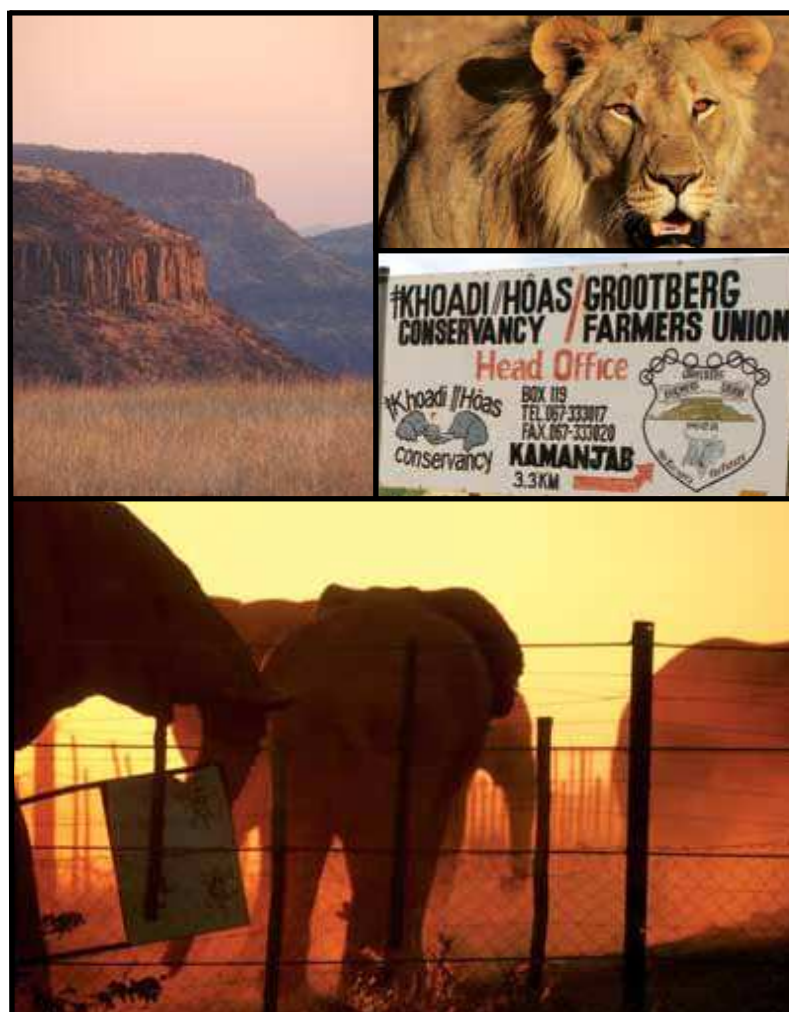


An analysis of Human Wildlife Conflict in the ≠Khoadi //Hoas Conservancy for the period 2007 to June 2011

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for CDSS

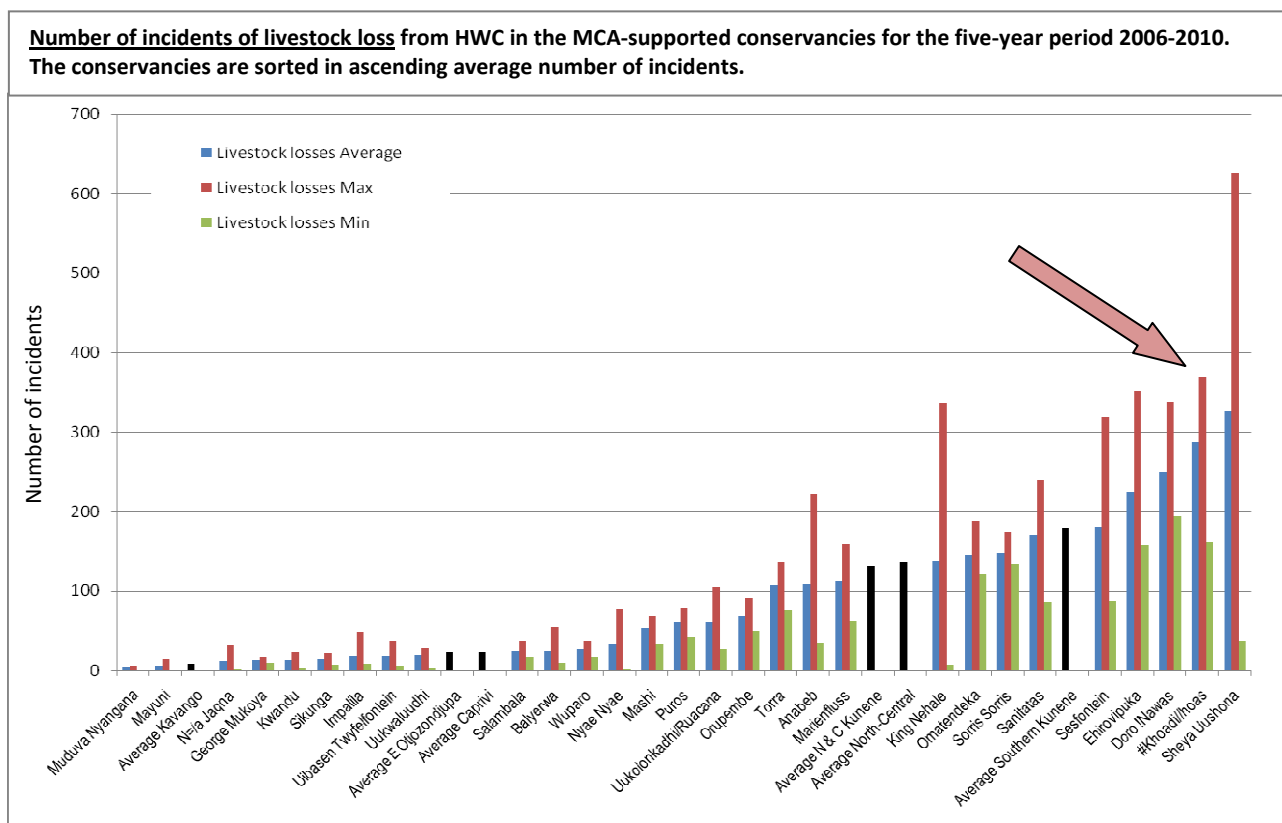


September 2011

Introduction

1. This analysis was undertaken to:
 - a. Better understand the extent, characteristics and details of Human-Wildlife Conflict (HWC) in the ≠Khoadi //Hoas Conservancy,
 - b. Develop an analytical approach to HWC at conservancy level which can then be rolled out to other priority conservancies, and to
 - c. Plan an appropriate response to HWC at the conservancy level, taking into account the various types of conflict, the costs of the different types of conflict, the wildlife species involved, the geographic locations of the conflict and the dynamic nature of the conflict in terms of seasonality, year to year and longer-term trends.

