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Research article

Trends in Accounting for Greenhouse Gases Emission in Zimbabwean Corporations

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ABSTRACT:

Accounting greenhouse gases GHG emissions is an essential step for companies to assess climate change-related risks and understand their impacts on climate. This paper argues that this reduction goal can only be satisfied by embracing a paradigm from a 'top-down' strategy through national policy levers to a 'bottom-up' approach focused

at the sub-national and corporate levels. After examining current carbon management practices by reviewing corporate environmental reports and interviewing environmental managers from six companies in Zimbabwe. The findings from show that there has been a poor disclosure environmental awareness in 2005. However, there was a positive move of 16% of the companies started reporting on environmental companies by 2011. There has been an increase by 12% on most companies which use annual reports as their media in disclosing their environmental awareness.

Keywords: pollution - Greenhouse gases - carbon emission control -corporate social responsibility - sustainable production.

1.0 Introduction

Climate change is a constraint to sustainable socio-economic development in Zimbabwe. The increasing frequency and severity of droughts and floods, the shift in onset of the rains, and increasing intensity of mid-season dry spells in the last 50 years have been identified in the Initial National Communications (1996) and the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (2001) as a major consequence of climate change. ln Zimbabwe most of the national aggregated greenhouse gas (GHG) emissions as are associated with Carbon dioxide (CO2) that originates from coal combustion, land usage, and forestry. Most of the emissions can be linked to the energy, industry, transportation, agriculture, residential and public sectors. Changing climates are set to worsen the problem by 2030. Hence "It is of paramount importance for businesses to operate with minimum environmental impact, carbon footprint and increased awareness of environmental implications of their operations," said Zimbabwe Environment Minister Francis Nhema at the 2012 environment exposition. Describing Climate Change as a serious challenge to sustnable development in Zimbabwe, the Secretary in The Ministry of Environment and Natural Resources Management (MENRM), Ms. Florence Nhekairo said that according to a recent capacity assessment study that the Ministry conducted the country has weak inter-and intra sectoral coordination in Climate Change issues, limited capacity for Climate Change policy research, analysis and implementation as well as inadequate resources to fund Climate Change adaptation and mitigation programmes in the country.

2.0 Formulation of the Problem

Climate change has already had an impact in Zimbabwe. The Meteorological Service Department confirming that rainfall here has declined, while temperatures have risen in the past few years. Climate change place the country's food security and economic growth at risk. [i] A study on strengthening national capacity for climate change programme in Zimbabwe, commissioned by the government and United Nations agencies found that the nation lacks the capacity to mitigate and adapt to climate change (The Herald, Monday, 09 July 2012). The absence of a legal instrument enforcing compliance for in-house policies is a major weakness. (The Herald Monday, 23 April 2012).

This study aims at assessing the extent to which Zimbabwean corporations have been able to account for their greenhouse CO2 emissions.

3.0 Literature Review

A carbon footprint is "the total set of greenhouse gas (GHG) emissions caused by an organization, event, product or person" http://www.climatevarg.org. Greenhouse gases can be emitted through transport, land clearance, and the production and consumption of food, fuels, manufactured goods, materials, wood, roads, buildings, and services. For simplicity of reporting, it is often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted. The concept name of the carbon footprint originates from ecological footprint discussion. The carbon footprint is a subset of the ecological footprint and of the more comprehensive Life Cycle Assessment (LCA) (NOAA, 2009).

An individual's, nations, or organization's carbon footprint can be measured by undertaking a GHG emissions assessment (NOAA, 2009). Once the size of a carbon footprint is known, a strategy can be devised to reduce it, e.g. by technological developments, better process and product management, changed Green Public or Private Procurement (GPP), carbon capture, consumption strategies, and others(The Global Debate,2011)

