and spend, create sustainable economic benefits and protect the environment.

9.1.1 The historic importance of tourism in the Karoo

People have visited the Karoo for a long time. The area formed part of the hunting grounds of hunter-gatherers and of the grazing areas of nomadic Khoikhoi pastoralists (Elphick, 1979). The settlement of colonial farmers ("trekboers") in the Karoo from ca. 1760 (Guelke, 1979) led to the establishment of churches (Fransen, 2006), towns (Tamarkin, 1996) and boarding houses to accommodate travellers.

Up to the 1850s there were no proper roads in the Cape Colony (Solomon, 1983), yet people travelled through the Karoo (Green, 1975). By the late 1860s and thereafter goods were ferried across the Karoo by transport riders and ox wagons to the markets of Kimberley and Johannesburg and passenger coaches transported passengers. Hotels appeared and Jewish owners played an important role in their establishment (Kollenberg & Norwich, 2007).

Later railways displaced both transport-riding and passenger coach services (Solomon, 1983) and during the South African War (1899 –1902) large numbers of soldiers and goods were transported across the Karoo, often by train. The arrival of motor vehicles and improvement of roads after World

War II rapidly increased travel in South Africa, also in the Karoo (Solomon, 1983). Later air conditioning of motor vehicles eased the plight of travellers driving through the Karoo during the hot summer months. Places such as Swartberg Pass and Gamkaskloof ('Die Hel') received increasing numbers of visitors (Milton & Dean, 2010; Toerien, 2012a).

9.1.2 The present importance of tourism in the Karoo

The scope of tourism in the Karoo, its spatial distribution and its growth or decline are examined here. Enterprises in different business sectors of South African towns are present in fairly constant ratios to the total number of enterprises in towns (Toerien & Seaman, 2012a,b). This is also true for the tourism sector of towns of arid and semi-arid South Africa (Toerien, 2012b). Regularities observed between economic characteristics such as gross value added (GVA) and enterprise numbers if Karoo towns (e.g. Toerien, 2014) indicate that more enterprises in a particular business sector of one town than another reflects higher levels of economic value addition in that business sector. In 2015 the tourism sector was the most numerous enterprise (business) sector in the assessment area, comprising 828 (i.e. 22.2%) out of a total of 3737 enterprises (Figure 9.1). Tourism is, therefore, a major source of income in the assessment area.

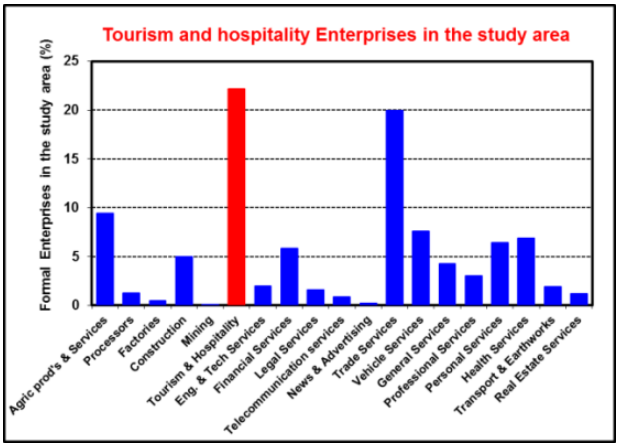

Figure 9.1: The enterprises of the tourism sector (in red) in relation to other business sectors in the study area.

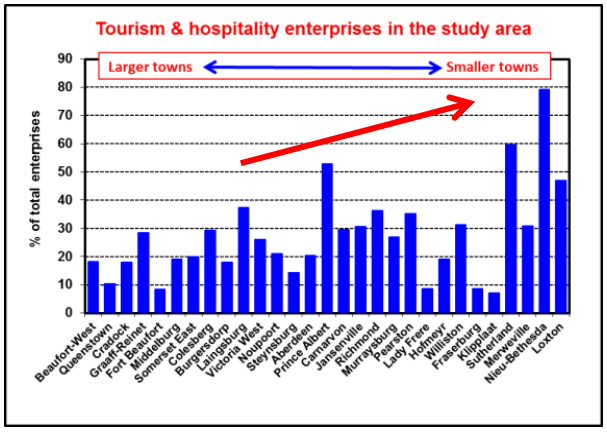

Figure 9.2: The tourism sector in relation to the population sizes of study area towns, ordered from left to right according to their 2011 population sizes

Tourism is, however, not equally distributed through the assessment area: smaller towns are generally, but not always, proportionally more dependent on this sector than larger towns as shown by an increasing trend of tourism enterprises relative to total enterprises (see red arrow) in smaller towns (Figure 9.2). Even very small towns in the assessment area have some tourism enterprises.

This does not mean that larger towns and their surrounding areas are not important with regard to tourism. They have the highest total number of tourism enterprises (Figure 9.3) and also have more balanced local economies with a diversity of other business sectors in addition to tourism.

In a number of towns the tourism sector is exceptionally strong, i.e. Graaff-Reinet, Colesberg, Loxton, Prince Albert, Sutherland and Nieu-Bethesda. Towns on national routes (N1, N6, N9, N10 and N12) in the assessment area generally have more tourism enterprises than towns further away from main routes (Figure 9.3).

Clustering (i.e. grouping) of the assessment area towns on the basis of their enterprise profiles [done according to the method of Toerien & Seaman (2010)] revealed two clusters of towns that differ markedly in terms of the contribution of tourism to their economies: cluster 1 (red in Figure 9.4) towns had an average of 15.5% and cluster 2 (blue in Figure 9.4) towns an average of 37.4% of their enterprises in the tourism sector. Klipplaat is an outlier with very few tourism enterprises.

Cluster 2 towns include many of the towns usually identified as tourism destinations in the Karoo (e.g. Nieu-Bethesda, Graaff-Reinet, Prince Albert, Sutherland, Colesberg and Beaufort West). These towns and their surrounding areas could, therefore, be very sensitive to negative impacts from shale gas exploration and exploitation, if implemented (see section 2.2). A number of these towns occur in or close to the area identified as having the highest likelihood of the presence of shale gas (Figure 1.x, chapter 1). These towns are currently marketed as areas where ‘one can get away from it all’, and it is in these sensitive areas that mitigation would be most needed should shale gas exploration and or exploitation take place.

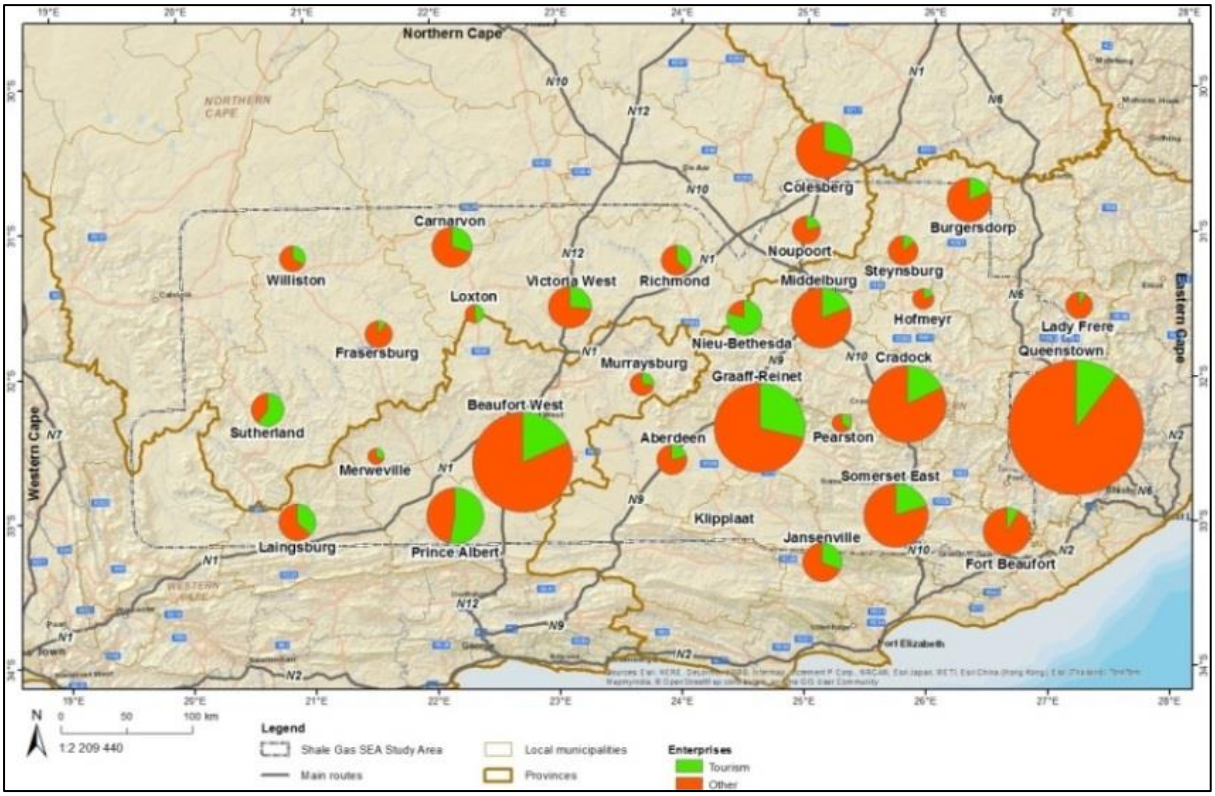

Figure 9.3: Total and tourism enterprises in or close to the study area towns.

All towns in the assessment area have enterprises providing accommodation (either bed & breakfasts [B&Bs], lodges, hotels, self-catering establishments, etc.) (Figure 9.4). Some smaller towns in cluster 2, e.g. Prince Albert, Sutherland and Nieu-Bethesda have many tourism enterprises relative to their size. Most of the very small towns (e.g. Lady Frere, Hofmeyr, Klipplaat and Fraserburg) do not have any 'food & drink' enterprises (Figure 9.4). On the other hand, Graaff-Reinet, Prince Albert and Nieu-Bethesda, all cluster 2 towns, seem to be the leading destinations providing typical Karoo food. Towns on national routes (e.g. Beaufort West, Queenstown, Somerset East, Cradock and Colesberg) also have many 'food & drink' establishments (Figure 9.4) but much of their offerings is fast food and not typical food of the region.

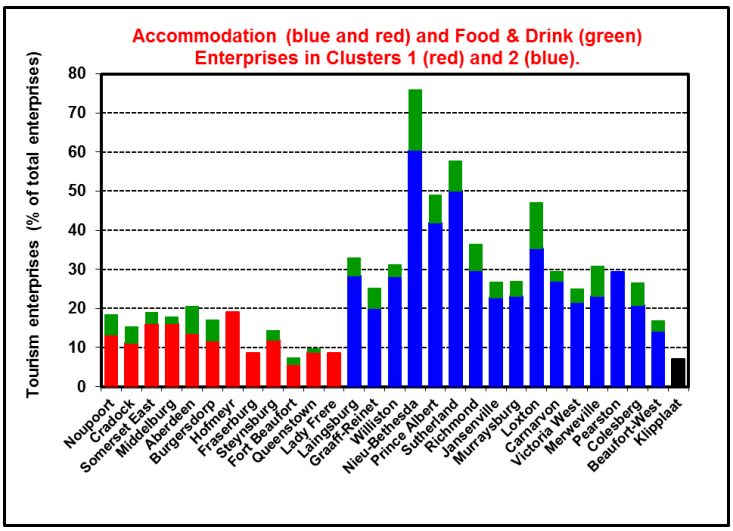

Figure 9.4: The contributions of accommodation and 'food and drink' enterprises to the enterprise profiles of two clusters of study area towns – cluster 1 (red) and cluster 2 (blue).

