Chapter 6: Evidence from the Field

Through the chapter, I seek to present and analyse the data obtained in the study. Chapter three described how I conducted the research, focusing on the research design, participants, research instruments, and data collection and presentation procedures. I present data collected from self-administered questionnaires and interviews, both derived from the research objectives. The data include information obtained from structured questionnaires administered to staff and management, and semi-structured interviews with key informants. The research objectives aimed to determine the impact of forest management on carbon trading, to ascertain the effect of current legislation and the compulsion for local companies in Zimbabwe to buy carbon credits, to investigate the relationship between global carbon prices and carbon trading volumes, and to propose a framework guiding carbon trading for sustainable forest management in Zimbabwe, using Carbon Green Africa as a case study.

I provide a summary of the participants' response rate to indicate the extent of contribution from the selected participants in numerical terms, as shown in Table 6.1.a. The data represent responses collected from staff and management of Carbon Green Africa, councillors and community members from the Binga District in areas under Chief Siabuwa and Sinamusanga, and officials from the Climate Change Department under the Ministry of Environment, Water and Climate. The response rate, based on returned questionnaires and actual interviews conducted, is presented in tabular form below.

Table 6.1: Questionnaire response rate (Primary data)

Study unit	Sample	Response	Response rate
CGA staff, Councillors, Community and Ministry officials.	95	79	83.16%

Out of the total sample size of 95 copies of questionnaires distributed, the general response rate was 83.16%. Most of the questionnaires were hand delivered and only 79 were answered and collected. The response rate was favourable and those that could not respond to the questionnaires took time to respond to the stipulated time frame. Generally, the response rate was good enough to render the results of the research as valid and representative though the researcher would have preferred a one hundred percent (100%) response rate.

Table 6.2: Reliability of Questionnaire

Item	Cronbach's Alpha	N of Items
The impact forest management has on the carbon trading volumes in Zimbabwe.	.714	9
The impact of current legislation and the compulsion to buy carbon credits by local companies in Zimbabwe.	.755	11
Overall	.727	20

Table 6.2 is a summary of the findings on how reliable the instrument was. Results indicate that the computed overall reliability of the questionnaire was 0.727, items addressing impact of forest management (0.714) and current legislation (0.755). The Crownbach's Alpha values were good in that the values were bigger than 0.7, the minimum acceptable value.

Table 6.3: Interviews response rate (Primary data)

Study units	Sample	Response	Response rate
Key informants (Chiefs, CGA staff, Ministry officials.)	22	22	100%

The researcher successfully conducted 22 interviews with Key informants and the general response rate was 100%. Therefore, the total number of participants was 101.

For the purposes of analysis, the researcher divided the participants into two subgroups which are general employees and managers for institutions and community elders (Key informants)
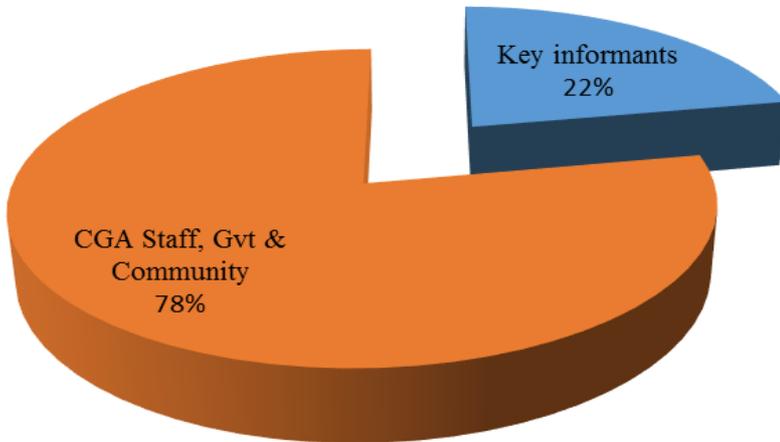

Figure 6.1 Semi-structured questionnaire and interviews response rate

The above descriptive statistics are as illustrated on figure 6.3 above, out of the 100 participants, 78 were proxies for CGA Staff, Government and the community and 22 represented key informants. This gave an average of 78.25% response rate but participation was 78% for CGA Staff, Government and the community and 22% for key informants. The reason being that staff interacts with the government officials and the community quite often.