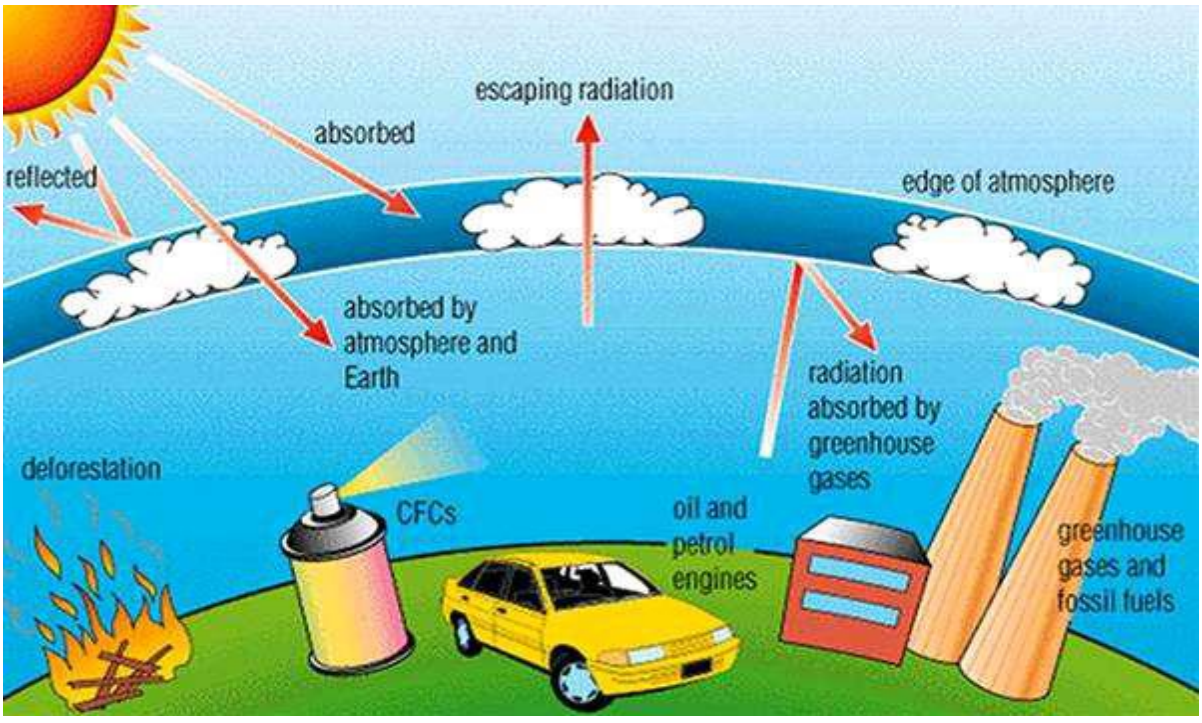

Figure 2.0: Earth's energy circulation (www.epa.gov).

The sources of greenhouse gases (GHG) come from various sectors including transportation, industrial processes, power generation for residential consumption, agriculture and deforestation. According to the United Nations Food and Agriculture Organization (FAO), deforestation accounts for 25 to 30 percent of the release of GHG http://www.fao.org/newsroom/en/news. The report states: "Most people assume that global warming is caused by burning oil and gas. But in fact between 25 and 30 percent of the greenhouse gases released into the atmosphere each year – 1.6 billion tonnes – is caused by deforestation." From 1990 to 2000, the net forest loss was 8.9 million hectares per year. From 2000 to 2005, the net forest loss was 7.3 million hectares per year.

The ten countries with the largest net loss of forest per year (2000 – 2005) are: Brazil, Indonesia, Sudan, Myanmar, Zambia Tanzania, Nigeria, Democratic Republic of the Congo, Zimbabwe, and Venezuela (combined loss of 8.2 million hectares per year). The ten countries with the largest net gain of forest per year (2000 – 2005) are: China, Spain, Viet Nam, United States, Italy, Chile, Cuba, Bulgaria, France and Portugal (combined gain of 5.1 million hectares per year). (http://www.fao.org/forestry/site/28821/en/). Figure 2.1 shows GHG by type (pie chart b) and sector (pie chart c) from the IPCC AR4 SPM (http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf). Note that CO2 fossil fuel use is only 56.6 % of GHG.