To establish whether the tourism sectors of the assessment area towns are stable, declining or growing we compared their sizes in 2006/08 with those of 2015/16 (Figure 9.5). The 2006/08 starting point was chosen because the use of smart phones for marketing purposes started taking off from 2007 (e.g. Lunden, 2013). Using telephone directories of 2006 would provide an overview of tourism enterprises at that time. Internet marketing is now used widely in the tourism industry in South Africa, also in the Karoo (e.g. Lekkeslaap, 2016; RoomsforAfrica, 2016: SafariNow, 2016). Internet searches were used to obtain 2016 information of tourism enterprises.

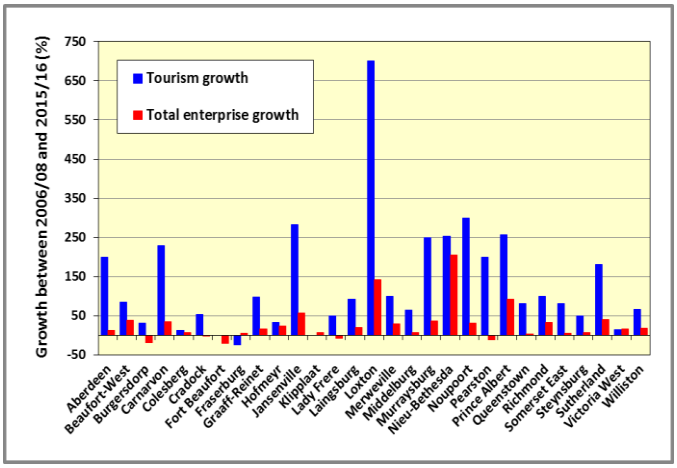

Figure 9.5: The growth (%) in the number of tourism (blue) and total (red) enterprises of the study area towns over 2006/08 to 2015/16.

With few exceptions (e.g. Colesberg, Fort Beaufort, Fraserburg, Klipplaat and Victoria West) the growth in the tourism sector of the towns outpaced the growth of the total enterprise numbers, further substantiating the growing importance of tourism in the assessment area. In Aberdeen, Carnarvon, Cradock, Graaff-Reinet, Jansenville, Loxton, Murraysburg, Nieu-Bethesda, Noupoort, Pearston, Prince Albert, Queenstown, Richmond, Somerset East, Sutherland and Williston tourism growth exceeded total enterprise growth by far (Figure 9.5). Not only does the tourism sector have the highest number of enterprises of all business sectors, but it is also growing more rapidly than other business sectors in the majority of towns. As suggested by Hoogendoorn & Nel (2012) many Karoo towns have entered a post-productive phase in which tourism has replaced the declining role of agriculture. The dispersed tourism activities across the farming areas are likely to be sensitive to negative impacts of shale gas exploration and exploitation, should they be implemented. It is, therefore, of concern that the Karoo, and the assessment area, straddles the borders between a number of provinces (Atkinson, 2016). Integrated management and promotion of tourism across provincial borders should happen but will be complex, and this situation will increase the difficulty of mitigating the impacts of shale gas exploration and exploitation, if implemented. Cooperation between provincial, mining and tourism stakeholders should be sought.

9.1.3 Why do tourists visit the Karoo?… Its tourism assets

Apart from officials and business travellers that visit towns for business reasons, it is important to understand why other tourists visit the Karoo. A recent study by Atkinson (2016) used questionnaires to determine why people visit the Karoo. She found that tourists: seek authentic and unique

experiences (35% of respondents), seek convenience (a useful stay-over place) (34%), are curious (finding out what the Karoo is about) (16%), seek excitement (e.g. sport, hunting, adventure) (7%), have loyalty (enjoyed previous visits) (5%) and some seek rest (having a holiday) (3%). She concluded that the tourism reputation of the Karoo has shifted profoundly from being hostile, dangerous and boring to being attractive, enticing and spiritual.

Scenery, especially mountains, and nature feature prominently in earlier tourist surveys. The Swartberg Pass, Seweweekspoort and Gamkaskloof ('Die Hel') are highlighted as important experiences. This highlights the importance of mountain passes and other scenic routes as key tourism assets for the region. The wide open spaces are also an important asset. Many respondents indicated that the lack of development and the unspoilt nature of the area attracted them. Getting away from it all and the peace and tranquillity ("The Nothingness" or "Die Niks") of the Little Karoo is especially important to repeat visitors (Gelderblom, 2006).

"Die Niks"

Nama Karoo landscapes are spectacular in a bleak and dramatic way. There is plenty of 'niks' (nothingness) affording wide viewsheds for the crowd-weary traveller and hunter (Milton & Dean, 2010). The Karoo is, therefore, defined by natural open spaces with the occasional koppie or windmill and is populated by authentic local people. The emptiness and undeveloped nature of the Karoo ("Die Niks") provides an escape for stressed people living in overcrowded cities and is the recognised brand used to market the region

Formal protected areas as well as private conservation initiatives are important tourist attractions. The Karoo National Park (Beaufort West, established in 1979), Mountain Zebra National Park (Cradock, established in 1937) and Camdeboo National Park (Graaff-Reinet, established in 2005) have experienced increased visitor numbers and investment (SANParks, 2015a, 2015b).

Saayman et al. (2009) examined the socio-economic impact of the Karoo National Park on the local economy. At that stage only a small percentage (4%) of businesses in Beaufort West owed their existence to the park. For the park to have a greater impact, it was imperative to increase its accommodation capacity, offer more activities and promote activities and attractions in the region. It is therefore encouraging that since then there has been substantial investment in the tourist experience including the re-introduction of lions and buffaloes in the Karoo and Mountain Zebra National Parks and the expansion of facilities.

The recent significant national and international investment in the establishment and expansion of protected areas in the Karoo attracted over 100 000 tourists to the National Parks in this region in 2014/2015. There is also substantial private investment in conservation including several private

nature reserves and the newly declared Protected Environment established on private land between the Camdeboo and Mountain Zebra National Parks.

Agritourism is on the increase in the Karoo. The growth in the number of game farms in South Africa, including the Karoo, has been significant (Saayman et al., 2011). Many commercial farmers are either introducing game into their normal farming operations or they are changing from commercial to game farming. The greatest source of income for game farms is hunting and the Northern Cape and Eastern Cape are key hunting provinces in South Africa, visited by local and foreign hunters (Saayman et al., 2011; Van der Merwe & Saayman, 2013; Van der Merwe et al., 2014).

Many visitors to the Karoo view the undeveloped nature of the area including the gravel roads as part of the appeal of the area. This lack of development is particularly important to adventure tourists such as motor bikers, hikers, 4x4 enthusiasts, hunters and mountain bikers. The absence of light pollution is also an important asset attracting both amateur and professional stargazers.

In tourist surveys in the region, small towns were generally more popular and their relative freedom from crime and hospitable, genuine people are a strong attraction (Gelderblom, 2006). Towns with a historic character are particularly important assets for tourism (chapter 15 provides information about historic towns and important historical sites scattered through the landscape). Prince Albert is one of the most important of the tourist towns in the assessment area. Its visitors come to rest and enjoy the attractive architecture and mountain scenery. Some 25% of visitors prefer more active recreation such as hiking, cycling and participation in guided tours to see historic sites, the Swartberg Pass, birds or the night skies. Others came to visit friends, trace family history, and escape the Cape Town winter weather or to invest in property (Milton, 1998). Some also explore the areas rich biodiversity under the guidance local experts.

9.1.4 Food tourism and the Karoo

Food tourism is a growing tourism product world-wide (Long, 2003). It includes any tourism experience in which one learns about, appreciates, and/or consumes food and drink that reflects the local, regional, or national cuisine, heritage, culture, tradition, or culinary techniques of a specific area (Ontario Culinary Tourism Association, 2010). Food tourism is not limited to urban regions and five-star restaurants (Boniface, 2003), but can include farms, farm stalls, fruit-picking sites, cheese manufacturers, honey producers, processors of foods such as preserves and confectionary, cafes, tea gardens and bars as potential sites. The importance in these offerings is that establishments are local and products authentic (Boniface, 2003; Hall et al, 2004).

Food tourism is also a growing tourism industry in the Karoo and has the potential to create unique culinary experiences (Green, 1975). Thus tourism and local food systems are being integrated to promote economic development, respond to the demand for quality food and dining experiences and to build on the cultural and culinary heritage of the region.

Cuisine

Skilled, thoughtful, refined cooking belonging to a particular style and group of people is identified as ***cuisine*** and is the foundation on which food tourism is based (Long, 2003). A ***regional cuisine*** is necessary to develop food tourism products that can form the basis of regional development (Gössling & Hall, 2013). It is a unified style of cooking common to most people living in a culinary region and is defined by three criteria: geography, homogenous food culture and defining dishes that are unique and noteworthy (Sackett & Haynes, 2012).

The Karoo has many assets that are supporting this development, including a culinary heritage and regional cuisine. The tourism offerings in the Karoo are authentic, within original small town atmospheres. Traditions such as 'roosterkoek" have been passed down through generations in the Karoo, and the climate and topography have allowed the propagation and cultivation of local produce shaping the very specific cuisine of the region. Local produce such as Karoo Lamb have been recognized with a designation of origin providing quality and geographical recognition and simultaneously achieving international acclaim (Hoosain, 2015; Kirsten, 2012).

Plans are on the way to establish an Association ('Karoo Food'), a public, non-profit organisation, to stimulate economic growth and job creation by working towards the sustainability of Karoo hospitality and camaraderie in the food tourism industry (Wright and Wright, 2015). The food and drink tourism offerings in many Karoo towns culminate in very popular food festivals, e.g. the Karoo food festival of Cradock which has become an annual event attended by many visitors.

9.1.5 The drivers of tourism in the Karoo

The recent increase of tourism in the assessment area (Figure 9.5) prompts the need to understand the phenomenon. Based on sections 1.3 and 1.4, this section focuses on those factors believed to have been the main drivers of tourism in the Karoo.

One of the key contributing factors is generally **improved road infrastructure** after World War II (Solomon, 1983). The national routes (N1, N6, N9, N10 and N12) that connect Gauteng and Western Cape, the two economically strongest provinces, via the assessment area have all been improved and this plays a vital role in increasing the flow of people through the region. The improved roads also benefit tourists to the assessment area, including business travellers and government officials having to visit towns for business purposes.

The **Karoo has also become a destination** in its own right, in line with an international trend towards "desert tourism", which is often associated with adventure and a desire to "get away from it all". Its establishment as a popular destination has been been associated with a measurable increase in publicity and a change in perceptions regarding the area (Atkinson, 2016). It has been linked with the **development of tourism routes** that combine the use of national roads with tourism offerings, e.g. the N12 Treasure Route, the N12 Battlefields Route and the Friendly N6 Route.

Expanding national parks and increased conservation-based activities have also stimulated tourism. These parks have also **introduced 4x4 and hiking routes**. There is also a **growth in private conservation initiatives**. The most recent development has been the establishment of a Protected Environment of over 250 000ha which includes 65 landowners in a corridor linking the Mountain Zebra and Camdeboo National Parks (SANparks 2016).

The **growth in niche tourism** based on festivals and events (e.g. Prince Albert), arts (e.g. Nieu-Bethesda) and science (e.g. Sutherland) also enhances tourism to the Karoo (Saayman et al., 2009; Saayman & Saayman, 2010). The Karoo has a **rich historic heritage** (see Chapter 15), which also enhances Karoo tourism (Maguire, 2009; Koekemakranka Tourism, 2015).

The **rise of agritourism** in all its forms (e.g. farm stays, game farming, hunting, etc.) is one of the greatest drivers of modern tourism in the Karoo. **Increased agritourism services** offered by farms in the assessment assessment area include wedding venues and conference facilities, game breeding, 4x4 and hiking trails, a variety of accommodations, stargazing, horse riding, fishing, and other water activities, especially on the Fish River in the Cradock region. Karoo tourism has over time moved from being more concentrated in the towns to being more dispersed in the rural Karoo farming areas.