An assessment of respondent's demographics, especially level of key informants and staff experience was conducted with the aim of providing an understanding of background information about the profiles of the sampled respondents. The study starts by presenting the socio-demographic data obtained from CGA staff, government officials and the community. This was followed by employment experience. The succeeding section shows socio-demographic data:

Table 6.4: Level of Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Managerial – Lower Level	33	41.8	41.8	41.8
	Non-Managerial	46	58.2	58.2	100.0
	Total	79	100.0	100.0	

Of the 83.16% response rate from the semi-structured questionnaires presented in table 6.4, 58.2% represented non-managerial employees and 41.8% represented lower-level managers. This is also shown by a bar chart below which clearly depicts the employees who participated in the completion of the semi-structured questionnaire.
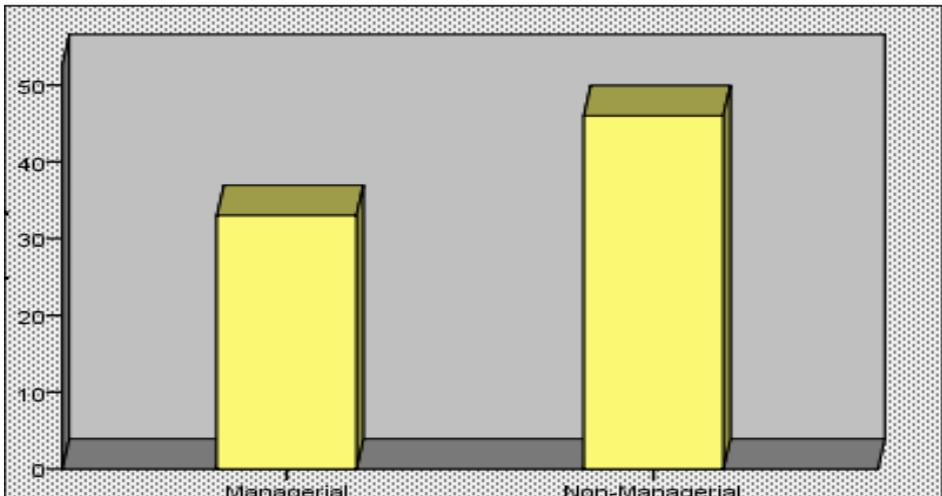

Figure 6.2: Level of management

The demographics of employees' experience were presented using a table and a bar chart showing descriptive statistics of frequency. The study examined employment experience background of the employees from CGA and the Ministry who participated in the study to measure their nature in terms of employment experience to validate the data.

Table 6.5: Employment Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	13	16.5	16.5	16.5
	5-10 years	32	40.5	40.5	57.0
	11-15 years	24	30.4	30.4	87.3
	16-20 years	5	6.3	6.3	93.7
	Above 20 years	5	6.3	6.3	100.0
	Total	79	100.0	100.0	

The findings showed that employees of the two main employers (CGA and Government) who participated had two (2) dominated groups. The responses show that 40.5% have been working for CGA and Government for a period ranging from 5 to 10 years followed by those in the range of 11 to 15 years who constituted 30.4%.
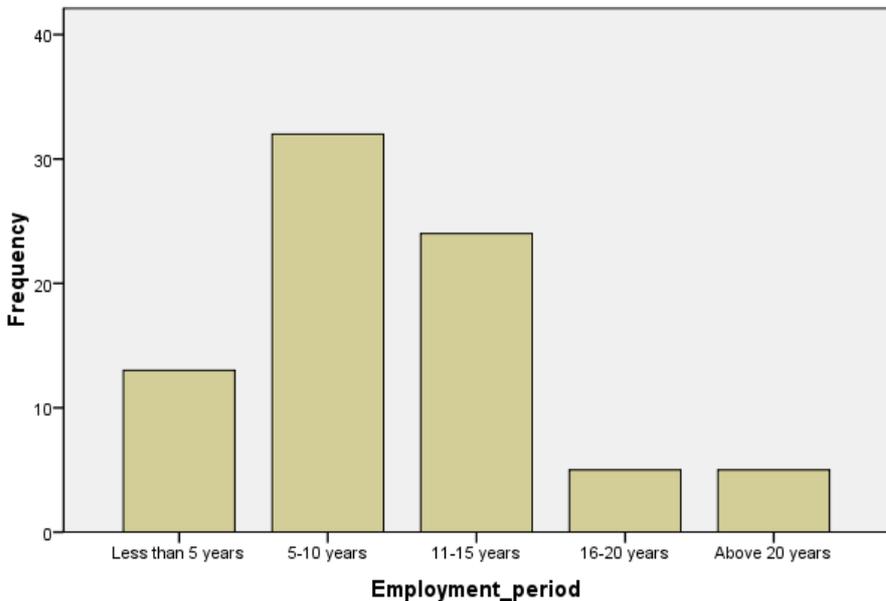

Figure 6.3: Employment experience

The data presented tendencies of normal distribution as shown in Figure 6.3.b. The data is highly skewed with a skewness of .704 showing that employees are concentrated in the below 15-year period. However, a great number of the employees have remained with CGA and the Government for periods ranging from 5 to 10 years showing high levels of experience.