2. The ≠Khoadi //Hoas Conservancy was selected as a pilot conservancy because it is exposed to high incidents of HWC, both from elephants (it is on an elephant movement corridor from Etosha National Park via Hobatere) and from predators (both from Etosha/Hobatere and from its own exclusive wildlife area). The position of ≠Khoadi //Hoas Conservancy relative to all the MCA-Namibia-supported conservancies is shown in the figures below. It should be kept in mind that the MCA-supported conservancies are likely to experience more HWC than the average for all communal conservancies in Namibia because their selection was influenced by proximity to national parks.



3. The **Vision** of the ≠Khoadi //Hoas Conservancy as stated in the HWC Management Plan is “To live in harmony with wildlife and to reducing human-wildlife losses and maximizing benefits from wildlife by establishing and implementing an active human-wildlife management and self-reliance programme.”
The **Objectives** are:

Objective 1: To live in harmony with elephants

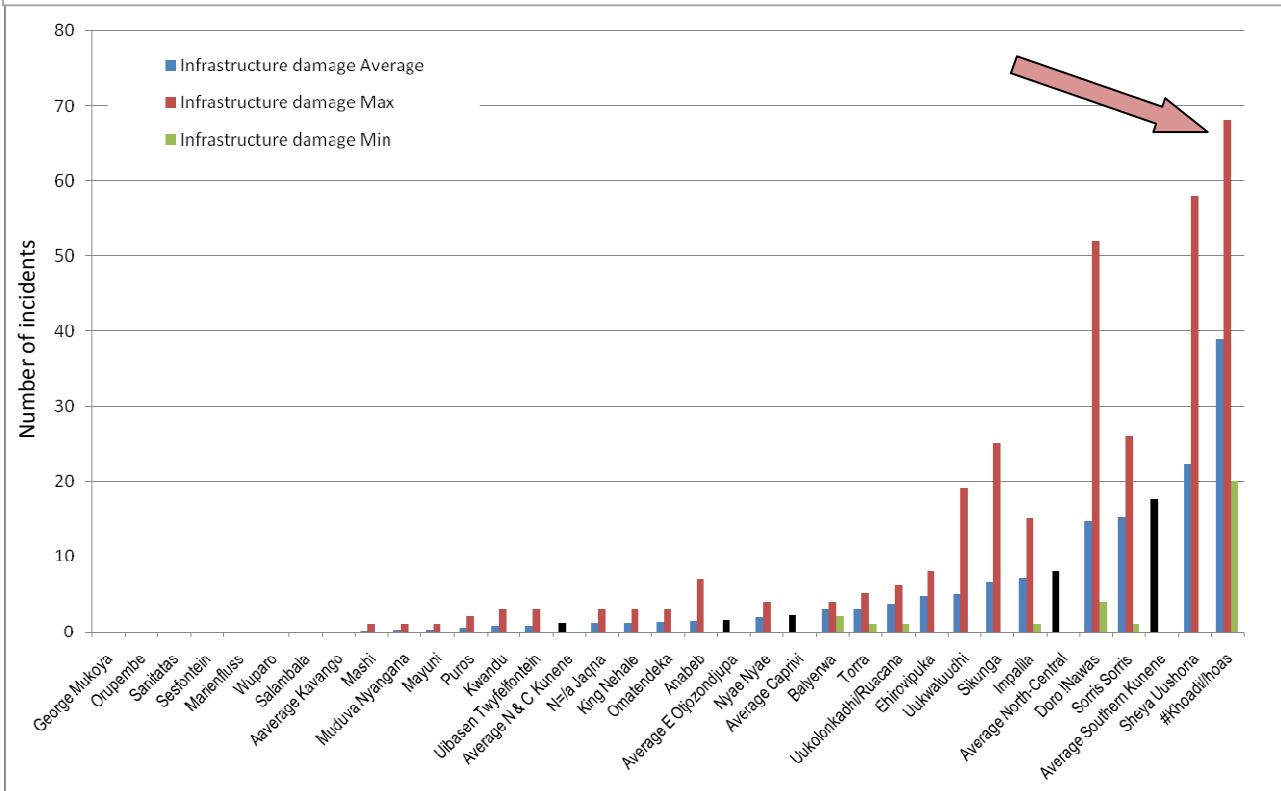
Objective 2: To maximize benefits and minimize costs through consumptive and non consumptive use of lions

Objective 3: To minimize conflict between cheetahs and the farming community and maximize benefits

Objective 4: To increase benefits and minimize conflicts with hyaenas

Objective 5: To confine baboons to the exclusive wildlife area as far as possible

Number of incidents of infrastructure damage from HWC in the MCA-supported conservancies for the five-year period 2006-2010. The conservancies are sorted in ascending average number of incidents.



4. The data used in this analysis were obtained from the Event Books of the Environmental Shepherds in the #Khoadi //Hoas Conservancy. The analysis covers the period from January 2007 to June 2011.

5. An important principle of the Event Book system is that the Event Books live in the conservancy and are used for local decision-making and adaptive

Block Number					Problem animal		PROBLEM ANIMALS		
Date	Village	South	East	Species	Type of Damage	Number	Complainant	Complainant's signature	
7/1/2007	ERITE	124	508	Jackal	goat	1	J. Pictus	J.Pictus	
2/1/2007	Kaiserfontein pos	119	510	Bobcats	lamps	6	Ukonati	Ukonati	
4/1/2007	Kaiserfontein	119	510	Cheetah	goats	3	L. Konati	L. Konati	
21/1/2007	Kaiserfontein pos	123	511	Jackal	goats	1	E. Gansob	E. Gansob	
6/1/2007	Eandrag pos 3	122	567	cheetah	sheep	5	E. Gansob	E. Gansob	
4/1/2007	Eandrag	122	567	cheetah	sheep	3	Immanuel	Immanuel	
5/1/2007	Eandrag	122	567	Jackal	goat	2	Immanuel	Immanuel	
7/1/2007	Eandrag	122	567	Caracal	lamp	1	Immanuel	Immanuel	
7/1/2007	Kaiserfontein	119	510	cheetah	goat	2	E. Gansob	E. Gansob	
7/1/2007	Kaiserfontein	119	510	bobcats	lamp	9	E. Gansob	E. Gansob	
4/1/2007	ERITE pos 1	123	510	Jackal	goat	1	S. Gansob	S. Gansob	
6/1/2007	ERITE pos 1	123	510	Jackal	lamp	1	J. Gansob	J. Gansob	
6/1/2007	ERITE pos 2	123	510	hyaena	cattle	1	I. H. Gansob	I. H. Gansob	
5/1/2007	ERITE pos 2	123	510	Jackal	goat	1	L. H. Gansob	L. H. Gansob	
3/1/2007	ERITE pos 2	123	510	Jackal	goat	2	F. H. Gansob	F. H. Gansob	
3/1/2007	ERITE pos 2	123	510	Jackal	goat	1	M. H. Gansob	M. H. Gansob	
12/1/2007	Mona pos 2	134	564	Cheetah	calf	1	R. Gansob	R. Gansob	
12/1/2007	Mona pos	134	564	cheetah	goats	6	F. Gansob	F. Gansob	
12/1/2007	Libra	128	566	Cheetah	goat	1	E. Gansob	E. Gansob	
12/1/2007	Libra	128	566	elephant	boke fence	1	E. Gansob	E. Gansob	
12/1/2007	Opuno	133	566	hyaena	goat	1	E. Gansob	E. Gansob	
12/1/2007	Opuno	133	566	hyaena	goats	1	E. Gansob	E. Gansob	
12/1/2007	Opuno	133	566	Baboons	goats	1	E. Gansob	E. Gansob	

NOTE: If a Predator is Involved in a PAC incident, then also fill in the PREDATOR log.

management. They may never leave the conservancy. For this reason, the relevant pages of the Event Books were photographed in the conservancy office and the data were later transcribed into an excel spreadsheet.