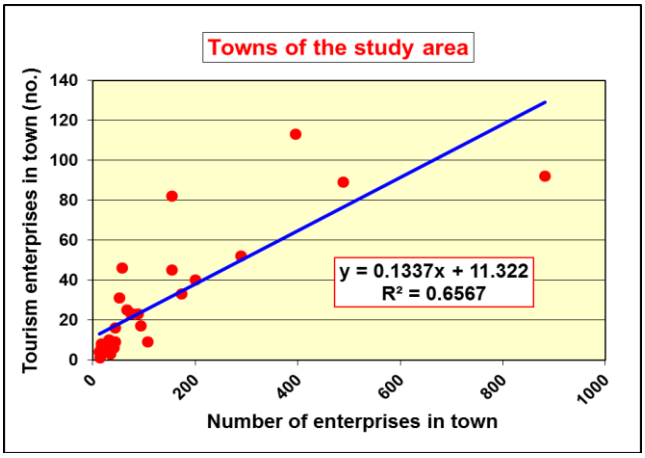

Figure 9.6: The broad correspondence between town size and the number of tourism enterprises in 2015/16 in the study area.

There was (in 2015) a broad, but statistically significant, correlation between town size (measured by total number of enterprises) and tourism enterprise numbers in the towns of the assessment area (Figure 9.6). Larger towns generally have more tourism establishments than smaller towns despite not

necessarily being labelled as tourist destinations. This relationship indicates that the **business tourism** group (e.g. visits of business people, officials, etc.) and the **'visiting friends and relatives' (VFR)** group are important. The larger a town, the more of these tourists visit it. The data did not enable distinguishing between who visits a town for business/administrative purposes and who visits for VFR purposes. The two groups are, therefore, considered together.

9.1.6 Tourism impacts recorded elsewhere about exploration for and production of shale gas and oil

Some information is available regarding the actual and projected economic impacts of shale gas exploration and exploitation, e.g. IHS Global Insight (2009) reported on the economic and energy impacts of proposals to regulate hydraulic fracturing in the U.S. There are, however, few formal studies of the impacts on tourism and those available focus mostly on expected and not actual impacts. Newspaper reports sourced from the New York Times provided some stories of impacts on American towns but there is not much by way of quantified estimates.

Buttler & Fennell (1994) observed that development of the North Sea oil proved both beneficial to the tourism industry through improved infrastructure and guaranteed access to an affluent market. However, it was negative to the pleasure element of the industry, which was displaced and ignored for over a decade. Studies in Pennsylvania (Upadhyay & Bu, 2010), New York State (Rumbach, 2011), Newfoundland (Bezzina, 2013) and Queensland, Australia (McLennan et al. 2015) of shale or coal seam gas extraction also suggested that some impacts might be beneficial and others detrimental to tourism.

Rumbach (2011) suggested that although the tourism sector creates a significant number of jobs in the

Negative impacts of shale gas and coal seam gas extraction on tourism

- Air pollution through release of methane gas that must be flared off.
- Continuous noise pollution as a result of drilling, construction and fracking activities.
- Heavy truck traffic because each single-well fracking well pad requires an estimated 890 to 1,340 truck trips.
- Visual impacts when drilling operations and fracking wells are within sight of residents, visitors and travellers. Flaring of gas adds to the visual impacts.
- Increased seismic activity.
- Disposal of hazardous wastes with the danger of toxic spills during storage or transport of wastes,
- Contributions to climate change and its potential impacts on tourism.
- Negative impacts on tourism products, promotion and visitor perceptions of tourism brands,
- Institutional shifts towards the resources sector
- Structural lock-in to the resources sector with a two-speed economy and lack of affordable accommodation
- Negative impacts on infrastructure and support services

Southern Tier region of New York, it is likely that the value of gas drilling, measured simply by jobs created and wages generated, might exceed the value of tourism in the short term. Rumbach (2011) expected the employment 'boom' of gas drilling to be relatively short-term and non-local. However, gas production in the Gladstone region of Queensland has resulted in the region becoming a major industrial cluster, with strengths in the export of resources, engineering, construction and manufacturing (McLennan et al., 2015).

In the immediate vicinity of the shale or coal seam gas production, enterprises such as hotels, restaurants, and shopping venues benefited from an influx of gas workers (Rumbach, 2011; Bezzina, 2013, McLennan et al., 2015). Many of the communities where drilling proceeded in North America were relatively sparsely populated and drilling led to a shortage of available hotel rooms (Price et al., 2014), thereby inhibiting 'normal' tourism.

Rumbach (2011) considered whether drilling would permanently damage the carefully developed 'tourism brand' of the Southern Tier region in New York State. The region's ability to attract tourists could be damaged in the long-term if the perception of the region as an industrial landscape outlasts the employment and monetary benefits of gas drilling. Other regions where concerns have been raised about regional brand degradation include Newfoundland (Bezzina, 2013), Queensland (McLennean et al., 2015), Tasmania (Department of Primary Industries, Water and the Environment, 2015) and Romania (Muresan & Ivan, 2015). Farmers in the region of the Marcellus Shale Play in the U.S. that produce organic products for high end and organic restaurants were concerned about the preservation of their brands should water pollution occur as a result of fracking (Ong, 2014).

The pace and scale of gas drilling is a crucial determinant of the overall impact on the tourism economy (Rumbach, 2011). Bezzina (2013) concluded that the overall impact of fracking on tourism would be negative in western Newfoundland. Bezzina expected a short-term economic boom for the region, e.g. increased occupancy rates for hotels but predicted a long term negative impact on the regional tourism brand. Tourists are currently attracted to western Newfoundland by landscapes and scenery, camping facilities, hiking trails and boat tours and these nature-based attractions may be negatively impacted.

Upadhyay & Bu (2010) estimated the visual impacts at different distances of gas drilling and well pads in Pennsylvania. They indicated that such activities were not visually overly intrusive at distances exceeding about 3km, but lights at well pads and flaring of gases could be readily seen at night. However, visitors flying in to a region with well pads will see them with potentially negative impacts.

Deutch (2011) and Morse (2014) commented on the good news resulting from the exploitation of shale gas and oil. Krauss (2011) remarked that a 17-mile stretch of road between a forsaken South Texas village, Catarina, and the county seat of Carrizo Springs, was until 2010 rundown and a patchwork of derelict gasoline stations and rusting warehouses. By 2011 the region was in the hottest new oil play in the country, with giant oil terminals and sprawling RV parks replacing fields of mesquite. In the Rust Belt of Ohio transformation spread as a result of a surge in domestic oil and gas production and entire economic sectors like manufacturing, hotels, real estate and even law were reshaped (Schwartz, 2014).

Not all impacts lasted. A tumble in gas prices due to increased competition caused the boom in western Colorado, a region rich in natural resources and where oil and gas jobs formed the bedrock of the local economy, to dry up (Healy, 2012). Main Street businesses were struggling and big new schools built to accommodate a surge of students from the previous energy rush found their enrolments dwindling. There might also be potential synergies between mining activities and tourism, e.g. mining becoming a possible tourism post-boom product (McLennan et al.,2015).

9.2 Risk Assessment and Sensitivities

9.2.1 Risk assessment

An extractive industry such as mining and tourism invariably end up in conflict (McLennan et al., 2015). Gas exploration and production is the assessment area would, therefore, create risks for the tourism industry of the area.

The physical steps in shale gas exploration/production, if approved and implemented in South Africa, would not differ materially from those used in the U.S. (see chapter 1). The negative impacts listed by Upadhyay & Bu (2010), Rumbach (2011), Bezzina (2013) and McLennan et al. (2015) (see sidebar in section 1.6) could also be experienced in the Karoo. A further complexity is that in South Africa mineral resources belong to the State and not the landowners, whereas in the United States it is the opposite. The Karoo also falls under the jurisdiction of more than one province (Atkinson, 2016), which adds complexity to a goal of integrated tourism management in the assessment area.

Bezinna (2013), McLennan et al. (2015) and others have remarked that the use of local tourist accommodation by gas and oil workers ‘crowd out’ regular tourists but benefit local tourism entrepreneurs. Gas development, therefore, results in an internal restructuring of the tourism industry (McLennan et al., 2015), which could lead to problems following a mining boom. Butler & Fennell (1994) suggested that it can take 10 years or longer for tourism to recover.

The manifestation of negative impacts on the tourism sector is expected to be losses of tourism enterprises, and reductions in employment and economic value addition. The development of an understanding of the risks associated with the above required a special analysis (Addendum A).

There is a lack of trustworthy publicly available tourism information such as number of bednights sold and tourist spending in the tourism establishments in the assessment area. Therefore, use was made of Standard Industry Classification (SIC) data available for 16 of the 29 towns of the assessment area. The dataset included the nominal total GVA for 2010 and the GVA contributions of the following nine broad economic sectors: agriculture, mining, manufacturing, electricity supply, construction, trade, transport, financial services and other services. It also included total employment as well as employment numbers in each of the above broad sectors. Census 2011 population data and 2015/16 enterprise numbers (total and tourism-related) of the 16 towns completed the dataset.

The presence of positive correlations between a number of economic, demographic and entrepreneurial characteristics of the 16 towns enabled three different analyses by which losses of tourism enterprises could be interpreted in terms of losses of employment and losses in economic value addition. Thereafter the analyses were extended to the towns not included in the dataset in order to develop a complete picture of the risks in the assessment area (Addendum A).

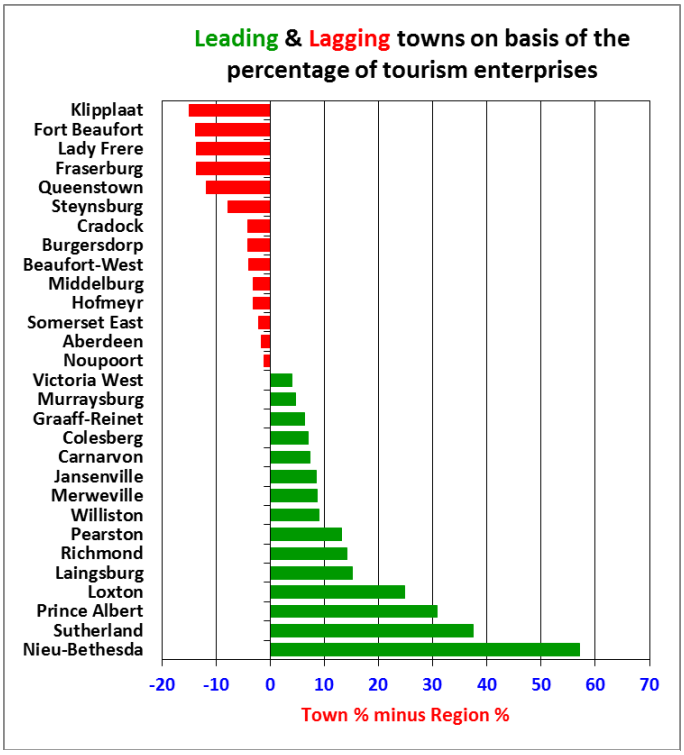

Figure 9.7: Leading and lagging towns in terms of the strength of their tourism sectors (expressed as % of total enterprises). The norm is the average strength of the tourist sector (% of all enterprises) for the whole of the assessment area

The upper risk limit is set by the limit of acceptable change, which in this case was determined by the combined experience and insights of the project team. The team set the limit at a 20% decrease in tourism enterprises because losses in excess of that figure would be catastrophic to the tourism industry of the area. Using this limit of change, expected losses of employment and economic value addition by tourism was developed for a range of risks (Table 9.1).