We present findings of the study particularly, regarding the impact forest management has on carbon trading volumes in Zimbabwe, impact of current legislation and the compulsion to buy carbon credits by local companies in Zimbabwe, relationship between global carbon prices and carbon trading volumes and last but not least, a framework to guide carbon trading for sustainable forest management in Zimbabwe.

The participants were asked on the impact of forest management on carbon trading volumes in Zimbabwe. The study sub-categorised the main variable into small components (forest management and carbon trading volumes) which all pointed to the first research objective. The results from the research question which sort to assess the impact of forest management on carbon trading volumes in Zimbabwe are presented on the following pie chart.
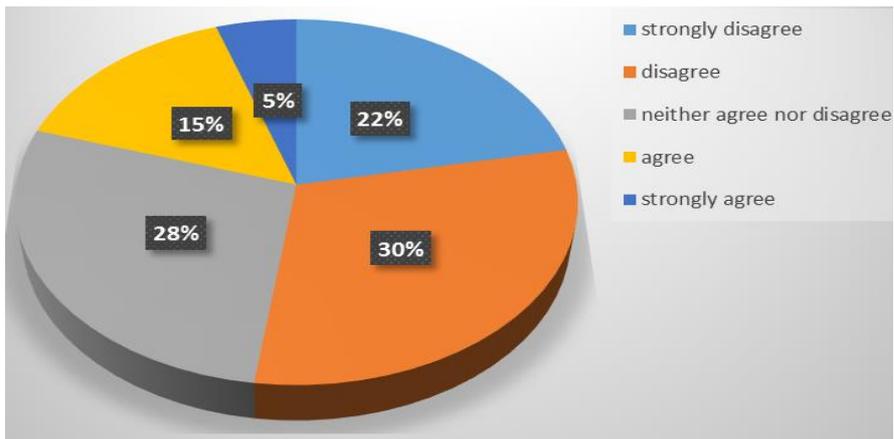

Figure 6.4: Forest management and carbon trading volumes weighted average responses

The general perception of the participants is that forest management has no strong bearing on carbon trading volumes. The above pie chart shows that 30% disagree with all factors which pointed to the impact of forest management to carbon trading volumes. 28% of the responses could neither agree nor disagree to the assertion. Furthermore, 22% of the responses strongly disagreed with the fact that forest management impact carbon trading volumes. Nonetheless, 15% agreed that good forest management practices have an impact on carbon trading volumes. They were supported by 5% of the responses which strongly agreed to the narrative.

Table 6.6: Forest management impact on carbon trading volumes by designation.

		Forest management impact on carbon trading volumes					
		strongly disagree	Disagree	neither agree nor disagree	Agree	strongly agree	Total
Description	Key informants	0	8	0	10	15	33
	CGA Staff, Gvt staff and The community	7	15	7	6	11	46
Total		7	23	7	16	26	79

Table 6.6, above show that there is divergent opinion on the participants with 58% of key informants (15 out of 26 participants) and 42% of CGA Staff, government staff and the community (11 out of 26 participants) strongly agree that Forest management has an impact on carbon trading volumes over time. This is supported by 65% (10 out of 16 participants) of key informants and 35% (6 out of 16 participants) of CGA Staff, government staff and the community who agree to the notion.