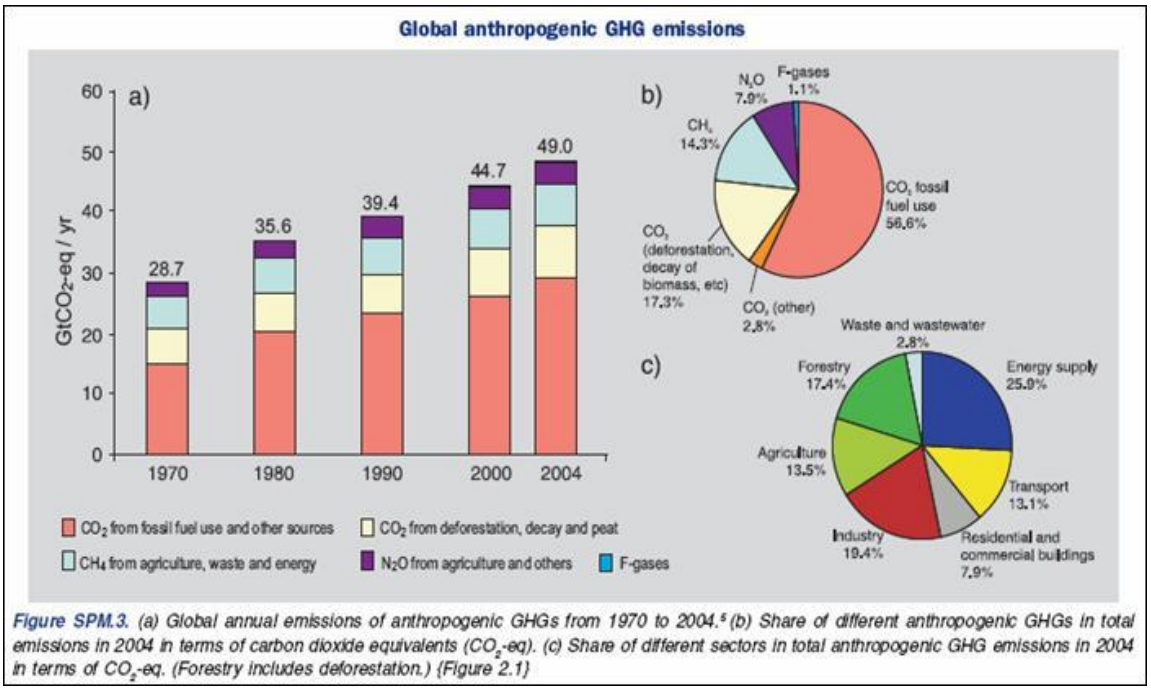

Figure SPM.3. (a) Global annual emissions of anthropogenic GHGs from 1970 to 2004.[5] (b) Share of different anthropogenic GHGs in total emissions in 2004 in terms of carbon dioxide equivalents (CO_2-eq). (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO_2-eq. (Forestry includes deforestation.) {Figure 2.1}

Figure 2.1: GHG Emissions by Type and Sector (IPCC AR4 SPM)

Becoming vegetarian would be more efficient in reducing greenhouse gases than driving a hybrid car. The United Nations Food and Agriculture Organization (FAO) released a report in November 2006

(http://www.fao.org/newsroom/en/news/2006/1000448/index.html) that states: "the livestock sector generates more greenhouse gas emissions as measured in carbon dioxide carbon dioxide (CO2) equivalent – 18 percent – than transport…. the livestock sector accounts for 9 percent of carbon dioxide (CO2) deriving from human-related activities, but produces a much larger share of even more harmful greenhouse gases. It generates 65 percent of human-related nitrous oxide, which has 296 times the Global Warming Potential (GWP) of carbon dioxide (CO2) …it accounts for 37 percent of all human-induced methane (23 times as warming as carbon dioxide (CO2)) "

An analysis of rainfall and temperature in Zimbabwe reveals a rise in daily minimum temperatures of around 2.6°C in a century and a rise in daily max temp of about 2°C per century (www.weather.utande.co.zw).There has been a shift in onset of the rains, increased frequency of heavy rainfall events, increased proportion of low rainfall years, increased proportion of tropical cyclones reaching high intensity, drizzle weather events have declined and, mid-season dry spells are more frequent and intense as shown in figure 2.3 (www.weather.utande.co.zw).