Above: Photograph of a HWC page in the Event Book of an Environmental Shepherd in the ≠Khoadi //Hoas Conservancy.

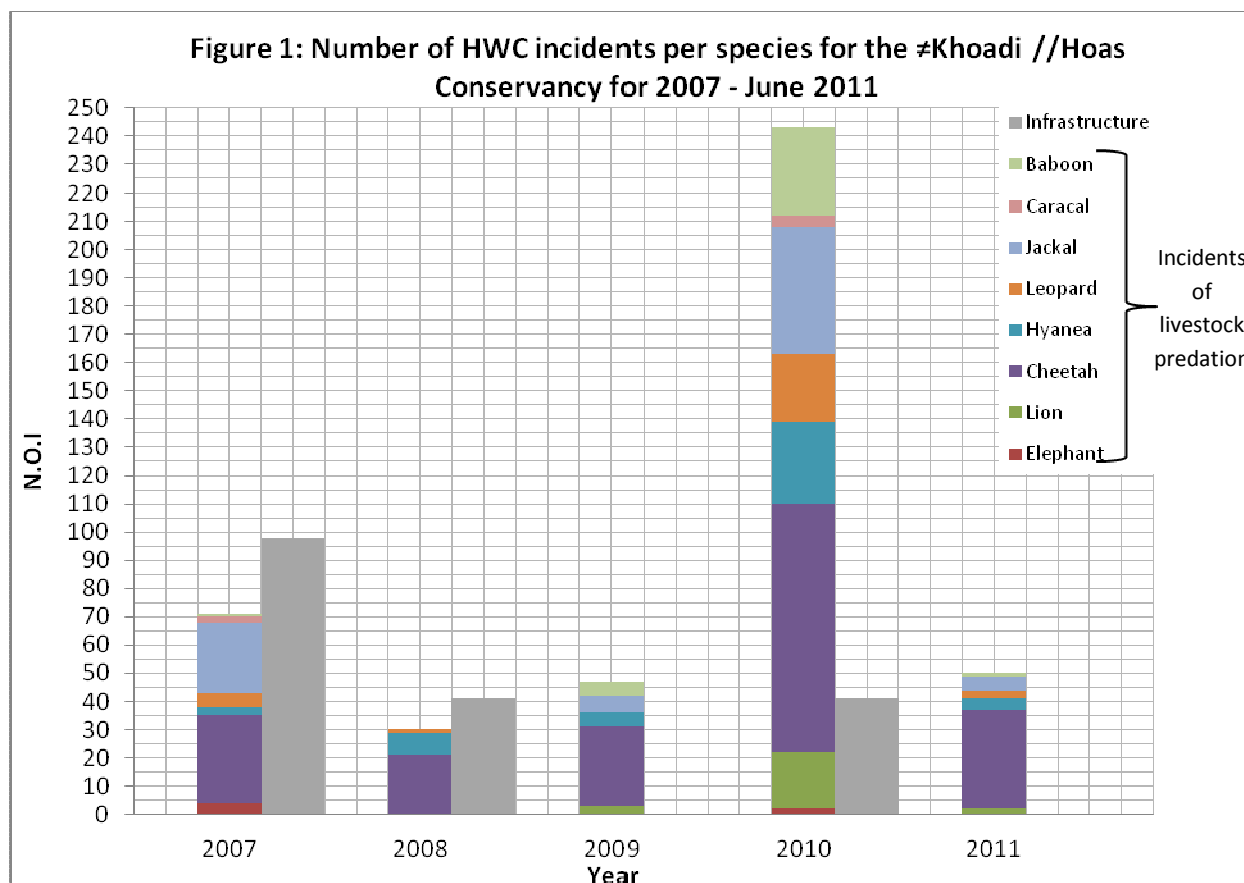
Right: Filing system for Event Book data in ≠Khoadi //Hoas conservancy office.



Results and Discussion

6. The HWC data for the ≠Khoadi //Hoas Conservancy are summarized in Table 1 (see end of report). These data were analysed in two ways:
 - (i) number of incidents of (a) infrastructure damage (mainly water related, but also fencing, gardens and homesteads), and (b) predation, per species and per year; and
 - (ii) cost of incidents from both infrastructure damage and predation, per species and per year.
7. Costs of infrastructure damage were based on average replacement costs and cost to people's livelihoods, while predation costs were based on the current average value of livestock in the region. These costs are summarized in tabled 2 below.
8. It is clear that there is considerable year-to-year variation in the overall levels of HWC, as measured by the number of incidents and by the costs incurred. The number of incidents ranging from 47 in 2009 and 288 in 2010; and the cost incurred from these incidents ranged from about N\$88,000 in 2009 to N\$446,000 in 2010 (Table 1). These are minimum values because a significant number of HWC goes unreported, particularly when elephants drink from reservoirs where farmers have provided the diesel to pump the water. The overall average minimum figures for HWC per year in the ≠Khoadi //Hoas Conservancy is about 138 reported incidents costing about N\$254,000.
9. Not only is there great year-to-year variation in the overall levels of HWC, but also in the types of incidents (Figure 1). Damage to infrastructure by elephants was greatest in 2007 with 96 incidents and least in 2009 with no incidents. The average number of infrastructure related incidents reported was 40 per year. Similarly, the incidents of predation of domestic stock varied greatly, with 243 reported incidents in 2010 compared to 30 in 2008. The average number of livestock predation incidents reported was 98 per year.
10. An "incident" of livestock predation may involve the killing of more than one animal. Of the total number of 441 livestock incidents the average number of livestock killed was 2 per incident. However, this varied between predators (Table 3). Predators feeding on smaller prey, e.g. Caracal, Jackal and Cheetah, tended to kill more on average per incident that predators feeding on larger prey (Hyaena, Lion and Leopard). Also, as would be expected, larger numbers of small stock (sheep, goats) were killed

