DIGITAL ADDENDA 9A - 9B

DIGITAL ADDENDUM 9A: Estimates of employment, value addition and the potential impact of shale gas development (SGD) on the tourism sector of the study area.

Standard Industry Classification (SIC Codes) (Statistics South Africa, 2012) analyses do not include tourism as a separate entity and it's 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 (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 firstly to estimate the economic value added and employment created by the tourism sector of the study area. These estimates are then compared with national data reported by the SA Tourism Review Committee (2015).

The first approach is based on regularities (in the form of linear regression equations) observed in enterprise development and dynamics of South African towns (Toerien, 2012b, 2014, 2015; Toerien & Seaman, 2010, 2012a, 2012b). 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, 2012b).

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 study area.

To determine if such regularities are present, use was made of economic, demographic and entrepreneurial characteristics of towns of the study 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 study area form part of the dataset. This meant that a significant portion of the 29 towns of the study 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 A9.1). Regularities were thus observed as in other regions.

Table A9.1: Correlation coefficients and regression equations of the relationships between GVA (gross value added), total employment, total enterprises and tourism enterprises of 16 Karoo towns.

Characteristics	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 A9.2. This analysis suggests that there are 11 632 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 R 2 billion to the economies of the 16 towns (Table A9.2), which equates to an average value addition of R 3.325 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

Table A9.2: 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

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 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 A9.3) and regularities similar to the earlier ones were observed.

Table A9.3: 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.

Characteristics	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 A9.4). This analysis suggested that there are 9 618 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 R 1.9 billion to the economies of the 16 towns (listed in Table A9.2); which equates to an average value addition of R 3.24 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.

Table A9.4: 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

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 were significantly (P<0.01) correlated with one another as well as with the tourism enterprise numbers (Table A9.5). Regularities were again observed. The ratio of tourism enterprises to the 'other services' enterprise numbers for each town was used to estimate the tourism sector's GVA and employment contributions in the 16 towns (Table A9.6).

This analysis suggested that there are 7 224 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 R 1.6 billion to the local economies of the 16 towns, which equates to an average value addition of R 2.77 million per tourism enterprise to local economies.

Table A9.5: 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 R 2.77 million and R 3.33 million of economic value to their local economies.

Extending the analyses to all of the towns of the study 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 A9.7). Combination of the information in Tables A9.2, A9.4, A9.6 and A9.7 shows that there are 828 tourism enterprises in the study area employing between 10 100 and 16 400 workers and adding between R 2.3 billion to R 2.7 billion to the local economies of the study area.

Reality check

A review of South African tourism estimated that in 2013 tourism contributed R 103.6 billion to the South African GDP and employed 655 509 persons (SA Tourism Review Committee, 2015). This relationship suggests that the tourism employment estimates of this study (10 100 to 16400 persons) are equivalent to a GDP contribution of between R 1.6 billion and R 2.6 billion. This is in reasonable agreement with the estimates of the present study that were used to quantify the SGD risks for the tourism industry in the study area.

Quantification of the risks involved with SGD

The overall risk methodology prescribed for the assessment of risks associated with SGD 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 (Scholes et al., 2016).

The upper risk limit is set by the limit of acceptable change, which in this case was determined from 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 quantified in terms of potential losses in employment and negative economic impact in the study area. 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 A9.8 and provides measures whereby Table 9.2 in Toerien et al. (2016) can be interpreted.

Table A9.6: 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 A9.7: The estimated contribution of the tourism sector to employment and economic value addition in the towns of the study 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

Table A9.8: Quantification of risks to the tourism sector of the study 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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DIGITAL ADDENDUM 9B: Tourism sensitivity

Sensitivities of tourism facilities and assets in towns and elsewhere in the study area to impacts of Shale Gas Development (SGD)

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 SGD happen in the study 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 were employed.

Access of tourists to the study area

Tourists enter the study 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 study area. Most of the 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 or driving through the 'poorts', scenery adds to the tourist experience. In the study 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 SGD 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.

Atkinson (2009) identified six Karoo tourist routes, three of which cross or skirt the study area. The Camdeboo Route (N9 national highway) is especially important because it provides access to the study 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 study area and carries a lot of north-south traffic. The Sundays River Route on the N10 skirts the study area. The sensitivity of both of the latter routes is judged to be high.

Noise pollution

Table 1.3 in Burns et al. (2016) and Section 2.5.2 of Wade et al. (2016) provide estimates of the large number of shale gas truck visits expected should SGD be implemented from about 2025 onwards. Based on experiences elsewhere, a continuous stream of trucks (in the Small and Big Gas scenarios, Burns et al., 2016) passing through towns where tourists overnight, will negatively impact on these tourists and tourist facilities close to through roads. These tourists are likely to seek accommodation elsewhere where intrusive noises are absent. Truck traffic on dirt roads in areas with dispersed tourist accommodation will be audible over long distances and is bound to influence perceptions about the study area as a place 'to get away from it all'.