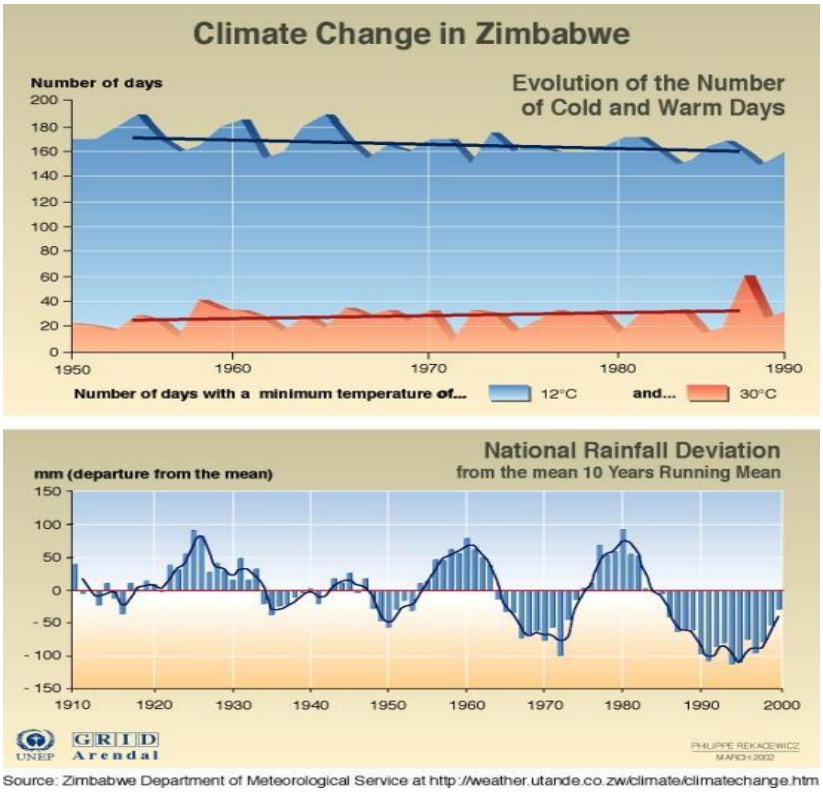

Figure 2.3: Trend of climate pattern in Zimbabwe (www.weather.utande.co.zw)

Climate Change is a global issue that transcends national boundaries, hence the need for concerted efforts by all nations. International efforts to address Climate Change are coordinated through the United Nations Framework Convention on Climate Change (UNFCCC). This Convention had no mandatory limits on greenhouse gases (GHGs)

for individual nations and contained no enforcement provisions thus being legally non-binding until the introduction of the Kyoto Protocol, the only legally binding document on GHGs reduction. As of 2008, the Convention has been ratified by 192 States and the European Community, which makes it one of the most universally supported of all international environmental agreements. The Conventions ultimate objective is to achieve stabilization of greenhouse gases GHGs concentrations in the atmosphere at a level that would prevent dangerous human interference with the climate system within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. Parties agreed that they would recognize common but differentiated responsibilities, with greater responsibility for reducing greenhouse gas emissions in the short term held to developed/industrialized countries. The debate on Climate Change (CC) started at the first World Climate Conference in 1979 organised by the World Meteorological Organisation (WMO). At this conference, scientists publicly admit for the first time that human activities have adverse impacts on the climate. This was further confirmed in 1990 at the second World Climate Conference when the IPCCs First Assessment Report (FAR) highlighted the risks and threats of Climate Change (CC). Figure 8 shows the major events in International Negotiations.