However, 65.22% (15 out of 23 participants) of CGA Staff, government staff and the community and 34.78% (8 out of 23 participants) of key informants disagree and concur with 30% in the pie chart above who disagree with all factors which pointed to the impact of forest management to carbon trading volumes saying that there is no significant impact. The diagram below clearly shows the variations.
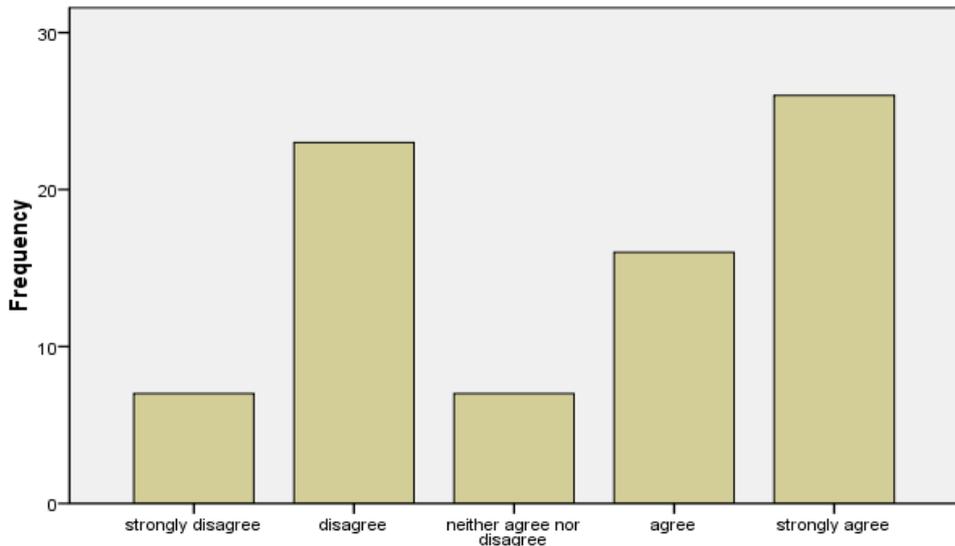

Figure 6.5: Forest management impact on carbon trading volumes by designation.

The divergence of views can best be illustrated by the bar graph above. In depth interviews from all the key informants showed that senior members of institutions and the community strongly agree because they have a direct benefit from carbon trading as a result of good forest management. However, the group that disagreed cited less meaningful benefits derived from carbon trading over time.

The graph below presents the responses on the impact of compulsory buying of carbon credits by local firms as enshrined in the current legislation. This variable assessed the effect of regulatory frameworks on local companies' particularly on compulsory buying of carbon credits.

From the data collected, 21% of the respondents strongly agreed that current legislation impact heavily on local firms compulsory buying of carbon credits. This figure was supported by 24% who responded in favour of the same notion that the current legislation has a bearing on local firms. The researcher observed that from the findings it shows that there was discord among the participants as seen by the support of 23% of the respondents who could neither agree nor disagree. The other 24% disagreed that the current legislation was an impediment to local companies. The data is presented in the following bar graph.
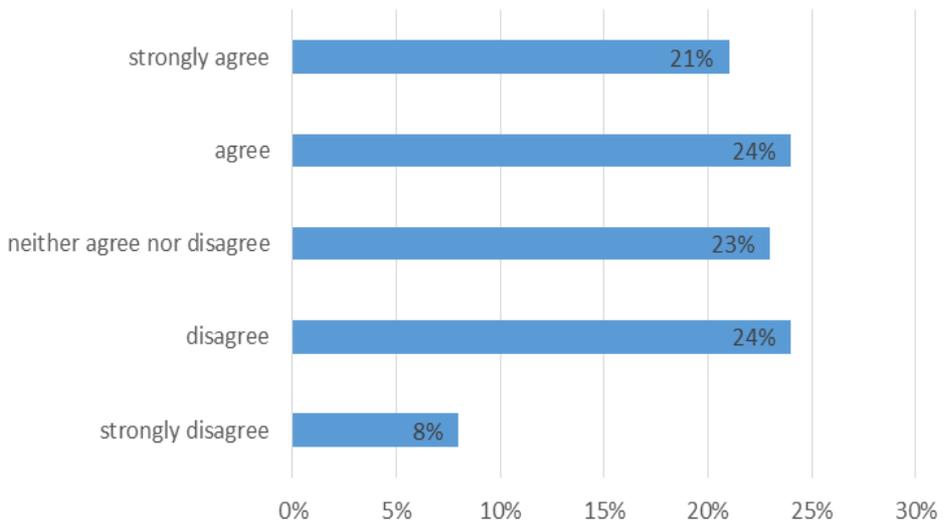

Figure 6.6: Current law structural inefficiencies in relation to carbon trading.