There are three main groups of tourists in the Karoo:

Tourists seeking authentic and unique Karoo experiences, e.g. visits to heritage sites, national parks and farms, enjoyers of Karoo food, hunters, cyclists, motor bikers, hikers, stargazers, the users of 4x4 trails, visitors at festivals, etc. (hereafter called niche tourists), visit leading towns with very strong tourism sectors e.g. Nieu-Bethesda, Sutherland and Prince Albert (Figure 9.7).

Persons travelling through the Karoo and in need of accommodation, food and/or fuel services (hereafter called passing through tourists). They contribute to the tourism enterprise strength of towns on major routes, e.g. Laingsburg, Richmond, Colesberg and Victoria West (Figure 9.7).

Business and VFR tourists mainly visiting towns (hereafter called business tourists). The presence of this group is indicated by the positive correlation between total enterprises (and hence town size) and the number of tourism enterprises in the assessment area (Figure 9.6).

Table 9.1: The losses in tourism enterprises, employment and value addition that may be associated with negative impacts by gas exploration and production on the tourism sector in the assessment area.

Loss in tourism enterprises	Tourism employment loss	Loss in GVA R million (2010 Rand)	Risk
< 4%	<530	<100	Very low
4 - 8%	530 - 790	100.1 - 200	Low
8.1 - 12%	791 - 1580	200.1 - 300	Medium
12.1 - 16%	1581 - 2110	300.1 - 400	High
16.1 - 20%	2111 - 2660	400.1 - 500	Very high
>20%	>2660	>500	Limit

These three groups are expected to react differently to shale gas exploration and production. The tourists passing through are on their way to other destinations and will travel through whether shale gas exploration and production take place or not, unless roads become totally congested. The business group visits towns for business/administrative/VFR reasons and the size of this group is a function of the size of the towns irrespective of issues such as gas exploration and production. In fact, the size of this group would probably increase because of the likelihood of business visits associated with gas exploration and production. The niche tourists would probably be negatively impacted by the problems associated with gas exploration and production (see section 1.6). Different risk profiles can, therefore, be expected for towns closely associated with the different tourist groups.

Table 9.2 presents a detailed analysis of the expected risks that might arise under the different scenarios of shale gas exploration and production in the assessment area. Each tourism sector has its own risk profile. The niche tourism sector is to a large extent dependent on the image of the Karoo as

'a place to get away from it all'. Large-scale development of shale gas ('Big Gas') will result in high risks for the tourism sector in almost all impact categories. In particular, slow moving heavy traffic with its associated noise pollution, road degradation and water pollution could have serious negative impacts on the sector, partly because of the tourism sector's importance in certain towns (Figure 9.4) and its increasingly dispersed nature in the form of farm stays and game farms throughout the Karoo. Even 'Small Gas' (scenario 2) will create a number of high risks for the sector (Table 9.2). Exploration is expected to have at most moderately negative impacts but this would depend on the extent to which exploration practices would result in traffic, noise and visible disturbances and the ability of Karoo ecosystems to recover rapidly from such disturbances.

The risk profiles of the passing through tourists and business tourists (Table 9.2) are expected to be dominated by traffic densification caused by large numbers of slow-moving heavily laden trucks, noises of shale gas trucks close to tourist enterprises and crowding out of tourists due to the use of tourist enterprises by shale gas workers during the exploration and/or production phases. All other impacts would probably be lower than those of the niche tourism sector.

The issue of the complexity of integrated tourism management across the administrative and legal borders of different provinces, each with their own set of priorities, is common to all the tourism sectors. The possibilities of earthquakes and an increased carbon footprint as a result of exploration and development actions would also probably fairly similar for all of the tourism sectors.

Table 9.2: Risk analysis for different tourism sectors from negative impacts of gas exploration and production and for different scenarios and with or without mitigation.

Impact	Scenario	Tourism sector	Without mitigation			With mitigation		
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
Heavy traffic & road degradation	0	Niche	Substantial	Very unlikely	Low	Substantial	Very unlikely	Very low
		Pass through						
		Business & VFR						
	1	Niche	Substantial	Likely	Moderate	Substantial	Likely	Moderate
		Pass through						
		Business & VFR						
	2	Niche	Severe	Likely	High	Severe	Likely	Moderate / High
		Pass through					Very likely	High
		Business & VFR						
	3	Niche	Severe	Very likely	Very high	Severe	Likely	Moderate / High
		Pass through					Very likely	High
		Business & VFR						
Noise pollution	0	Niche	Substantial	Very unlikely	Very low	Moderate	Very unlikely	Low
		Pass through	Slight	Extremely unlikely	Very low	Slight	Extremely unlikely	Very low
		Business & VFR						
	1	Niche	Substantial	Likely	Moderate	Moderate	Unlikely	Low
		Pass through	Moderate	Unlikely	Very low	Slight		Very low
		Business & VFR	Substantial			Substantial		
	2	Niche	Severe	Likely	Moderate / High	Moderate	Likely	Moderate
		Pass through						
		Business & VFR						
	3	Niche	Severe	Very likely	High	Substantial	Very likely	Moderate / High
		Pass through						
		Business & VFR						

Impact	Scenario	Tourism sector	Without mitigation			With mitigation		
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
Visual impacts	0	Niche	Substantial	Very unlikely	Low	Moderate	Very unlikely	Low
		Pass through	Slight	Extremely unlikely	Very low	Slight	Extremely unlikely	Very low
		Business & VFR						
	1	Niche	Substantial	Likely	Moderate	Moderate	Unlikely	Low
		Pass through	Slight	Unlikely	Very low	Slight	Unlikely	Very low
		Business & VFR						
	2	Niche	Severe	Likely	Moderate / High	Substantial	Likely	Moderate
		Pass through	Moderate	Likely	Low	Slight to Moderate	Likely	Low
		Business & VFR						
	3	Niche	Severe	Very likely	High	Substantial	Likely	Moderate
		Pass through	Moderate	Likely	Low / Moderate	Medium		Low
		Business & VFR	Severe	Very likely	High	Substantial		Moderate
Increased seismic activity	0	Niche	Substantial	Very unlikely	Very low	Substantial	Very unlikely	Very low
		Pass through						
		Business & VFR						
	1	Niche	Substantial	Very unlikely	Low	Substantial	Very unlikely	Low
		Pass through						
		Business & VFR						
	2	Niche	Severe	Likely	Moderate / High	Severe	Likely	Moderate / High
		Pass through	Substantial	Unlikely	Moderate	Substantial	Unlikely	Low / Moderate
		Business & VFR	Severe			Severe		Moderate
	3	Niche	Severe	Likely	High	Severe	Likely	Moderate / High
		Pass through	Substantial			Substantial		Moderate
		Business & VFR						

Impact	Scenario	Tourism sector	Without mitigation			With mitigation		
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
Water pollution	0	Niche	Substantial	Very unlikely	Very low	Moderate	Very unlikely	Very low
		Pass through						
		Business & VFR						
	1	Niche	Substantial	Unlikely	Low	Moderate	Unlikely	Low
		Pass through		Very unlikely			Very unlikely	Very low
		Business & VFR						
	2	Niche	Substantial	Likely	High	Moderate	Unlikely	Low
		Pass through				Substantial	Unlikely	Low / Moderate
		Business & VFR						
	3	Niche	Severe	Likely	High	Severe	Very likely	High
		Pass through					Likely	
		Business & VFR						
Disposal of hazardous wastes	0	Niche	Substantial	Very unlikely	Very low	Moderate	Very unlikely	Very low
		Pass through	Moderate					
		Business & VFR						
	1	Niche	Substantial	Likely	Moderate	Moderate	Unlikely	Low
		Pass through	Moderate	Very unlikely	Very low		Very unlikely	Very low
		Business & VFR						
	2	Niche	Severe	Very likely	High	Substantial	Likely	Moderate
		Pass through	Substantial	Likely	Moderate	Moderate	Unlikely	Low
		Business & VFR						
	3	Niche	Severe	Very likely	High	Substantial	Very likely	Moderate / High
		Pass through	Substantial	Likely	Moderate	Moderate	Unlikely	Low
		Business & VFR						

Impact	Scenario	Tourism sector	Without mitigation			With mitigation		
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
Increased carbon footprint & climate change.	0	Niche	Moderate	Extremely unlikely	Very low	Moderate	Extremely unlikely	Very low
		Pass through	Slight			Slight		
		Business & VFR						
	1	Niche	Moderate	Very unlikely	Low	Moderate	Very unlikely	Low
		Pass through	Slight		Very low	Slight		Very low
		Business & VFR						
	2	Niche	Substantial	Likely	Moderate	Substantial	Likely	Moderate
		Pass through	Moderate	Unlikely	Low	Moderate	Unlikely	Low
		Business & VFR						
	3	Niche	Substantial	Likely	Moderate / High	Substantial	Likely	Moderate / High
		Pass through			Moderate			Moderate
		Business & VFR						
Karoo tourism brand degradation	0	Niche	Moderate	Very unlikely	Very low	Moderate	Very unlikely	Very low
		Pass through						
		Business & VFR						
	1	Niche	Moderate	Likely	Low	Moderate	Unlikely	Low
		Pass through		Unlikely				
		Business & VFR						
	2	Niche	Substantial	Very likely	High	Substantial	Likely	Moderate
		Pass through	Moderate	Likely	Low	Moderate	Unlikely	Low
		Business & VFR						
	3	Niche	Substantial	Very likely	High	Substantial	Very likely	Moderate / High
		Pass through	Moderate	Likely	Low	Moderate	Likely	Low
		Business & VFR						

Impact	Scenario	Tourism sector	Without mitigation			With mitigation		
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk
Increased demands on existing tourism infrastructure	0	Niche	Moderate	Very unlikely	Very low	Moderate	Very unlikely	Very low
		Pass through						
		Business & VFR						
	1	Niche	Moderate	Likely	Low	Moderate	Likely	Low
		Pass through						
		Business & VFR						
	2	Niche	Substantial	Likely	Moderate	Substantial	Likely	Moderate / High
		Pass through						
		Business & VFR						
	3	Niche	Substantial	Likely	High	Substantial	Likely	Moderate / High
		Pass through						High
		Business & VFR						
Increased complexity in tourism management	0	Niche	Moderate	Very unlikely	Very low	Moderate	Very unlikely	Very low
		Pass through						
		Business & VFR						
	1	Niche	Substantial	Likely	Moderate	Moderate	Likely	Low
		Pass through		Likely	Low / Moderate		Very unlikely	Very low
		Business & VFR						
	2	Niche	Substantial	Very likely	Moderate / High	Substantial	Likely	Moderate
		Pass through		Likely	Moderate		Unlikely	Low
		Business & VFR						
	3	Niche	Severe	Very likely	High	Substantial	Very likely	High
		Pass through		Likely		Severe	Unlikely	Moderate
		Business & VFR						

9.2.2 Sensitivity of the tourism sector to negative impacts

The identification of risks (Table 9. 2) enabled the evaluation of the sensitivity of the tourism sector of towns, the rural areas, and in and outside the assessment area, to impacts of shale gas exploration and production (Addendum B). The evaluation firstly considered the access routes of tourists to the assessment area and for reasons outlined in Addendum B certain passes over and 'poorts' through mountains were judged to have a very high sensitivity. Atkinson (2009) identified six Karoo tourist routes, three of which cross or skirt the assessment area. The Camdeboo Route (N9) provides access to the central part of the assessment area and is an important access route. It features in mitigation proposals in this chapter (see section 2.2) and is judged to have a very high sensitivity. The Great Karoo Route on the N1 passes partly through the assessment area and carries a lot of north-south traffic. The Sundays River Route on the N10 skirts the assessment area. The sensitivity of both of the latter routes is judged to be high.