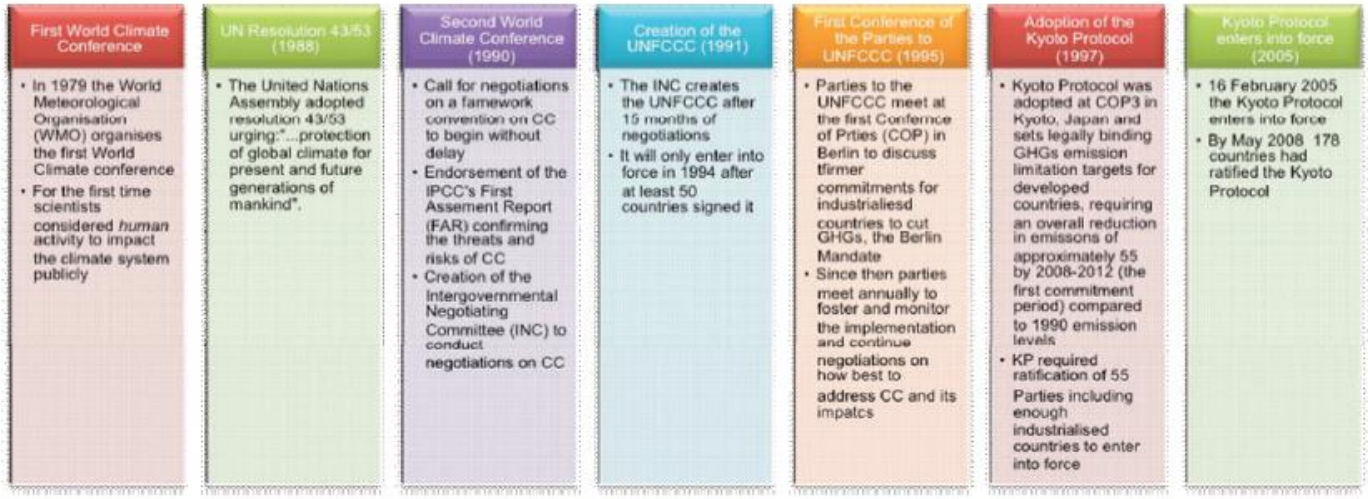

Figure 2.4: Timeline of International Negotiations DEFRA (2000).

4.0 Research Methodology

4.1 Research Design

This study is a descriptive survey of six companies in Zimbabwe.

4.2 Population and Sampling Methods

Six companies were conveniently selected for this study namely General Beltings/ Pigott Maskew, AICO Africa Limited, Olivine lndustries Pvt Ltd, Delta Beverages Transport Pvt Ltd, Delta Lagers Pvt Ltd, Lafarge Pvt Ltd, Murray & Roberts Pvt Ltd given their perceived potential impact on the environment but also the fact that they represent a broad spectrum of industries, products and services.

4.3 Research Instruments and Data Collection Methods.

Desk research and literature review allowed the researcher to identify current worldwide trends, and using these trends as a benchmark the researchers assessed what is happening in the six Zimbabwean corporations selected. Data was collected by reading environmental reports and interviewing various environmental managers.

5.0 Findings

5.1 Trends in Corporate Environmental Reporting

There has been a poor disclosure environmental awareness in 2005 with 39% of the companies with a zero recording figure 4.1. Hence there was a positive move of 16% of the companies started reporting on environmental companies by 2011.There has been an increase by 12% on most companies which use annual reports as their media in disclosing their environmental awareness figure 4.1.