This can point to the fact that participants are confused on why the law is failing the local companies. A further scrutiny had to be done which looked at the structural inefficiencies. The following pie chart presents the data.
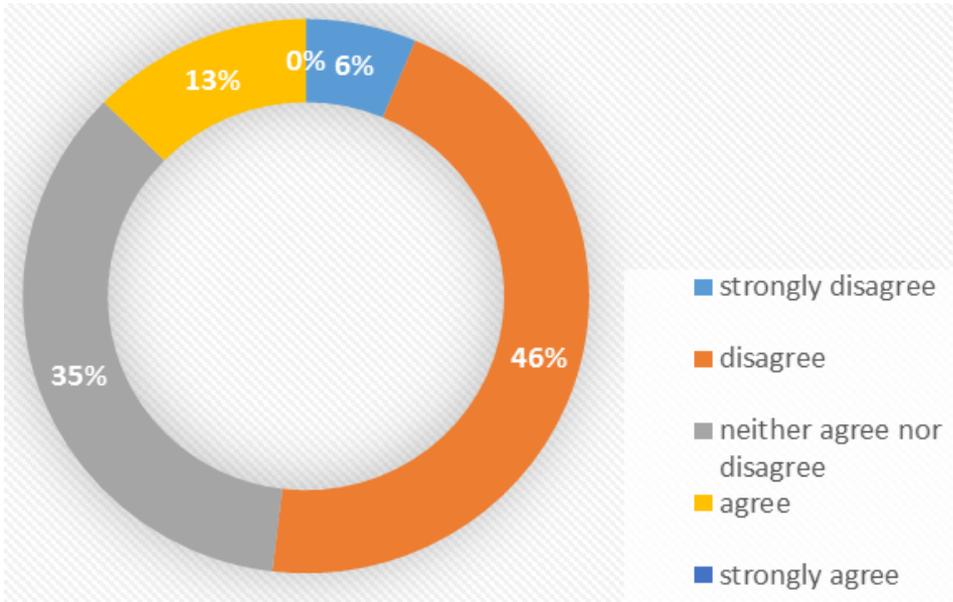
Figure 6.7: Structural inefficiencies in relation to carbon trading

The above pie chart shows that 46% disagreed that structural inefficiencies in relation to carbon trading have been affecting local business save for structural inefficiencies in the application of the current legislation. It was observed that 35% were neutral on the subject; only 13% agreed that structural inefficiencies have been affecting local businesses. Last but not least were the 6% who strongly agreed that structural inefficiencies were an impediment to conducting business.

Administration costs have been cited as the major cause for local companies' distress due to poor global markets prices, as such the study sort to assess the effect of the administration costs. As can be seen on the pie chart below, 47% of the participants disagreed with the opinion that administration costs had decreased over the years. This was supported by 20% of the responses which strongly disagreed as well. Overall, 33% were neutral on the matter.
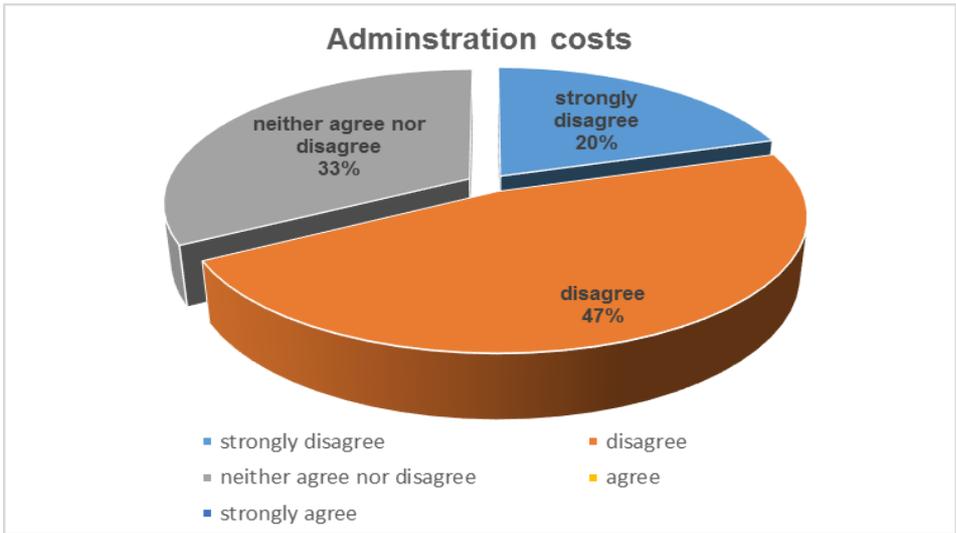
Figure 6.8: Administration costs

The study analysed the link between global carbon prices and carbon trading volumes. The findings found that 32% of the respondents neither agreed nor disagreed that there was a relationship between global carbon prices and carbon trading volumes. However, 25% of the respondents agree and were convinced that global carbon prices had a material impact on carbon trading volumes.