Table 2: Average cost (N\$) of different types of Human-Wildlife Conflict			
HWC Impact	Cost (N\$)	Explanatory notes on cost	
Human life	5,000	This is not a value on human life but only the cost of funeral benefits provided.	
Infrastructure damage	Pipes	1,500	Per incident, being the estimated average cost of new infrastructure / equipment, transport, travel and installation.
	Taps	1,500	Per incident, being the estimated average cost of equipment, transport, travel and installation.
	Tank	4,000	For 5,000 litre tank. Includes purchase, transport and installation.
	Pump	40,000	Includes Lister diesel engine, pump, transport and installation.
	Windmill	90,000	Includes purchase, transport and installation.
	Actual water loss	150	Per tank of 5,000 litres, calculated at pumping rate of 2,000 litres water per hour, 6 litres diesel per hour at N\$10 per litre.
	Cost to livelihood as a result of losing water	6,100	Per 30 days of impact on livestock condition and reproduction, assuming a 5% value loss to stock over this period; and assuming an average livestock holding of 40 goats, 10 sheep, 5 cows and 4 donkeys per household; with an average of 4 households per water point.
	Fence	350	Per incident, being the estimated average for replacement of material, transport and repair time.
	Garden	500	Per incident, being an estimate of average value of vegetables lost and opportunity costs including travel and health impacts.
Homestead	3,500	Per incident, being an estimate of average cost of replacement of material and rebuilding time and labour.	
Local value of domestic stock	Cow	4,000	Cost of replacing lost livestock
	Horse	1,500	
	Goat	600	
	Donkey	500	
	Sheep	450	



on average per incident than larger stock (cow, donkey, horse) – 2.2 and 1.1 respectively (Table 4). Where more than one large stock animal was killed in one incident, it often involved young animals, calves or foals. Similarly, where large numbers of small stock were killed by Baboons, these were usually lambs.

Predator	No. incidents	No. stock lost	Average no. stock per incident	Range (min-max)
Lion	24	38	1,52	1-6
Cheetah	203	486	2.39	1-21
Hyaena	49	58	1.18	1-4
Leopard	33	53	1.60	1-10
Jackal	81	153	1.88	1-7
Caracal	16	18	3.00	1-10
Baboon	38	83	2.18	1-9
Total	441	889	2.02	1-21

Stock	No. incidents	No. stock lost	Average no. stock per incident	Range (min-max)
Cow	60	66	1.10	1-3
Horse	9	13	1.44	1-2
Donkey	22	30	1.36	1-5
Goat	299	689	2.30	1-21
Sheep	51	91	1.78	1-7
Total	441	889	2.01	1-21

11. A similar pattern of great year-to-year variability emerges from an analysis of the cost of HWC to the ≠Khoadi //Hoas Conservancy (Figure 2). In some years (2007) infrastructure damage to water installations by elephants caused the greatest cost, in other years it was predation on livestock. While there is some evidence that elephants cause less damage in good rainfall years (and this would seem a logical conclusion), more years of data are needed to confirm this. Elephant damage varied from over N\$ quarter of a million (2007) to zero (2009). Similarly, predation varied from almost N\$380,000 (2010) to less than N\$90,000 (2009).
12. The year-to-year variation in the HWC costs to farmers by different species per year is shown in Figure 3. Last year (2010) saw an enormous increase in the cost of stock losses from all predators.
13. The average cost to farmers per year in the ≠Khoadi //Hoas Conservancy caused by the different wildlife species and calculated over the 4½ years is shown in Figure 4. Elephants and Cheetah caused the greatest amount of damage (about N\$83,000 and N\$75,000 respectively per year), followed by Hyaena (N\$34,000) and Jackal (N\$26,000). Lion, Baboon and Leopard caused damage of just over N\$10,000 per year while the figure for Caracal was just over N\$2,000.

Figure 2: Cost (N\$) of HWC per type of incident and per species for the ≠Khoadi //Hoas Conservancy from 2007 - June 2011