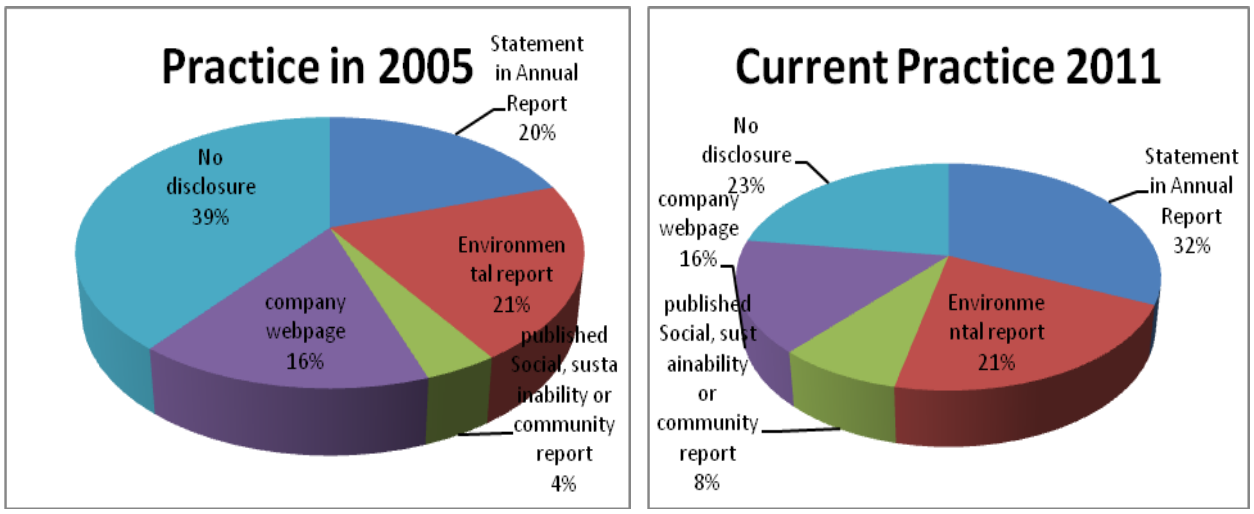

Figure 4.1 The current level of media used to disclose environmental awareness in Zimbabwe companies.

Although this collective environmental awareness has changed little over the past five years, figure 4.1 illustrates that the medium used to convey this awareness has altered significantly, which found the majority of environmental disclosures to be made within the company's Annual Report. Environmental reporting practices have evolved, disclosing performance data in the company's annual report or within separate environmental reports has decreased, to be replaced by disclosure within social, sustainability or community reports.

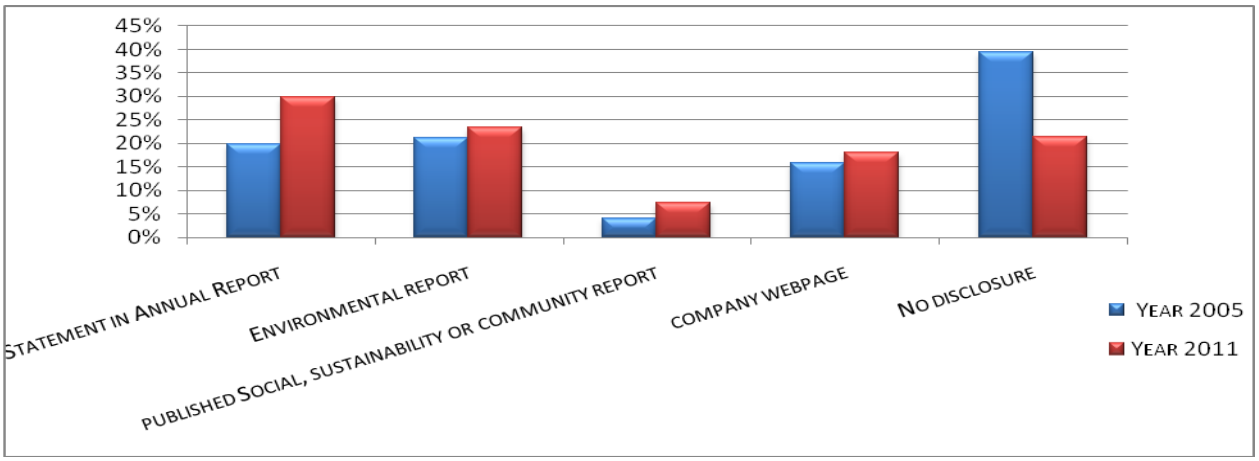

Figure 4.2 Trends in disclosure practices from 2005

Moreover, additional reporting categories have developed, including the integration of environmental awareness within corporate social responsibility reports and on the companies webpage figure 4.2. These additional categories indicate that overall environmental awareness has increased from 20 percent in 2005 to a 30 percent in 2011 statement of annual reports, a slight increase of between 2% to 3% in the environment reports and corporate social responsibility reports and on the company's webpage as illustrated in figure 4.2.There is a positive move in the increase of disclosing companies performance data by 15% since 2005.