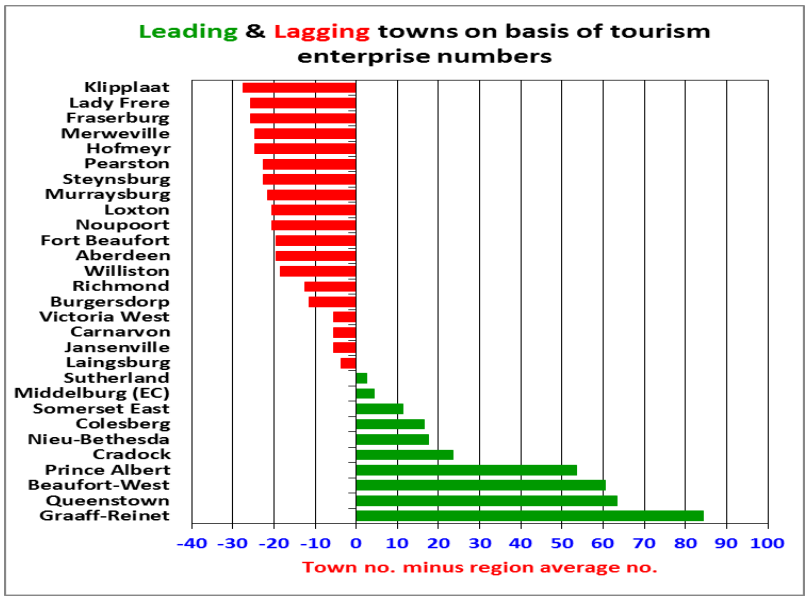

Figure 9.8: Leading (green bars) and lagging (red bars) towns in the assessment area in terms of number of tourism enterprises. Regional average is total number of tourism enterprises in the assessment area divided by the number of towns.

Agritourism, eco-tourism and other niche tourism activities have contributed to the dispersal of tourism facilities throughout the assessment area. There is a lack of information about the precise location of these facilities. Therefore, the whole of the assessment area was judged to have a medium sensitivity except where otherwise indicated. As better information about the location of tourism

facilities and assets becomes available, the sensitivity estimates of specific locations would have to be adjusted.

The sensitivity assessments of the tourism sector of towns were based on two tests: (i) does a town have more or fewer enterprises than the average number of tourism enterprises in the assessment area (i.e. the total number of tourism enterprises in the assessment area divided by the number of towns) (Figure 9.8). This test considers a town's relative contribution to the tourism sector of the assessment area, (ii) does a town have a higher percentage of enterprises in the tourism sector than the average for the assessment area (total number of tourism enterprises in the assessment area divided by the total number of enterprises in the assessment area and expressed as a percentage) (Figure 9.7). This test considers a town's relative dependence on the tourism sector.

It should be noted that when calculating figures for each town the number of enterprises in the surrounding countryside were also included and thus towns which are deemed sensitive would also have sensitive surrounding countrysides. This would also make sense in terms of the countryside being an important resource for tourists visiting the area.

Towns that exceeded the norm in either test were designated leaders and those that did not, were designated laggards.

Taking into account that all towns in the assessment area have one or more tourism enterprises, the minimum sensitivity accorded to towns in the assessment area is medium. The sensitivities of leading towns in both categories have been judged to be very high. The sensitivities of towns that are leaders in one but not the other category have been judged to be high. The sensitivities of towns that are laggards in both categories have been judged to be medium. Table 9.3 summarises the results.

Five towns are deemed to be very sensitive: Graaff-Reinet, Nieu-Bethesda, Prince Albert, Sutherland and Colesberg. All of these towns have a reputation of being a tourist destination. Colesberg is additionally positioned as an overnight stop for travellers between the metropolitan areas of Johannesburg and Cape Town.

The sensitivity of Beaufort West, Cradock, Middelburg, Queenstown and Somerset East is deemed to be high. These are all large towns and derive their enterprise number leadership probably partly from the business and VFR travellers and partly from overnight visitors. Cradock also attracts some niche visitors, e.g. for Karoo food culinary experiences and aquatic activities.

Table 9.3: Assessment of the sensitivity to negative impacts by shale gas exploration and production on the tourism sector of towns in the assessment area.

Town	Enterprise numbers	Tourism sector strength	Sensitivity
Graaff-Reinet	Leader	Leader	Very high
Nieu-Bethesda	Leader	Leader	Very high
Prince Albert	Leader	Leader	Very high
Sutherland	Leader	Leader	Very high
Colesberg	Leader	Leader	Very high
Beaufort-West	Leader	Laggard	High
Cradock	Leader	Laggard	High
Middelburg	Leader	Laggard	High
Queenstown	Leader	Laggard	High
Somerset East	Leader	Laggard	High
Carnarvon	Laggard	Leader	High
Jansenville	Laggard	Leader	High
Laingsburg	Laggard	Leader	High
Loxton	Laggard	Leader	High
Merweville	Laggard	Leader	High
Murraysburg	Laggard	Leader	High
Pearston	Laggard	Leader	High
Richmond	Laggard	Leader	High
Victoria West	Laggard	Leader	High
Williston	Laggard	Leader	High
Aberdeen	Laggard	Laggard	Medium
Burgersdorp	Laggard	Laggard	Medium
Fort Beaufort	Laggard	Laggard	Medium
Fraserburg	Laggard	Laggard	Medium
Hofmeyr	Laggard	Laggard	Medium
Klipplaat	Laggard	Laggard	Medium
Lady Frere	Laggard	Laggard	Medium
Noupoort	Laggard	Laggard	Medium
Steynsburg	Laggard	Laggard	Medium

Two tourism assets seem to play significant roles in the group of small towns that are laggards in the number of tourism enterprises but leaders in tourism sector strength: (i) overnight visitors on main routes from inland to the south (N1 and N12 routes) or to the West Coast (R63 route) benefit Carnarvon and Williston on the R63, Laingsburg and Richmond on the N1, and Victoria West on the N12, and (ii) a Google search confirmed that many hunting opportunities are advertised in the vicinities of all of the towns in this group.

The Square Kilometer Array (SKA) is also being constructed close to Carnarvon and this town's tourism enterprises are benefiting from business tourism associated with this activity.

Aberdeen, Burgersdorp, Fort Beaufort, Fraserburg, Hofmeyr, Klipplaat, Lady Frere, Noupoort, and Steynsburg laggards in the number of tourism enterprises and in tourism sector strength (Table 9.3). The tourism sector has not yet become a major strength of these towns, and the sensitivity of their tourism sectors was judged to be medium.

The assessment area contains many protected areas such as national and private nature reserves. The sensitivity of these areas was judged to be high.

The above analysis enabled the development of an integrated map of the sensitivities of the tourism sector of the assessment area to negative impacts of shale gas exploration and production (Figure 9.9), which shows that protected areas, roads and towns with high and roads and towns with very high sensitivities will have to be handled carefully should shale gas exploration and production be implemented.

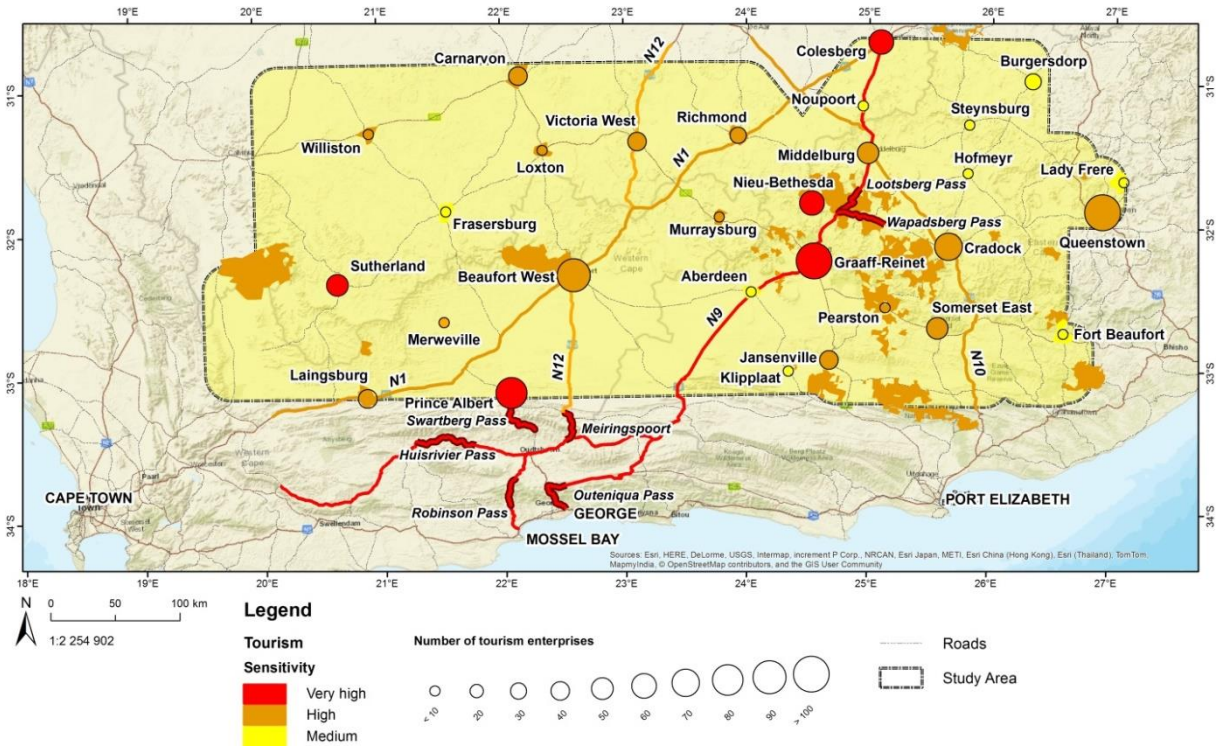

Figure 9.9: Map of the sensitivities to negative impacts of shale gas exploration and production on protected areas, major roads and the tourism sectors of towns of and the access routes from the south to the assessment area.

9.3 Mitigation of Impacts

Mining and tourism invariably end up in conflict (De Klerk & Heath, 2015; McLennan et al., 2015). The dispersed nature of tourism in the assessment area and its sensitivity to negative impacts from shale gas exploration and production (Figure 9.9), suggest conflict could be unavoidable. In fact, two camps have already emerged in the Karoo's 'great shale debate' (De Wit, 2011). Conservationists argue that extraction of the gas will leave massive irreparable environmental scars on one of South Africa's iconic landscapes. Others argue that there is a strong empirical correlation between energy use and wealth, and gas burns almost 50% cleaner than coal. Toerien (2015) suggested that the nature of the conflict is a dilemma between conservation and utilization and creation of a win-win situation requires special efforts.

This prompts the question whether mitigation of negative impacts on the tourism sector is possible. Rumbach (2011) suggested that individual impacts in gas and oil production in Newfoundland are unlikely to have serious and long-term consequences, but without mitigation they could cumulatively do substantial damage to its tourism sector. In addition, he suggested that municipal and county governments have many tools at their disposal to help mitigate the impacts of gas development.

De Klerk & Heath (2015) suggested that ecotourism destinations and mining can co-exist if certain critical factors are considered and applied. This can lead to a long-term partnership between the two industries that should be enforceable beyond mine closures. McLennan et al. (2015) observed that there are key synergies between mining and tourism in two regions in Queensland, Australia. Strategies that could enhance the co-existence of the two sectors, include, among other: (i) the development of trust, communication and partnership between the two sectors, (ii) development of a joint long-term vision and strategy, (iii) development and improvement of industrial tourism products and industry tours, and, (iv) improvement of information flows.

An active partnership between the mining and tourism sectors in the assessment area needs to evolve. Central, provincial and local governments then need to support such action. This section explores some of the realities that have to be taken into account in a quest to create a win-win situation.