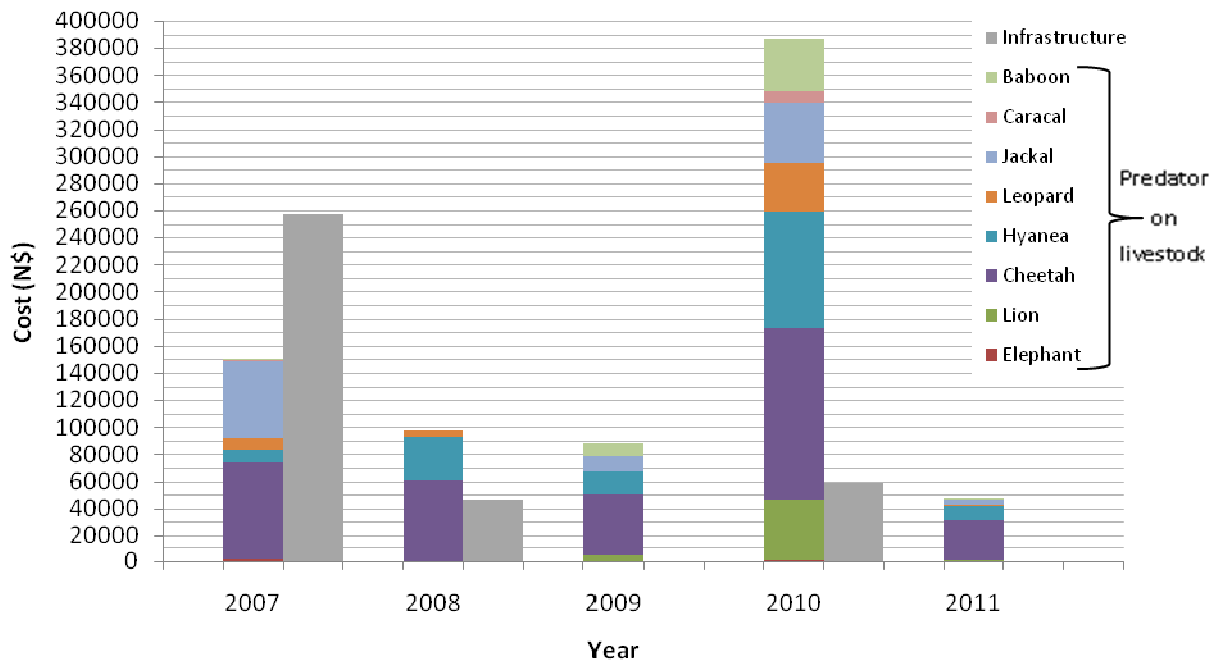
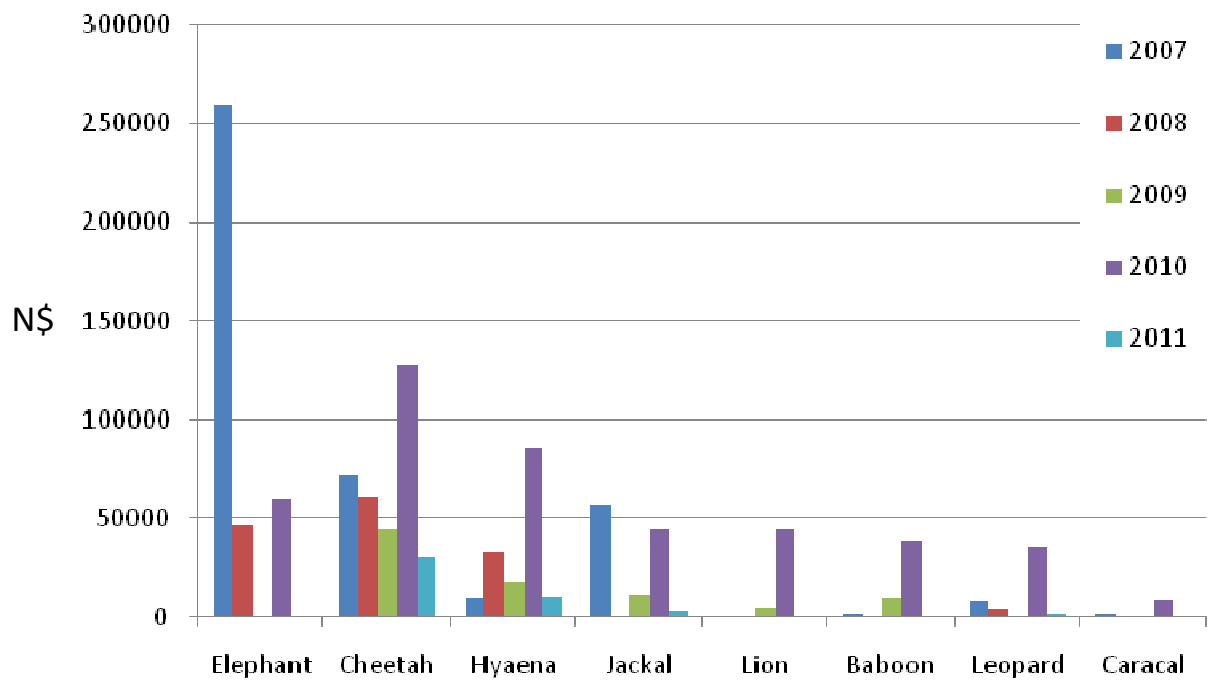
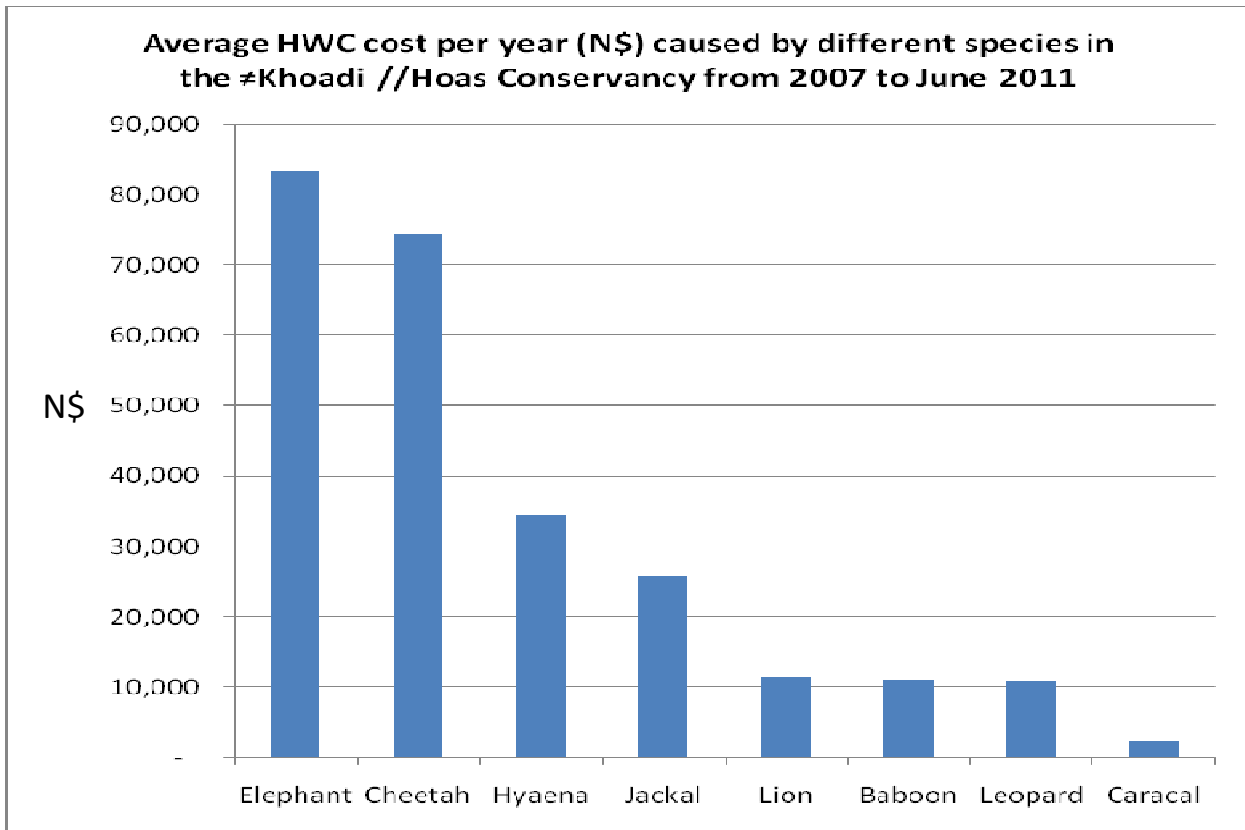


Figure 3: Annual HWC costs to farmers in the ≠Khoadi //Hoas Conservancy resulting from different wildlife species (2007 – June 2011)