Interviews carried out confirmed this and alluded it to the fact that investors were losing appetite for forest derived credits in favour of wind-based offsets, with sales of forest derived registered at 11MtCO2e compared to the wind based at 12.7 MtCO2e in 2015. In addition, 19% strongly agree with notion, that investors play a critical role in the sustenance of the carbon credits business. The above arguments are as explained in the following pictorial representation.
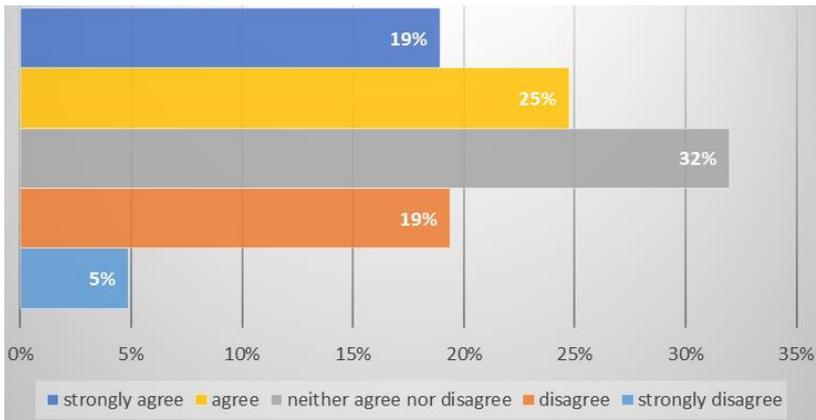
Figure 6.9: Link between global carbon prices and carbon trading volumes

Figure 6.9 below show the results of the effect of global carbon prices on the trading of carbon credits. Results show that 57% of the participants strongly agree that global carbon prices have a bearing on the trade of carbon credits. This was supported by the 43% responses garnered for the same notion. The following pie chart highlights the above arguments.
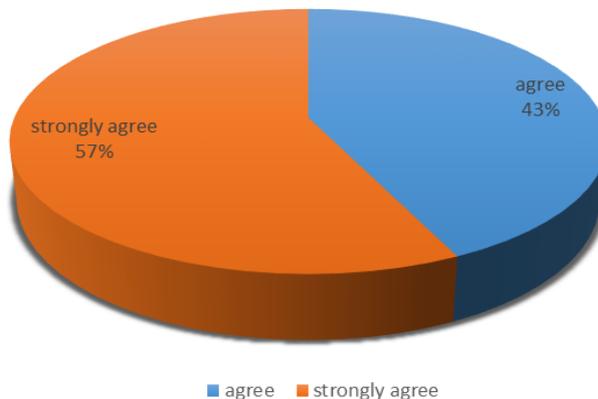

Figure 6.10: Link between global carbon prices and carbon trading volumes

The study sought to establish the relationship between guiding framework for sustainable forest management in relation to trading of

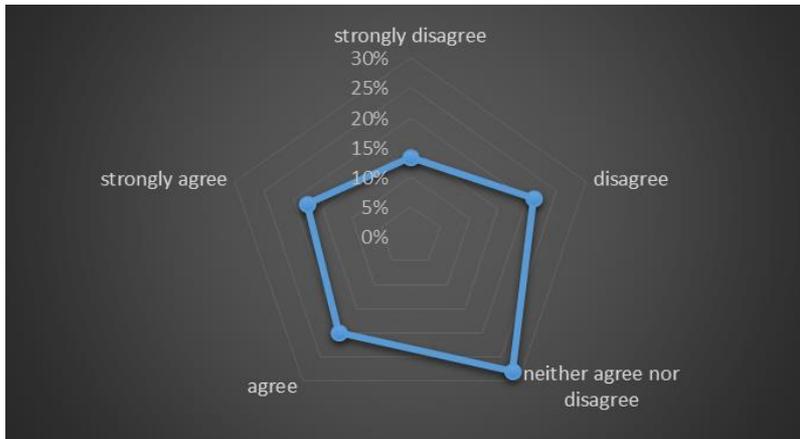carbon credits. The following pictorial representation shows the results of the respondents in the study.

Figure 6.11: Guiding framework for sustainable forest management in relation to trading of carbon credits.

Figure 6.11 above show that 28% of the respondents neither agree nor disagree if there is a relationship between guiding frameworks for sustainable forest management in relation to trading of carbon credits. The study reviewed that 17% of the participants disagree with the notion that there is a nexus between guiding frameworks for sustainable forest management and trading of carbon credits. However, 12% agree that indeed there exists a fundamental relationship between the two variables.