Dispersed tourist attractions

The rise of various niche tourism activities in rural Karoo (e.g. agri-tourism, ecotourism) has dispersed tourism activities and facilities throughout the study area. There is a lack of information about the precise location of these activities. Therefore the whole of the study 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 study 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: SGD. 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 in terms of the regional average number of tourism enterprises per town. 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 study area.

Graaff-Reinet is the leading study area town based on numbers of tourism enterprises (Figure B9.1) and based on composition (tourism percentage) it is also one of the leading towns (Figure B9.2). 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 B9.1) but are lagging in the relative strength of their tourism sectors (Figure B9.2). The large number of tourism enterprises in Queenstown, Beaufort West, Cradock, Middelburg and Somerset East (Figure B9.1) are probably mostly a function of their business and VFR tourism sector. In terms of relative strength (percentage of tourism enterprises) the tourism sectors of these towns are lagging the region's average (Figure B9.2). Niche tourism probably plays a relatively limited role in these towns. The towns are expected to have a high sensitivity to negative impacts.
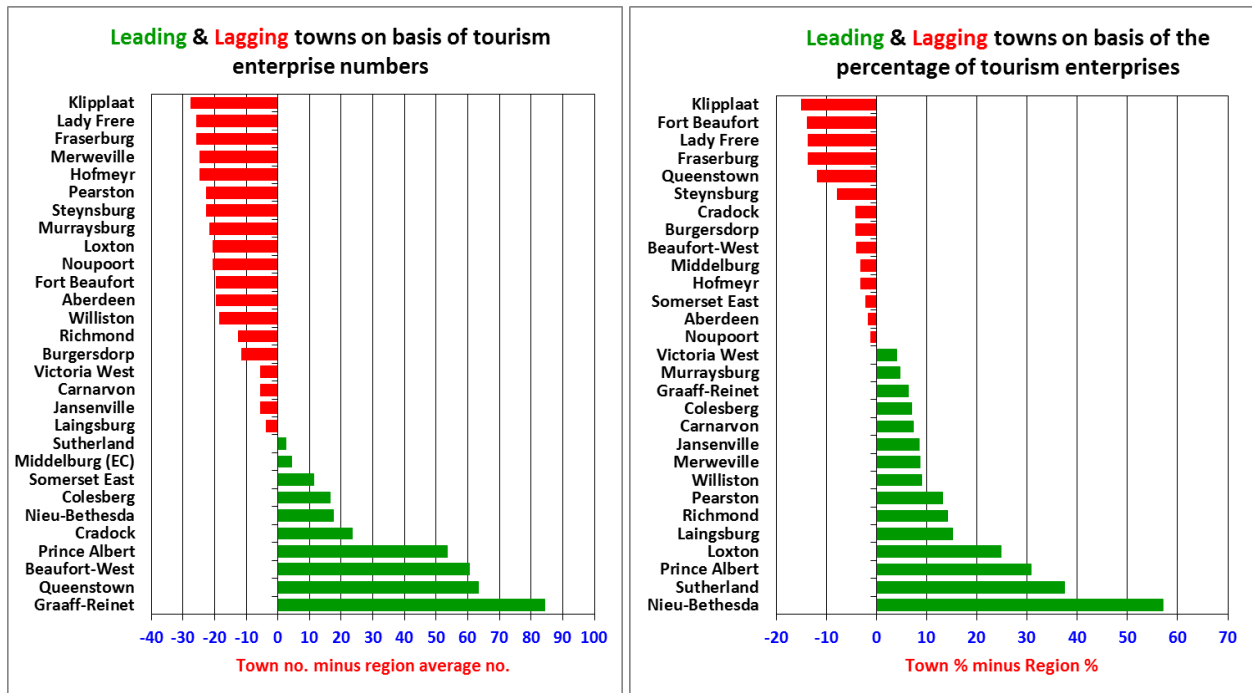

Figure B9.1 Leading (green bars) and lagging (red bars) towns in the study area in terms of number of tourism enterprises. Regional average is total number of tourism enterprises divided by number of towns.

Figure B9.2 Leading (green bars) and lagging (red bars) towns in the study area based on their relative % of tourism enterprises. Regional % is total number of tourism enterprises in the study area divided by total number of enterprises and expressed as %.

Despite being fairly small towns, Prince Albert, Nieu-Bethesda and Sutherland are leaders as far as the numbers of tourism enterprises are concerned (Figure B9.1), as well as the relative strength (percentage of total enterprises) of their tourism sectors (Figure B9.2). They are tourist destinations and are considered to have a very high sensitivity to negative impacts on their tourism sectors.

Colesberg is a leader in terms of tourism enterprise numbers as well as the strength of its tourism sector (Figures B9.1 and B9.2). 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 B9.2) but lag in the number of tourism enterprises (Figure B9.1). 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 terms of number of tourism enterprises (Figure B9.1) and in tourism sector strength (percentage tourism enterprises) (Figure B9.2). 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 study area. The map of the sensitivities is presented in Figure 9.9 of this assessment (Toerien et al., 2016).

Digital Addendum 9B References

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