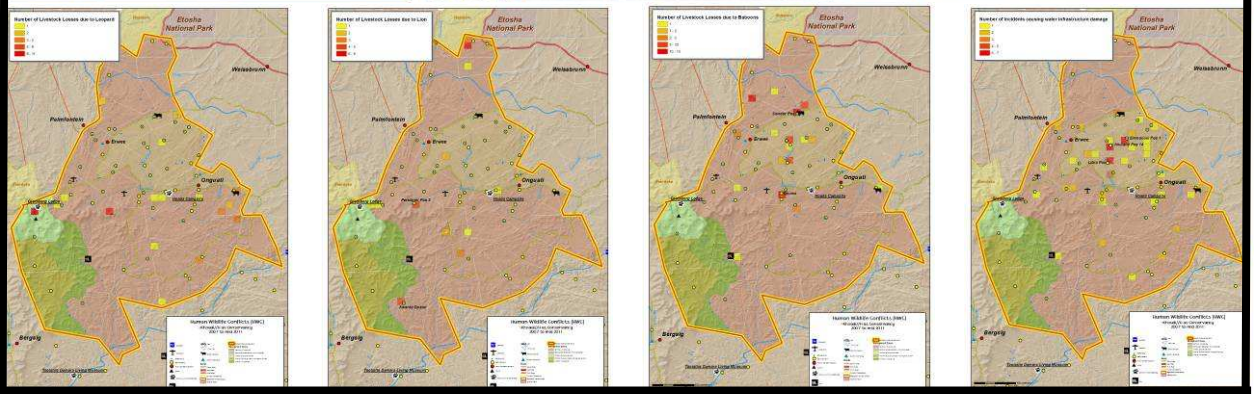
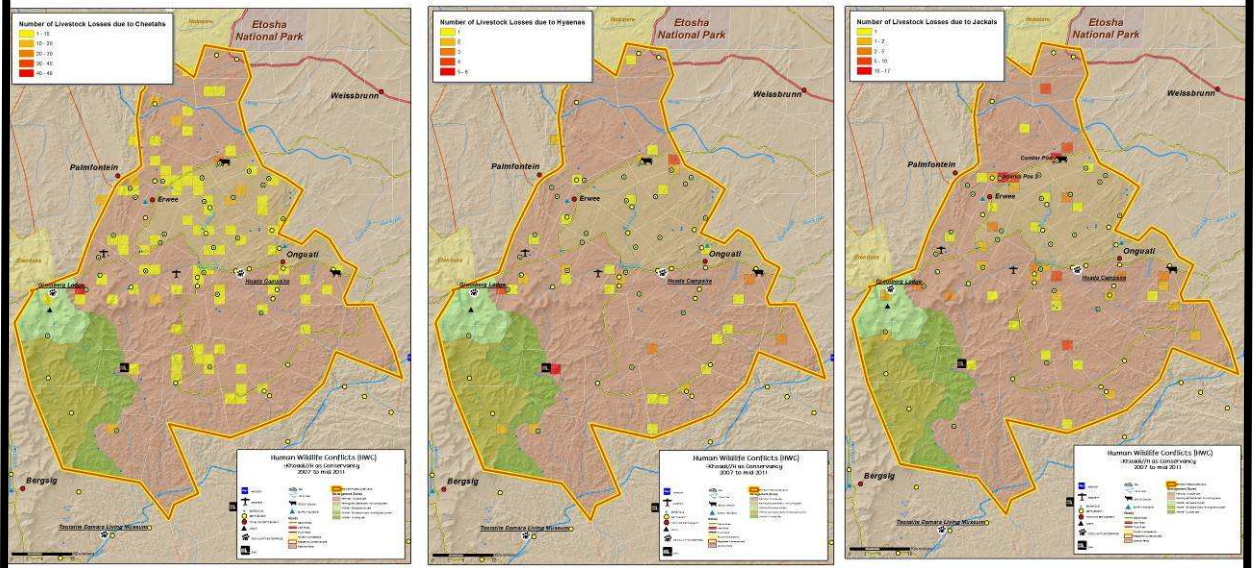
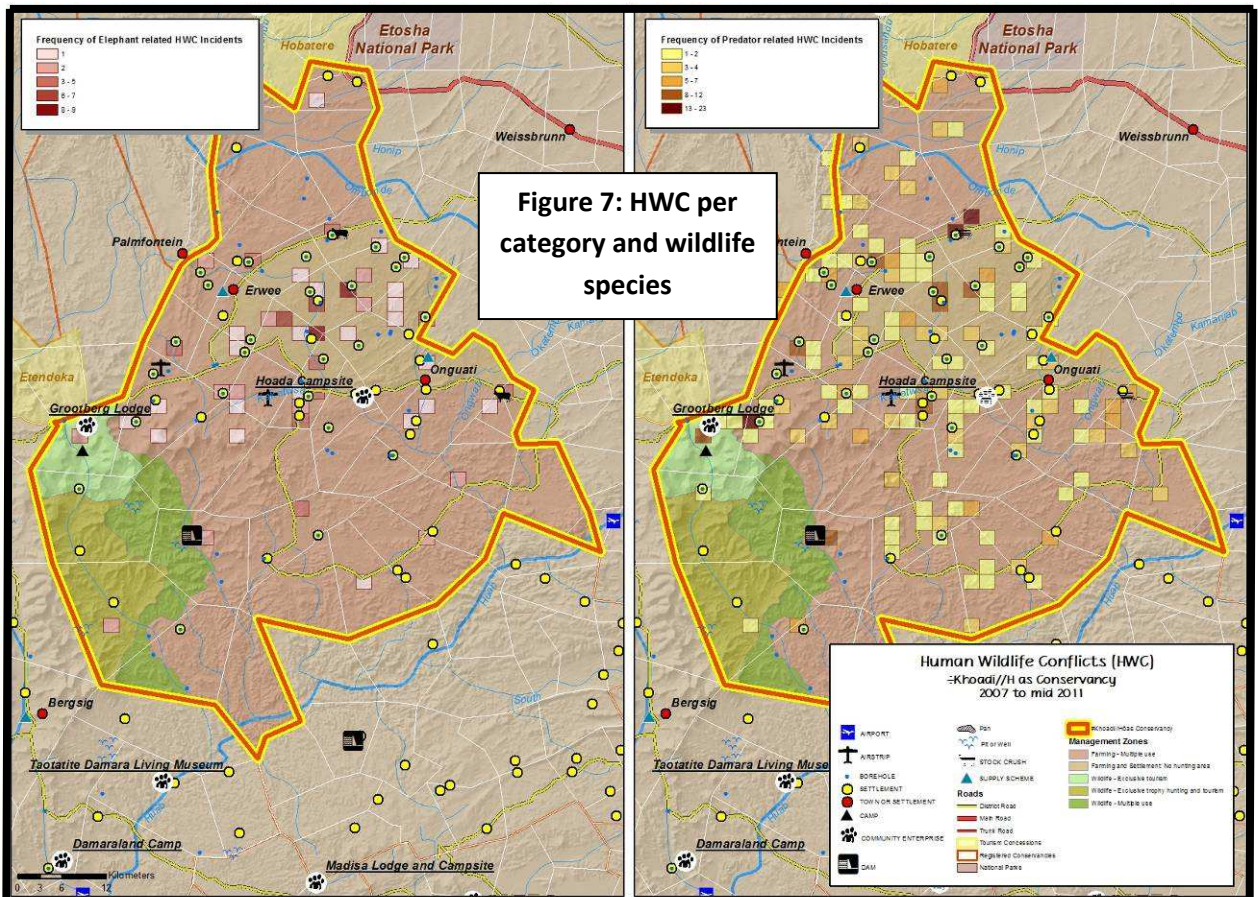


14. Average figures for the costs caused by different wildlife species do not tell the full story. Farmers have to bear extreme losses in some years, which can be critical to their livelihoods (Table 4). In the case of elephants, the highest annual loss was 3 times higher than the average. For lions it was 4 times higher, while for Cheetah, Hyaena and Jackal it was about twice as high. The sum of the highest annual losses is about N\$637,000 which is 2.6 times greater than the average.