Factor analysis was employed to unearth the forest management and carbon trading volumes variables or factors. Before factor analysis was carried out data were tested for sampling adequacy and sphericity using KMO and Bartlett's Test respectively, a condition which had to be satisfied before factor analysis was conducted. The conditions were met, since Kaiser-Meyer-Olkin Measure of Sampling Adequacy was statistically not significant (p=0.485) and Bartlett's Test of Sphericity was insignificant (p=0.000) at 95% confidence interval (p<0.05).

Table 6.7 below illustrated this. Also a correlation matrix was computed to eliminate very highly correlated variables that is r>0.9. However, no such relationship existed in this data with regards to a nexus between forest management and carbon trading volumes.

Table 6.7: KMO and Bartlett's Test*a*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.485
Bartlett's Test of Sphericity	Approx. Chi-Square	759.055
	Df	66
	Sig.	.000

a. Based on correlations

Table 6.8: Total Variance Explained

	Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Raw	1	3.409	37.237	37.237	3.409	37.237	37.237	1.709	18.663	18.663
	2	1.661	18.142	55.379	1.661	18.142	55.379	2.845	31.076	49.740
	3	1.424	15.555	70.934	1.424	15.555	70.934	1.254	13.699	63.439
	4	.785	8.577	79.512	.785	8.577	79.512	1.472	16.073	79.512
	5	.571	6.233	85.745						
	6	.492	5.371	91.116						
	7	.308	3.359	94.475						
	8	.196	2.138	96.613						
	9	.131	1.436	98.049						
	10	.108	1.183	99.232						
	11	.052	.569	99.801						
	12	.018	.199	100.000						
Rescaled	1	3.409	37.237	37.237	3.773	31.445	31.445	2.925	24.373	24.373
	2	1.661	18.142	55.379	2.453	20.445	51.890	2.849	23.745	48.119
	3	1.424	15.555	70.934	1.468	12.236	64.125	1.873	15.604	63.723
	4	.785	8.577	79.512	1.173	9.773	73.898	1.221	10.175	73.898
	5	.571	6.233	85.745						
	6	.492	5.371	91.116						
	7	.308	3.359	94.475						
	8	.196	2.138	96.613						
	9	.131	1.436	98.049						
	10	.108	1.183	99.232						
	11	.052	.569	99.801						
	12	.018	.199	100.000						

Extraction Method: *Principal Component Analysis*

When covariance matrix was analysed, the initial eigenvalues were the same across the raw and rescaled solution.

Table 6.8 indicated the actual factors which were extracted as factors had inhibiting carbon trading. Results reveal that out of the 20 components under investigation only four were extracted as principal determinants in hindering the growth of carbon trading, and for the components accounted for a total variability of 79.5% and 73.90% of all the variables before and after rescaling of all the variables. The components were extracted basing on an Eigen value of 1 and only those factors whose Eigen value was greater than 1 were extracted as they met the cut-off criterion.
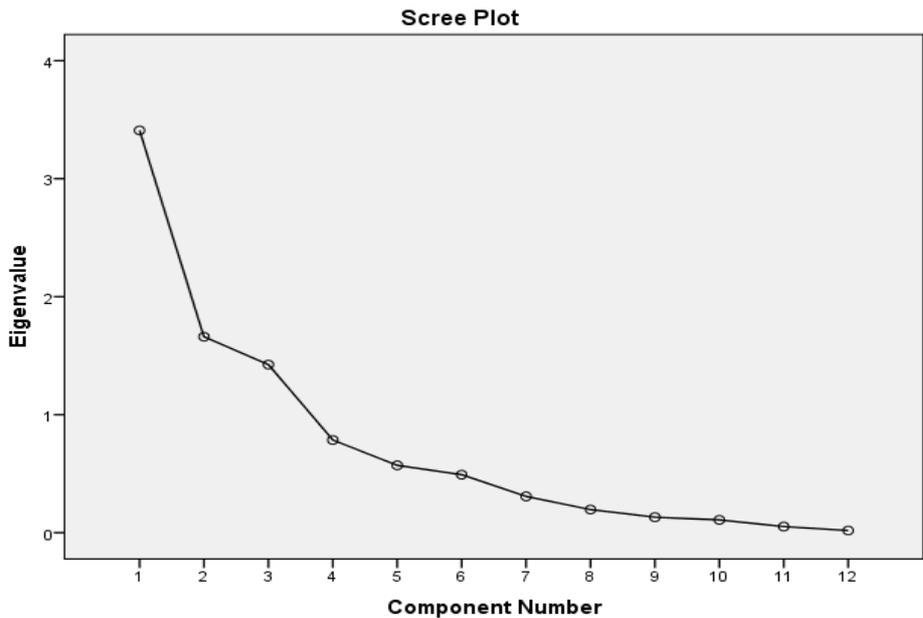