Earlier analyses have shown that there could be severe negative impacts on tourism from traffic densification, its associated noise pollution and degradation of roads. Visual and water pollution, the presence of hazardous wastes, increases in earthquakes and the carbon footprint, as well as 'crowding out' of regular tourists by workers of the gas exploration and production sector, could also negatively influence the perceptions of tourists about the assessment area. As a result the Karoo tourism brand

may be degraded and require rejuvenation following shale gas exploration, which would result in an increased need for integrated tourism management in the assessment area.

The mining sector has to accept that tourism is a major business sector in the assessment area and that its planned activities will impact upon it. Tourism generates employment for some 13000 persons and add about R2.5 billion of value to the economy of the assessment area. Should operations of the mining sector result in a 20% decrease in tourism enterprises, more than 2500 employment opportunities and R500 million in economic value could be lost in the assessment area (Table 9.1). It is also important to note that the majority of these jobs are held by semi-skilled local people and that a high proportion is women. In seeking a win-win situation the avoidance of such losses should be pursued and there are two considerations: (i) mitigation of negative impacts, and, (ii) creating a partnership between the different role players

Mitigation of visual, noise and water pollution as well as the disposal of hazardous wastes requires world class practices in the exploration and development phases (see chapters 4,5,6,14 and 16 for more information about mitigation of such impacts). However, from a tourism perspective these steps would in some instances have to be supplemented further.

The noise pollution of non-stop traffic of heavily-laden slow-moving trucks close to tourism establishments in towns and in rural areas could be devastating to tourism in the assessment area. Traffic congestion would also hinder tourists on their way in or out of the assessment area, resulting in a shift of such tourism to other areas not affected by shale gas exploration and production. The routing of shale gas trucks hauling supplies have to be considered with these problems in mind.

Many tourists access the Karoo (and assessment area) from the south using routes that have mountain passes over or ‘poorts’ through mountains (Figure 9.9 and Addendum B). The scenic beauty of the mountains adds to tourist experiences. Traffic congestion on the passes would negatively influence tourists. It is, therefore, suggested that the N9 national road, a major south to north route through the assessment area, should be kept free of truck traffic associated with shale gas exploration and production. The idea of the exclusion of trucks from specific routes is not new. For instance, in California commercial vehicles with 3 or more axles, or a gross vehicle weight of 9,000 pounds or more, are prohibited on Route 2 between the City of La Canada Flintridge and County Route N4 (California Department of Transportation, 2016).

To implement this idea, agreement would be necessary between the mining sector and the tourism sector that it is in the best interests of both sectors to ensure that there is at least one unhindered tourist access route to the assessment area. This could be achieved by designating the N9 national

route as a 'Tourism Protection Route' from which shale gas trucks are barred. Such a route would be a logical extension of the R62 Route (Figure 9.9), which has been successfully developed in the Little Karoo (Route 62, 2016). The Route 62 brand name is legally protected and the intellectual property belongs to a close corporation of stakeholders (G. Lubbe, personal communication). The N9 Tourism Protection Route could be managed in a similar manner (more later).

To further reduce the impacts of visual and noise disturbances on niche tourism, exclusion zones for gas exploration and development could (in addition to use around towns and national parks) be employed around all established rural tourism facilities (e.g. cabins, cottages, houses, lodges, conference venues, etc.) as well as all major roads. The extent of such zones should not be pre-set but should result from the individual Environmental Impact Assessments (EIAs) for each planned drilling and well pad operation. The buffer distances proposed in chapters 7, 14, 15 and 16 provide some indication of what would be required and these would need to be systematically integrated to determine the appropriate buffer for each area from a tourism perspective. More important routes and sites would of necessity require larger buffer distances.

Water pollution can potentially have a significant impact on providing safe water to all tourist categories (Tables 2). This includes niche tourists that visit rural tourism facilities such as farm stays, game farms and the like. It is suggested that in addition to the implementation of world class practices, all of the tourism entrepreneurs in an area where shale gas exploration and/or development are planned, should undergo special training in aspects of water supply. In addition, the water supplies of all rural establishments as well as a selection of establishments in towns in the assessment area should be subject to regular water tests (see later).

Shale gas exploration, but especially production activities, would make demands on existing tourism facilities and perhaps 'crowd out' regular tourists. However, the development of the SKA in the vicinity of Carnarvon as well as a solar power installation at De Aar has shown that private tourism entrepreneurs provide new facilities rapidly when demand rises. No special mitigation steps are proposed.

Shale gas exploration and development increases the carbon footprint of an area (Bezzina, 2013) and this would also happen in the assessment area. A 'Jobs 4 Carbon' project in the Little Karoo is being carried out under the auspices of the Gouritz Cluster Biosphere Reserve (2016). The project establishes large stands of 'Spekboom' (*Portulacaria afra*) to sequester carbon because the plant has a natural capacity to store large amounts of carbon. It might be possible to use plantings of this tree in the Little Karoo to offset part or all of the carbon dioxide emissions from shale gas exploration and production in the Karoo. This possibility should to be investigated.

Earthquakes has the potential to scare and possibly harm tourists visiting or passing through the assessment area (Table 9.2) and can also damage heritage architecture which attracts tourists.. Chapter 4 examines this aspect and considers mitigation possibilities.

Finally, as suggested by McLennan et al (2015) there is an imperative to create a partnership between the mining sector and the tourism sector. Only a few companies are involved in the potential exploration and production of shale gas in the assessment area. Cooperation between these companies should be possible in order to enter into a partnership with the tourism sector. Relationships in the tourism sector, however, are complex. Three provinces and a number of municipalities (district and local) are involved in the assessment area, each pursuing its own strategies. To overcome this complexity and to develop an effective management model, it is suggested that a tourist agency be founded timeously and that it be authorised and empowered, perhaps as a statutory body, to manage tourism holistically in the assessment area. The creation of such an agency would require a bureaucratic mind shift in various levels of government and strong leadership would be needed.

The proposed agency could enter into a partnership with the mining sector and undertake some of the tasks outlined above (e.g. training of stakeholders). In addition, the agency and the mining sector could drive a process to develop industrial tourism products and tours associated with mining as suggested by McLennan et al. (2015). Initial funding of the agency could be obtained from a levy on tourism enterprises but once gas production starts, a tourist levy on gas production could be implemented.

9.4 Lack of Information

Although knowledge about tourism in the Karoo has expanded much in the past decade (e.g. Atkinson, 2016), there are still many important information gaps. Four gaps are particularly important:

The potential implementation of dispersed shale gas in the rural areas of the assessment area where dispersed tourism enterprises are located raises questions about the exact localities of these enterprises and the types of tourism products they offer. This information is not readily available and the lead time involved should shale gas exploration be implemented, offers a time window in which the location and activities of all rural tourism enterprises in the assessment area should be recorded in order to define rural sensitive areas more closely.

The degree to which the different tourist groups (niche, pass through and business tourists) utilize tourism facilities in the different towns and rural areas of the assessment area should be more clearly determined.

The numbers, needs and wants of the pass through tourism group should be analysed.

The needs and wants of business and VFR tourists and their economic importance to Karoo towns must be analysed more closely.

Studies should be undertaken to address these gaps in knowledge.

9.5 Ackowledgements

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9.6 References

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9.7 ADDENDUM A9: Estimates of employment, value addition and the potential impact of shale gas exploration and production on the tourism sector of the assessment area.

Standard Industry Classification (SIC Codes) (Statistics South Africa, 2012) analyses do not include tourism as a separate entity) and its economic and employment contributions are partly hidden in other categories such as 'Other services'. Assessments of the value of tourism as part of the economic development of South African towns and regions are, therefore, usually based on measures such as bed nights and general estimates of money spent by tourists (e.g. Kyle Business Projects, 2009). Some of the data is derived from completed questionnaires, which usually represent only a fraction of all questionnaires distributed. In addition a number of assumptions based on national and other data are used to estimate economic and employment contributions of the tourism sector (see model described in Kyle Business Projects, 2009). Quantification of tourism enterprise numbers does not form part of such assessments.

In contrast, SIC data is used here to estimate the economic value added and employment created by the tourism sector of the assessment area. The approach is based on the regularities (in the form of linear regression equations) observed in enterprise development and dynamics of South African towns (Toerien, 2012, 2014, 2015; Toerien & Seaman, 2010, 2012a,b,c). These studies revealed statistically significant correlations (and linear regression equations) between economic (i.e. gross value added [GVA] and total personal income), demographic (i.e. population numbers), employment (i.e. total as well as sector employment numbers) and entrepreneurial (i.e. number of total as well as sector enterprises) characteristics of South African towns. These regularities also apply to the tourism sector (Toerien, 2012).

Kahneman, (2011) indicated that simple algorithms often predict more effectively than experts. So if in Karoo towns, the GVA, total employment, total enterprise numbers and tourism enterprise numbers are statistically significantly correlated with one another, it would be possible to estimate the portion of employment due to tourism of the towns in the assessment area.

To determine if such regularities are present, use was made of economic, demographic and entrepreneurial characteristics of towns of the assessment area. The economic and employment data was obtained from IHS Global Insight for a range of Karoo towns. The dataset includes the nominal total GVA for 2010 and the GVAs of the following nine broad economic sectors: agriculture, mining, manufacturing, electricity supply, construction, trade, transport, financial services and other services. It also includes total employment as well as employment in each of the above broad sectors. Sixteen

of the 29 towns of the assessment area form part of the dataset. This meant that a significant portion of the 29 towns of the assessment area was included. The dataset also includes Census 2011 populations and 2015/16 enterprise numbers (total and tourism-related) of the 16 towns.

The total GVA, total employment, total enterprise numbers and tourism enterprise numbers of the 16 towns were highly significantly ($P<0.01$) correlated with one another (Table 1). Regularities were thus observed as in other regions.

Table 1: Correlation coefficients and regression equations of the relationships between GVA (gross value added), total employment, total enterprises and tourism enterprises of 16 Karoo towns.

Characterisics	Correlation	Var. Expl. (%)	Regression coefficient	Intercept	n
GVA - employment	0.95	89.9	4.87	511.0	16
GVA - total enterprises	0.92	85.1	0.289	0.7	16
GVA - tourism enterprises	0.77	58.6	0.056	9.0	16
Employment - total enterprises	0.90	80.1	0.055	-15.72	16
Employment - tourism enterprises	0.70	49.6	0.010	7.45	16
Total enterprises - tourism enterprises	0.88	77.3	0.205	7.22	16

Var. expl. (%) = percentage of variance explained

This indicated that the ratio of tourism enterprises to total enterprise numbers for each town could be used to estimate the tourism sector's contribution to its GVA and employment. The basic premise was that because: (i) GVA and tourism enterprises, and (ii) employment and tourism enterprises, are correlated, the assumption could be made that tourism employment (or tourism GVA) is proportional to total employment (or total GVA) according to the ratio of tourism enterprises to total enterprises.

Three ways were identified to use this approach with the available data. Firstly, the total GVA, total employment, total enterprises and tourism enterprises could be used in an analysis summarised in Table 2. This analysis suggests that there are 11632 tourism employees in 589 tourism enterprises in the 16 towns, which equates to nearly 20 employees per tourism enterprise. According to this analysis tourism contributed just below R2 billion to the economies of the 16 towns (Table 2), which equates to an average value addition of R3.325 million per tourism enterprise.

This analysis, however, suffers from a significant weakness, i.e. in South Africa there is no database that provides information on the current number of farming operations in specific areas. Consequently, the number of enterprises (farming operations) that generate a major portion of the GVA attributable to agriculture in the 16 towns is not known. Although some of these farming enterprises are associated with tourism activities such as farm stays, game farming and hunting, and thus contribute to tourism GVA and employment, these contributions are probably still less than 10%

of that of agriculture. Nevertheless the exclusion of farming enterprises in the analysis might result in an overestimate of employment in the tourism sector.

To overcome this problem, the agricultural GVA and agricultural employment data as well as the agricultural enterprises serving the farming community were excluded in a second analysis. This analysis assumed that employment (or GVA) in tourism is proportional to non-agricultural employment (or non-agricultural GVA) according to the ratio of tourism enterprises to non-agricultural enterprises.