Table 4: Average and maximum yearly financial costs per species from HWC

Species	Average loss (N\$)	Maximum loss (N\$)	Ratio
Elephant	83,389	259,100	1 : 3.1
Cheetah	74,500	127,200	1 : 1.7
Hyaena	34,467	85,400	1 : 2.4
Jackal	25,822	56,950	1 : 2.2
Lion	11,444	45,500	1 : 4.0
Baboon	11,056	38,550	1 : 3.5
Leopard	11,044	35,800	1 : 3.2
Caracal	2,367	8,850	1 : 3.7
Totals	254,089	657,350	1 : 2.6

15. The greatest stock loss experienced on average by farmers was that of predation on goats (Figure 5). The average loss was just over N\$90,000 per year. The next greatest loss was from predation on cows (just less than N\$60,000 per year). Sheep, horses and donkeys averaged less than N\$10,000 per year.



Conclusion and Recommendations

18. It is currently not possible to predict the likely annual losses to HWC in the ≠Khoadi //Hoas Conservancy. However, we can say the following:
- a) The impact of HWC on farmers is highly variable from year to year.
 - b) In some years elephants cause the greatest financial damage, in other years predators do.
 - c) The average overall loss to farmers in the conservancy as a consequence of HWC is at least N\$254,000 per year, but this can go up to at least N\$446,000 in some years. The sum of the highest annual loss per wildlife species from the 4.5 year period was N\$657,350 which is 2.6 times the average.
 - d) This is a huge burden for poor subsistence farmers to bear.
 - e) Not all farmers share these costs equally. Farmers on migration routes and near favoured feeding grounds of elephants carry a greater burden of infrastructure damage and water loss than do other farmers; farmers near core wildlife areas, national parks, large river systems and rugged terrain experience more predator problems than do other farmers.
 - f) Finding solutions to help reduce the incidents of HWC is therefore extremely important from a financial point of view, and specifically from a poverty and livelihoods perspective.
 - g) However, there is also an important intangible component. Farmers manage the land, the water points and are in frequent daily contact with the conservancy's wildlife. It is important for farmers to have a positive attitude towards wildlife and to be actively supporting the conservancy. The large financial losses being experienced by farmers in this conservancy pose a serious risk of farmers turning against the conservancy.
 - h) It is clear that decisive interventions are required to address both infrastructure damage caused mainly by elephants, and domestic stock losses caused mainly by predators. Different project interventions are needed for these two categories.
 - i) In the case of elephants, the main interventions are (a) the protection of key water points used for homesteads and domestic stock in priority conflict areas and (b) the provision of alternative waters for elephants in carefully selected places.
 - j) It is also likely that different interventions will be needed to deal with different types of predation. Nocturnal predators such as Hyaena, Lion and Leopard require that (a) domestic stock is kraaled at night in (b) strong, secure kraals. This may require both management and infrastructure interventions with associated training. Diurnal predators such as Cheetah and Jackal may require more intensive protection of stock during the day, such as is provided by the use of guard dogs. This would require the development of a guard dog programme and supportive training and back-stopping.
 - k) It is important that these interventions are piloted with a number of willing farmers who suffer the greatest losses. The pilot interventions must be carefully monitored, adapted as necessary and then rolled out to other farmers suffering significant HWC losses.
19. And finally, the overall impact of project interventions should be monitored against HWC trends per species over the past years. The focus of the interventions should be to have as great a positive impact on longer-term trends as possible, over a period of at least 2-3 years. The extremely unpredictable and hugely fluctuating incidents of HWC in the ≠Khoadi //Hoas Conservancy makes it meaningless to set specific targets. However, the use of trends provides an elegant, realistic and pragmatic indicator to monitor the impacts of HWC project interventions. This is illustrated in Figure 8, which also provides the baseline.

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Figure 8: No. of incidents of HWC per year caused by different wildlife species in the ≠Khoadi //Hoas conservancy (bar graph) and the linear trends per species, using the number of incidents in 2001 as the intercept (i.e. baseline) figure

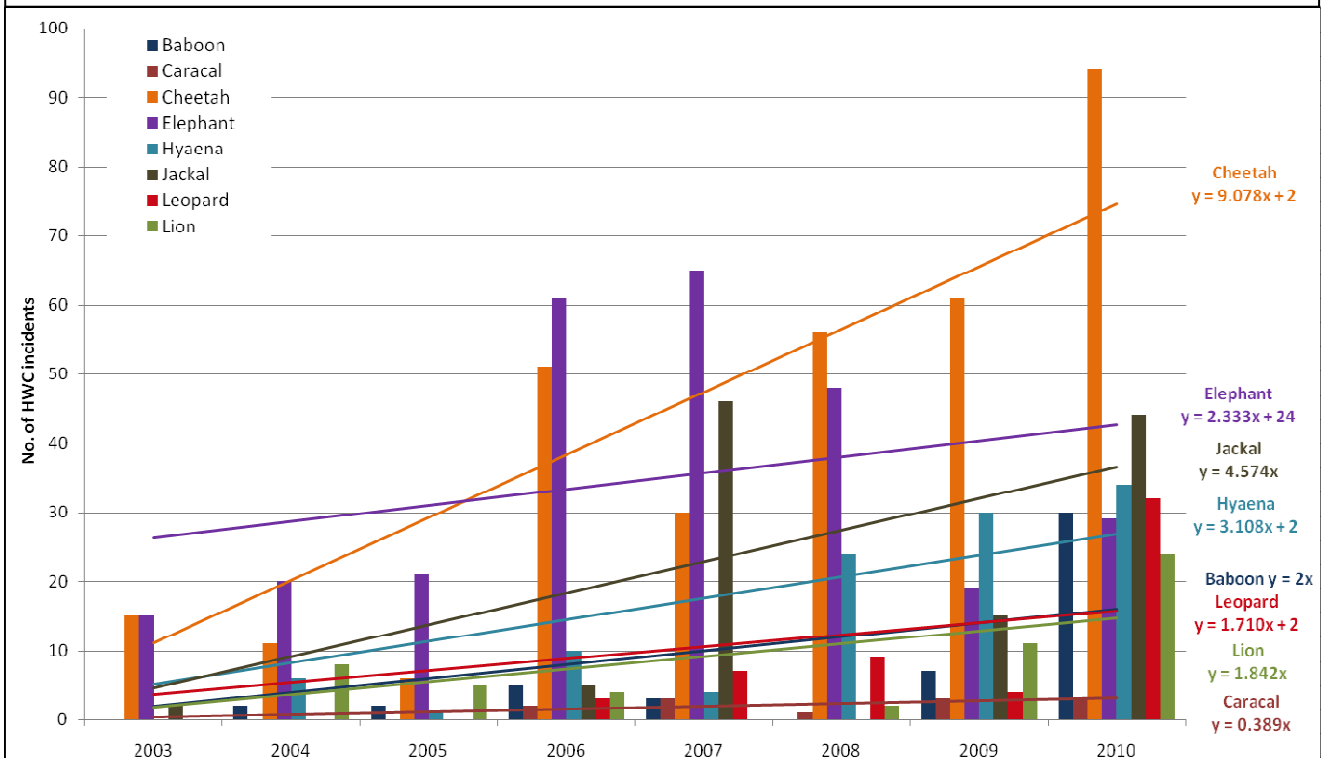


Table 1: Summary of Human Wildlife conflict per species and per types of incident in the ≠Khoadi //Hoas Conservancy from 2007 to June 2011 (Data from Game Guard Event Books)