This brief analysis on generic environmental reporting illustrates that the media within which carbon emissions are currently being disclosed are diverse. Figure 4.3 demonstrates that each medium represents a discrete stage along an environmental reporting variety related to the extent to which the report meets stakeholder needs. Thus, as carbon performance data are increasingly integrated within triple bottom line accountability reports, it can be expected that their evaluation will become more comprehensive in order to meet these needs figure 4.3.However, subsequent analyses question this assumption.

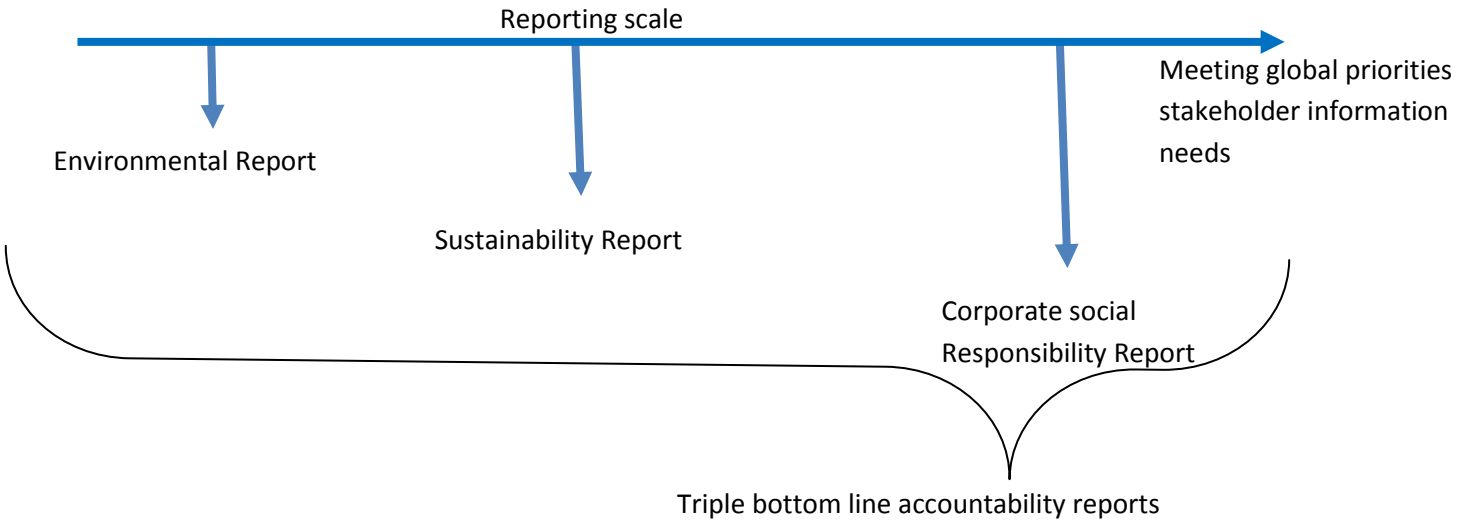

Figure 4.3 The environmental reporting continuum. Following the five-stage reporting model proposed by Sustainability and UNEP (1997) and discussions on Corporate Social Responsibility by Keay (2002) and Wheeler and Elkington (2001).