Figure 6.12: The Scree-plot below presents also shows graphically the extracted components.
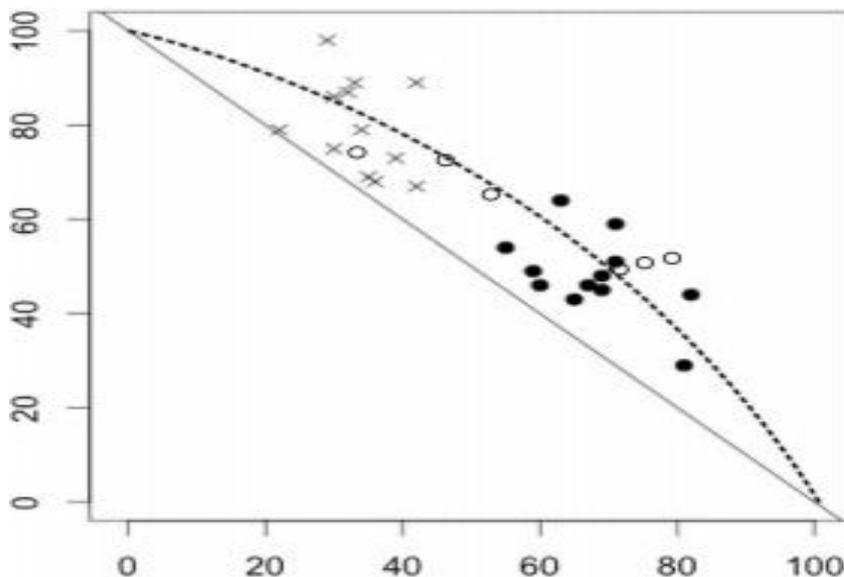
Figure 6.13: Relationship between forest management and carbon trading volumes.

The diagram above shows the Relationship between retained canopy cover proxy for forest management and percent carbon trading volume in 12 plots after simulated harvest. The filled circles represented high intensity on the map, with crosses showing low intensity, the empty circles revealing a validation set; the dashed line is an exponential fit. Last but not least is the solid line which stretched from end to end with a 1-to-1 relationship.

After testing Hypothesis 1, H_1 (alternative hypothesis) was adopted which proposed that forest management has a significant impact on the carbon trading volumes in Zimbabwe. The null hypothesis was adopted which proposed that the current legislation has no significant impact on the compulsion of local companies to buy carbon credits. H_1 (alternative hypothesis) was adopted which proposed that there exists a significant relationship between global carbon prices and carbon trading volumes in Zimbabwe.

The study findings indicate that the general perception is that forest management has a strong bearing on carbon trading volumes. On the other hand, hypothesis test one indicated that that forest management has a significant impact on the carbon trading volumes in Zimbabwe. However, Newell, Pizer and Raimi (2013) found out that forestry used to dominate carbon credits stocks but scientists have discovered wind credits which are cheaper.

Hypothesis two adopted a null hypothesis stating that current legislation has no significant impact on the compulsion of local companies to buy carbon credits. Jonsson *et al.* (2012) supported the study's findings, arguing that recent draft legislation in Austria, for example, allows businesses to offset up to 13% or 23% of their emissions—but not 100%—which leaves room for carbon emissions since the laws are not punitive. Politicians are balancing employment concerns with environmental goals. The findings also showed a significant relationship between global carbon prices and carbon trading volumes in Zimbabwe. Bottazzi *et al.* (2016) noted that empirical knowledge about how global carbon prices link to trading volumes remains limited.

The hypothesis tests received strong support from questionnaires and in-depth interviews. Participants indicated that current legislation heavily influences local firms' compulsory purchase of carbon credits. Evidence also suggested a nexus between global carbon prices and carbon trading volumes. These findings align with Ximenes *et al.* (2012), who found that current policy encourages converting production forests to conservation forests, while disincentivising the use of native forest residues for energy and discouraging the establishment of production-focused plantations. Additionally, the study's results correspond with Reyes (2011), who argued that international law enforcement in carbon trading remains largely underdeveloped.

The chapter has presented and analysed data on the impact of forest management on the carbon trading business, focusing on Carbon Green Africa in Zimbabwe. The analysis shows that some results agree with empirical and theoretical literature from various schools of thought, while others contradict. The results should not be applied in isolation; rather, recommendations are necessary to reinforce them. The next chapter concludes the study with summaries and recommendations.