Species	Types of HWC incident	2007			2008			2009			2010			2011 (6 months)			
		N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)	
Elephant	Human deaths	-		-	2		10,000	-		-	-		-		-		
	Infrastructure	Pipes	32		48,000	12		18,000	-		-	19		28,500	-		-
		Taps	7		10,500	2		3,000	-		-	3		4,500	-		-
		Tank	4		16,000	-		-	-		-	1		4,000	-		-
		Pump	1		40,000	-		-	-		-	-		-	-		-
		Windmill	1		90,000	-		-	-		-	-		-	-		-
		Waterloss	13		1,950	10		1,500	-		-	3		450	-		-
		Livelihood	5		30,500	3		18,300	-		-	1		6,100	-		-
		Fence/kraal	17		5,950	10		3,500	-		-	4		1,400	-		-
		Garden	14		7,000	4		2,000	-		-	7		3,500	-		-
		Homestead	2		7,000	-		-	-		-	3		10,500	-		-
	Subtotal Infrastructure		96		256,900	41		46,300	-		-	41		58,950	-		-
	Livestock	Goat	2	2	1,200	-	-	-	-	-	-	-	-	-	-	-	-
		Sheep	-	-	-	-	-	-	-	-	-	2	2	900	-	-	-
Donkey		2	2	1,000	-	-	-	-	-	-	-	-	-	-	-	-	
Subtotal Livestock		4	4	2,200	-	-	-	-	-	-	2	2	900	-	-	-	
Subtotal Elephant		100	4	259,100	43	-	56,300	-	-	-	43	2	59,850	-	-	-	
Lion	Livestock	Goat	-	-	-	-	-	-	-	-	5	10	6,000	-	-	-	
		Cow	-	-	-	-	-	-	-	-	9	9	36,000	-	-	-	
		Donkey	-	-	-	-	-	-	3	10	5,000	6	7	3,500	1	1	500
		Horse	-	-	-	-	-	-	-	-	-	-	-	-	1	1	500
Subtotal Lion		-	-	-	-	-	-	3	10	5,000	20	26	45,500	2	2	1,000	

Cheetah	Livestock	Goat	25	95	57,000	17	65	39,000	23	62	37,200	62	138	82,800	21	30	17,400
		Sheep	3	7	3,150	-	-	-	4	8	3,600	21	42	18,900	11	16	7,200
		Cow	3	3	12,000	3	5	20,000	1	1	4,000	4	6	24,000	1	1	4,000
		Donkey	-	-	-	-	-	-	-	-	-	-	-	-	1	1	500
		Horse	-	-	-	1	1	1,500	-	-	-	1	1	1,500	1	1	1,500
Subtotal Cheetah			31	105	72,150	21	71	60,500	28	71	44,800	88	187	127,200	35	49	30,600
Hyaena	Livestock	Goat	1	2	1,200	1	1	600	2	3	1,800	4	9	5,400	1	1	600
		Cow	2	2	8,000	7	8	32,000	3	4	16,000	9	19	76,000	2	2	8,000
		Donkey	-	-	-	-	-	-	-	-	-	5	5	2,500	-	-	-
		Horse	-	-	-	-	-	-	-	-	-	1	1	1,500	1	1	1,500
Subtotal Hyaena			3	4	9,200	8	9	32,600	5	7	17,800	29	34	85,400	4	4	10,100
Leopard	Livestock	Goat	2	5	3,000	-	-	-	-	-	-	16	30	10,800	-	-	-
		Sheep	1	1	450	-	-	-	-	-	-	-	-	-	1	1	450
		Cow	1	1	4,000	-	-	-	-	-	-	5	5	20,000	-	-	-
		Donkey	1	1	500	-	-	-	-	-	-	1	1	500	2	2	1,000
		Horse	-	-	-	1	3	4,500	-	-	-	2	3	4,500	-	-	-
Subtotal Leopard			5	8	7,950	1	3	4,500	-	-	-	24	39	35,800	3	3	1,450
Jackal	L/stock	Goat	22	46	27,600	-	-	-	6	19	11,400	45	74	44,400	4	5	3,000
		Sheep	2	3	1,350	-	-	-	-	-	-	-	-	-	1	1	450
	W/I	Impala	1	2	28,000	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Jackal			25	51	56,950	-	-	-	6	19	11,400	45	74	44,400	5	6	3,450
Caracal	L/stock	Goat	2	3	1,800	-	-	-	-	-	-	3	14	8,400	-	-	-
		Sheep	-	-	-	-	-	-	-	-	-	1	1	450	-	-	-
Subtotal Caracal			2	3	1,800	-	-	-	-	-	-	4	15	8,850	-	-	-

Baboon	L/stock	Goat	1	1	600	-	-	-	5	15	9,000	27	59	35,400	1	1	600
		Sheep	-	-	-	-	-	-	-	-	-	-	4	7	3,150	-	-
	Subtotal Livestock		1	1	600	-	-	-	5	15	9,000	31	66	38,550	1	1	600
	Gardens		2		1,000	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Baboon		2	1	1,600	-	-	-	5	15	9,000	31	66	38,550	1	1	600	
Subtotal Infrastructure Damage		98		257,900	41		46,300	-		-	41		58,950	-		-	
Subtotal Livestock Losses		71	176	150,850	30	83	97,600	47	122	88,000	243	443	386,600	50	65	47,200	
TOTAL HWC		169	176	408,750	73	83	153,900	47	122	88,000	284	443	445,550	50	65	47,200	

SUMMARY

Total number of infrastructure incidents over 4.5 years	180	Average no. of infrastructure incidents per year	40.0
Total cost (N\$) of infrastructure incidents over 4.5 years	363,150	Average cost (N\$) of infrastructure incidents per year	80,700
Total number of all HWC incidents over 4.5 years	623	Average no. of all HWC incidents per year	138
Total number of livestock lost over 4.5 years	889	Average no. of livestock lost per year	197.6
Total cost (N\$) of livestock lost over 4.5 years	770,250	Average cost (N\$) of livestock lost per year	171,167
Total costs (N\$) of all HWC over 4.5 years	1,143,400	Average cost (N\$) of all HWC per year	254,089