The non-agricultural GVA, non-agricultural total employment, non-agricultural enterprise numbers and tourism enterprise numbers of the 16 towns were highly significantly ($P<0.01$) correlated with one another (Table 3) and regularities similar to the earlier ones were observed.

Table 2: The 2010 gross value added (GVA), 2010 total employment, 2015/16 total enterprises and 2015/16 tourism enterprises of 16 Karoo towns

Town	2010 GVA (nominal R million)	Total enterprises towns	Total employment (no.)	Tourism enterprises	Fraction Tourism (%)	Estimated Tourism GVA R Million	Estimated Tourism Employment
Aberdeen	207.723	44	1,739	9	20.5	42.489	356
Beaufort West	1202.421	489	6,482	89	18.2	218.846	1180
Carnarvon	349.808	78	1,382	23	29.5	103.149	408
Colesberg	401.133	154	2,211	45	29.2	117.214	646
Cradock	1135.393	289	7,610	52	18.0	204.292	1369
Graaff-Reinet	1469.052	396	6,172	113	28.5	419.199	1761
Hofmeyer	56.680	21	746	4	19.0	10.796	142
Jansenville	225.190	75	1,817	23	30.7	69.058	557
Middelburg	853.806	174	4,612	33	19.0	161.929	875
Pearston	61.369	17	888	6	35.3	21.660	313
Prince Albert	183.170	155	2,058	82	52.9	96.903	1089
Somerset East	748.280	200	5,258	40	20.0	149.656	1052
Steynsburg	143.421	42	1,123	6	14.3	20.489	160
Sutherland	228.016	52	1,324	31	59.6	135.933	789
Victoria-West	409.467	88	2,449	23	26.1	107.020	640
Williston	255.670	32	943	10	31.3	79.897	295
Total	7930.598	2306	46814.000	589	452.1	1958.528	11632
Average	495.662	144	2925.875	37	28.3	122.408	727
Std Dev	445.294	140	2288.706	33	12.6	100.631	466
Median	302.739	83	1937.500	27	27.3	105.084	643

Std dev = standard deviation

Table 3: Correlation coefficients and regression equations of the relationships between non-agricultural GVA (gross value added), total non-agricultural employment, total enterprises and tourism enterprises of 16 Karoo towns.

Characterisics	Correlation	Var. Expl. (%)	Slope	Intercept	n
GVA - employment	0.97	94.7	4.40	264.6	16
GVA - total enterprises	0.88	77.4	0.266	12.4	16
GVA - tourism enterprises	0.76	57.5	0.057	12.1	16
Employment - total enterprises	0.90	81.0	0.060	-2.93	16
Employment - tourism enterprises	0.73	53.7	0.012	10.34	16
Total enterprises - tourism enterprises	0.88	77.8	0.219	8.78	16

The ratio of tourism enterprises to total non-agricultural enterprise numbers for each town was used to estimate the tourism sector's GVA and employment contributions (Table 4). This analysis suggested that there are 9618 tourism employees in 589 tourism enterprises in the 16 towns, which equates to just more than 16 employees per tourism enterprise. According to this analysis, tourism contributed about R1,9 billion to the economies of the 16 towns (Table 2), which equates to an average value addition of R3.24 million per tourism enterprise.

Although the second analysis does not include GVA and employment data contributed by farm-based tourism products, it includes contributions by sectors that are clearly not associated with tourism, i.e. the mining, manufacturing, electricity supply, construction, trade, transport and financial services sectors. This might also distort quantification of the GVA and employment contributions of the tourism sector.

Consequently a third analysis was done. It was assumed that the GVA and employment contributions of the tourism sector are mostly included in the 'other services' sector. The use of the ratio of the number of tourism enterprises to the number of enterprises in the 'other services' sector was used to estimate the GVA as well as employment contributions of the tourism sector. In this analysis all enterprises serving sectors not included in the 'other services' sector were excluded.

The GVA, employment and enterprise numbers in the 'other services' sector of the 16 towns (Table 5) were significantly ($P<0.01$) correlated with one another as well as with the tourism enterprise numbers (Table 6). Regularities similar to those observed before were again observed.

Table 4: The 2010 non-agricultural gross value added (GVA), 2010 total non-agricultural employment, 2015/16 total non-agricultural enterprises and 2015/16 tourism enterprises of 16 Karoo towns

Town	2010 non-agriculture GVA	Non-agricultural enterprises towns	Non-agricultural employment (no.)	Tourism enterprises	Fraction Tourism (%)	Tourism GVA R Million	Tourism Employment
Aberdeen	170.394	37	1207	9	24.3	41.447	294
Beaufort West	1063.860	472	5635	89	18.9	200.601	1063
Carnarvon	254.163	62	973	23	37.1	94.286	361
Colesberg	333.241	148	1623	45	30.4	101.323	493
Cradock	1056.959	250	5797	52	20.8	219.848	1206
Graaff-Reinet	1423.233	354	5405	113	31.9	454.309	1725
Hofmeyer	50.492	17	349	4	23.5	11.881	82
Jansenville	193.766	54	1211	23	42.6	82.530	516
Middelburg	821.777	141	3780	33	23.4	192.331	885
Pearston	46.327	16	422	6	37.5	17.373	158
Prince Albert	134.973	150	1196	82	54.7	73.785	654
Somerset East	690.229	164	3438	40	24.4	168.349	839
Steynsburg	122.011	32	702	6	18.8	22.877	132
Sutherland	121.463	47	671	31	66.0	80.114	443
Victoria-West	307.934	72	1770	23	31.9	98.368	566
Williston	150.118	29	589	10	34.5	51.765	203
Total	6940.939	2045	34769	589	520.6	1911.2	9618
Average	433.809	128	2173	37	32.5	119.4	601
Std Dev	434.157	131	1963	33	13.1	111.0	449
Median	223.965	67	1209	27	31.2	88.4	505

Std dev = standard deviation

The ratio of tourism enterprises to 'other services' enterprise numbers for each town was used to estimate the tourism sector's GVA and employment contributions in the 16 towns (Table 6).

This analysis suggested that there are 7224 tourism employees in 589 tourism enterprises in the 16 towns, which equates to just more than 12 employees per tourism enterprise. According to this analysis the tourism industry contributes just over R1,6 billion to the local economies of the 16 towns, which equates to an average value addition of R2.77 million per tourism enterprise to local economies.

Table 5: Correlation coefficients and regression equations of the relationships between GVA (gross value added), employment, and enterprises in the 'other services' sector as well as tourism enterprises of 16 Karoo towns.

Characterisics	Correlation	Var. Expl. (%)	Slope	Intercept	n
Other services GVA – other services employment	0.96	91.8	3.75	147.2	16
Other services GVA – other services enterprises	0.74	54.9	0.227	24.1	16
Other services GVA - tourism enterprises	0.65	42.3	0.094	16.7	16
Other services employment – Other services enterprises	0.80	64.7	0.063	12.93	16
Other services employment - tourism enterprises	0.67	44.5	0.025	13.41	16
Other services enterprises - tourism enterprises	0.94	88.0	0.444	4.61	16

The three analyses provide information about the likely lower and upper levels of economic and employment contributions of tourism enterprises in the 16 towns: 12 to 20 employees per tourism enterprise and each tourism enterprise adding between R2.77 million and R3.33 million of economic value to their local economies.

Extending the analyses to all of the towns of the assessment area

The ratios reported in the previous section were used to assess the likely lower and upper levels that the tourism sector contributes to employment and GVA in the 13 towns not included in the previous analyses (Table 7). Combination of the information in Tables 2, 4, 6 and 7 shows that there are 828 tourism enterprises in the assessment area employing between 10100 and 16400 workers and adding between R2.3 billion to R2.7 billion to the local economies of the assessment area.

The above information is used to quantify the risks for the tourism industry associated with shale gas exploration and production in the assessment area.

Table 6: The 2010 gross value added (GVA), 2010 employment and 2015/16 enterprises in the other services sector as well as the 2015/16 tourism enterprises of 16 Karoo towns

Town	2010 Other services GVA	Other services enterprises per town	Other services employment (no.)	Tourism enterprises	Fraction Tourism (%)	Tourism GVA R Million	Tourism Employment
Aberdeen	72.913	22	472	9	40.9	29.828	193
Beaufort West	332.678	234	1963	89	38.0	126.532	747
Carnarvon	157.566	38	411	23	60.5	95.369	249
Colesberg	144.473	73	613	45	61.6	89.059	378
Cradock	619.609	130	2762	52	40.0	247.843	1105
Graaff-Reinet	738.531	210	2435	113	53.8	397.400	1310
Hofmeyer	35.532	10	203	4	40.0	14.213	81
Jansenville	79.126	36	528	23	63.9	50.553	337
Middelburg	483.463	76	1897	33	43.4	209.925	824
Pearston	24.021	12	250	6	50.0	12.010	125
Prince Albert	48.049	109	456	82	75.2	36.147	343
Somerset East	329.134	97	1687	40	41.2	135.725	695
Steynsburg	77.035	14	267	6	42.9	33.015	114
Sutherland	22.582	38	233	31	81.6	18.422	190
Victoria-West	174.373	41	773	23	56.1	97.819	433
Williston	70.831	20	199	10	50.0	35.416	99
Total	3410	1160	15146	589	839.2	1629.3	7224
Average	213	73	947	37	52.5	101.8	451
Std Dev	225	69	881	33	13.2	105.3	377
Median	112	40	500	27	50.0	69.8	340

Std dev = standard deviation

Table 7: The estimated contributions of the tourism sector to employment and economic value addition in the towns of the assessment area that did not form part of the dataset used in the earlier analyses.

Town	Tourism enterprises (no.)	Total enterprises (no.)	Estimated tourism employment	Estimated tourism GVA contribution (R million)
Burgersdorp	17	94	204 - 340	47.1 - 55.25
Fort Beaufort	9	108	108 - 180	24.9 -29.3
Fraserburg	3	35	27 - 60	8.3 - 9.8
Klipplaat	1	14	9 - 20	2.8 - 3.3
Lady Frere	3	35	27 - 60	8.3 - 9.8
Laingsburg	25	67	300 - 500	69.3 - 81.3
Loxton	8	17	96 - 160	22.2 - 26.0
Merweville	4	13	48 - 80	11.1 - 13.0
Murraysburg	7	26	84 - 140	19.4 - 22.8
Nieu-Bethesda	46	58	552 - 920	127.4 - 149.5
Noupoort	8	38	96 - 160	22.2 - 26.0
Queenstown	92	882	1104 - 1840	254.8 - 299.0
Richmond	16	44	192 - 320	44.3 - 52.0
	239	1431	2868 - 4780	662.0- 776.8

Quantification of the risks involved with shale gas exploration and production

The overall risk methodology prescribed for the assessment of risks associated with shale gas exploration and assessment uses five levels of risk: very low risk, low risk, moderate risk, high risk and very high risk. These risk levels are functions of the likelihood of occurrence and the consequences of occurrence of events (Figure 1).

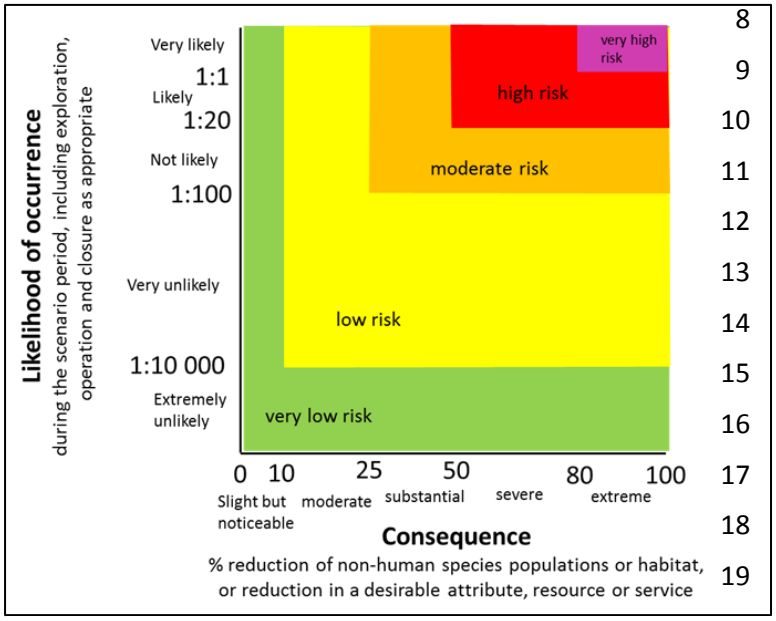

Figure 1: Risk assessment as a function of likelihood of occurrence and consequences.

The upper risk limit is set by the limit of acceptable change, which in this case was determined by the combined experience and insights of the project team. This team set the limit at a 20% decrease in tourism enterprises.

With the aid of the previous analyses the limit of acceptable change and the risk levels can be be quantified in terms of potential

losses in employment and negative economic impact in the assessment area (Table 4).To do this the averages of the lower and upper estimates of employment and economic value addition per tourism enterprise are used, i.e. 16 employees per enterprise and R3.0 million economic value added per tourism enterprise. The expected impacts are summarised in Table 8 and provides measures whereby the integrated risk table in the main text can be interpreted.

Table 8: Quantification of risks to the tourism sector of the assessment area in terms of losses in employment and economic value addition.

Loss in tourism enterprises	Tourism employment Loss	Loss in GVA R million	Risk
< 4%	<530	<100	Very low
4 - 8%	531 - 790	100.1 - 200	Low
8.1 - 12%	791 - 1580	200.1 - 300	Moderate
12.1 - 16%	1581 - 2110	300.1 - 400	High
16.1 - 20%	2111 - 2660	400.1 - 500	Very high
>20%	>2660	>500	Limit

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9.8 ADDENDUM B9: Tourism sensitivity

Sensitivities of tourism facilities and assets in towns and elsewhere in the assessment area to impacts of shale gas exploration and production

Mining significantly transformed the Australian economy and in the process the resources sector increasingly encroached on the tourism sector. This resulted in increased conflict between the two sectors (McLennan et al., 2015). It is inevitable that should shale gas exploration and production happen in the assessment area, the tourism industry will be negatively impacted. To develop an understanding of the geographic spread of the sensitivities of the area to negative impacts, it is necessary to identify the sensitivity levels of different components of the tourism industry in the area.

Levels of sensitivity

Five levels of sensitivity have been considered in this analysis: none, low, medium, high and very high. Allocation of a sensitivity level is mostly a judgment call of the project team, but where possible quantified measures are employed.

Access of tourists to the assessment area

Tourists enter the assessment area either by road, rail or air. Rail services in South Africa no longer carry many tourists and flight services to Karoo towns are limited. Consequently, road access is important for tourists to access the assessment area. Most tourists entering this area from the south have to negotiate passes over or 'poorts' through the mountains (e.g. Robinson Pass between Mossel Bay and Oudtshoorn, Outeniqua Pass between George and Oudtshoorn, Huisrivier Pass between Calitzdorp and Oudtshoorn, Meiringspoort on the N12 between De Rust and Beaufort West and Swartberg Pass on the R328 between Oudtshoorn and Prince Albert). Whilst crossing the passes, scenery adds to the tourist experience. In the assessment area several mountain passes also add to tourist experiences, e.g. Lootsberg Pass on the N9 route and Wapadsberg Pass on the R61 between the N9 and Cradock. The densification of traffic through the passes by large numbers of slow-moving trucks ferrying materials for shale gas exploration and production will negatively impact on tourists' perceptions about the Karoo as a tourist destination. Tourists' sensitivity to heavy traffic on the passes or through the 'poorts' are expected to be very high.

Tourists accessing the Karoo from directions other than the south do not have to negotiate mountain passes. Therefore tourist routes have to be considered. Atkinson (2009) identified six Karoo tourist routes, three of which cross or skirt the assessment area. The Camdeboo Route (N9 national highway) is especially important because it provides access to the assessment area and many of its tourism assets. The N9 route also forms part of the mitigation proposals of this study and is considered to be very sensitive to negative impacts. The Great Karoo Route on the N1 passes partly through the

assessment area and carries a lot of north-south traffic. The Sundays River Route on the N10 skirts the assessment area. The sensitivity of both of the latter routes is judged to be high.

Dispersed tourist attractions

The rise of various niche tourism activities in rural Karoo (e.g. agritourism, eco-tourism, etc.) has dispersed tourism activities and facilities throughout the assessment area. There is a lack of information about the precise location of these activities. Therefore the whole of the assessment area should be considered to have a medium sensitivity to negative impacts except where otherwise indicated. As better information about the location of tourism facilities and assets becomes available, the sensitivity estimates of specific locations might have to be adjusted.

Sensitivity of the tourism sectors of towns and their surrounding areas

Quantified data on the tourism enterprises of the assessment area is now available. There are two ways to use the data to determine the tourism sensitivities of towns and their surrounding areas (for simplicity's sake hereafter referred to as towns) re shale gas exploration and production. Firstly, the tourism enterprise numbers of towns can be compared to the regional average number of tourism enterprises per town. This identifies leading and lagging towns as far overall size of towns' tourism sectors are concerned. Secondly the relative strength of the tourism sector (normalised as a percentage of total enterprises) of a town can be compared to the strength of the tourism sector relative to all enterprises in the assessment area.

Based on numbers of tourism enterprises Graaff-Reinet is the leading assessment area town (Figure 1) and based on composition (tourism percentage) it is also one of the leading towns (Figure 2). Part of the strength of Graaff-Reinet probably resides in its role as a tourist destination for niche-seeking tourists and it is expected to have a very high sensitivity to negative impacts on its tourism sector.

Graaff-Reinet is clearly differentiated from the other large towns (Queenstown, Beaufort West, Cradock, Middelburg and Somerset East), which are leaders as far as tourism enterprise numbers are concerned (Figure 1) but are lagging in the relative strength of their tourism sectors (Figure 2). The large number of tourism enterprises in Queenstown, Beaufort West, Cradock, Middelburg and Somerset East (Figure 1) are probably mostly a function of their business and VFR tourism sectors. In terms of relative strength (percentage of tourism enterprises) the tourism sectors of these towns are lagging the region's average (Figure 2). Niche tourism probably plays a relatively limited role in these towns. The towns are expected to have a high sensitivity to negative impacts.

Despite being fairly small towns, Prince Albert, Nieu-Bethesda and Sutherland are leaders as far as the number of tourism enterprises are concerned (Figure 1) as well as the relative strength (percentage

of total enterprises) of their tourism sectors (Figure 2). They are tourist destinations and are considered to have a very high sensitivity to negative impacts on their tourism sectors.

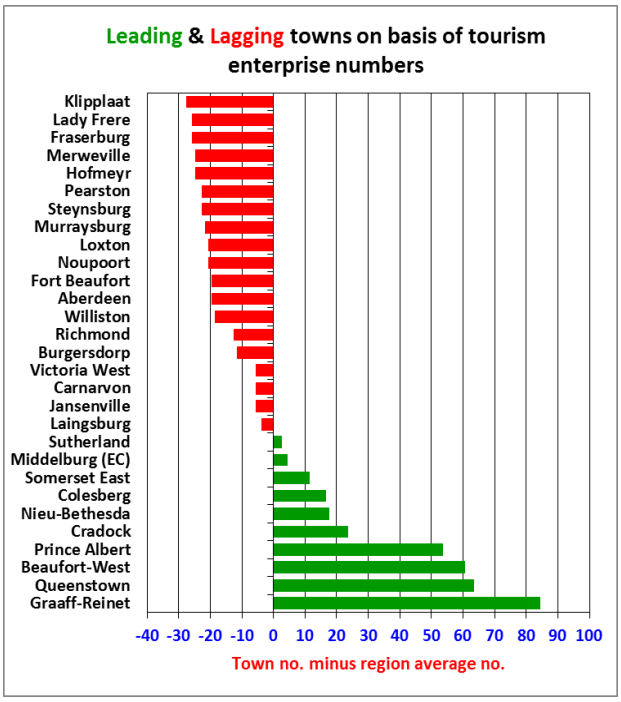

Figure 1: Leading (green bars) and lagging (red bars) towns in the assessment area in terms of number of tourism enterprises. Regional average is total number of tourism enterprises divided by number of towns.

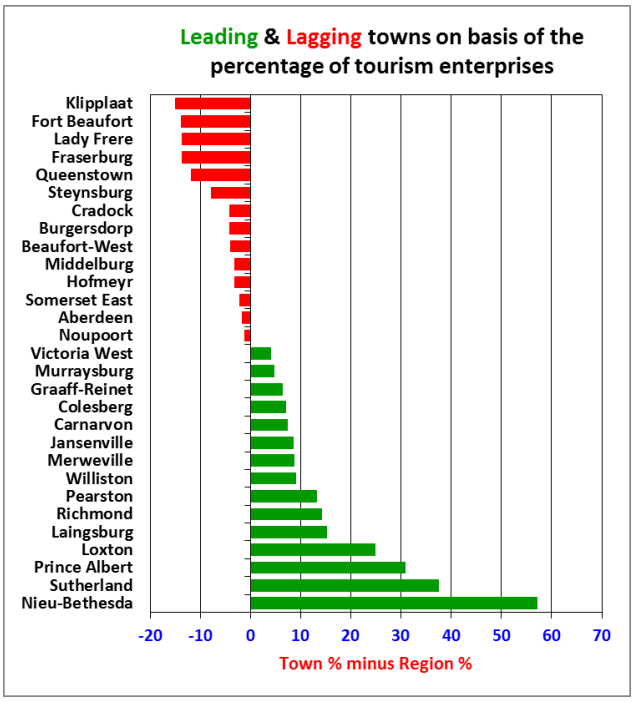

Figure 2: Leading (green bars) and lagging (red bars) towns in the assessment area based on their relative % of tourism enterprises. Regional average is total number of tourism enterprises in the assessment area divided by total number of enterprises and expressed as %.

Colesberg is a leader in terms of tourism enterprise numbers as well as the strength of its tourism sector (Figures 1 and 2). This town also benefits from its position as a stopover for travellers on the N1. It is expected to have a very high sensitivity.

A number of towns (Loxton, Laingsburg, Richmond, Pearston, Williston, Merweville, Jansenville, Carnarvon, Murraysburg and Victoria West) are leaders as far as the strengths of their tourism sectors (percentage tourism enterprises) are concerned (Figure 2) but lag in the number of tourism enterprises (Figure 1). Laingsburg, Richmond and Victoria West are located on national roads with lots of traffic and benefit from that. The rest of these towns are probably benefitting from niche tourism (including hunting), but being small, they have not been able to expand their tourism sectors to the extent that Prince Albert, Nieu-Bethesda and Sutherland have been able to do. The sensitivity to negative impacts on the tourism sectors of these towns is judged to be high.

A number of towns (Noupoort, Aberdeen, Hofmeyr, Burgersdorp, Steynsburg, Fraserburg, Lady Frere, Fort Beaufort, Klipplaat) are laggards in the number of tourism enterprises (Figure 1) and in tourism sector strength (percentage tourism enterprises) (Figure 2). They are judged to have a medium sensitivity to negative impacts on their tourism sectors.

Geographic representation of sensitivities

The information in this analysis was used to develop a geographic representation of tourism sensitivities in the assessment area. The map of the sensitivities is presented in the main chapter.

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