5.2 Trends in carbon disclosure practices

The review package, detailed in appendix 1, identified eight principal themes for assessing the level at which organisations are currently disclosing their carbon emissions performance data and management strategies. The modal code for each theme, or review area, across the 75 organisations surveyed from the Zimbabwe listed companies is presented in figure 4.4. Figure 4.4 highlights that not all review areas are disclosed at a consistent level, as depicted by its variable profile. Such an inconsistent profile can indicate a low level of activity in addressing those aspects being assessed which in turn describes a poorly developed carbon reporting process. It would be interesting to compare this situation over time to see if it evolves into a more rounded, and hence, developed profile.

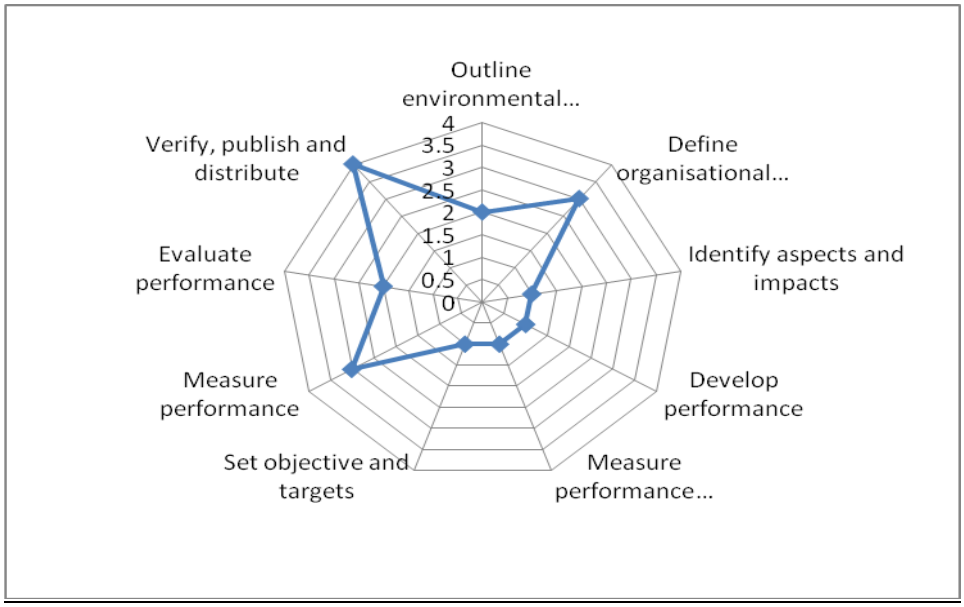

Figure 4.4 Modal codes for each review area in the review package (appendix 1).

Positively, however, modal codes in figure 4.4 indicate that a higher frequency of companies are currently disclosing carbon emissions within an external reporting context compared to those choosing to avoid this issue. However, this does not take into account the relative level of these disclosures. Figure 4.4 illustrates that three review areas which are defining organisational context, measuring performance, verifying, publishing and distributing received a modal code above 2, showing a carbon reporting process currently framed with significant omissions and an inadequate treatment of relevant aspects.

Thus, the principal strength of this carbon reporting process focuses on the defining organisational context ,measuring performance, verifying, publishing and distributing are identified in figure 4.4. However, the relevance of its environmental context, the accuracy with which carbon performance is measured and the transparency with which this performance is evaluated all depict weaknesses in the disclosure process. For example, companies readily presented statistics related to their carbon emissions, but failed to disclose how these figures were derived, thus reducing their potential accuracy and transparency. Each of these review areas contributes to the overall picture of current carbon disclosure practices and therefore, to address the subsidiary aims outlined in the methodology, these will now be discussed according to three themes, their scope, expression and the extent to which they address level greenhouse gas reduction targets.

5.3 The scope of current carbon reporting practices

In order to evaluate the scope of carbon management practices currently being framed within corporate environmental reports, the third review area is identifying aspects and impacts, will initially be examined. Figure 4.5 depicts the results of this review area, categorised according to those review criteria used to assess the completeness of the organisation's carbon emissions inventory and those used to evaluate the disclosure of significant sources from this inventory. Clearly, the weight of identifying environmental aspects and impacts within an environmental report is placed on the significant carbon risks and opportunities as opposed to identifying all potential risks from which this selection can be made. This is consistent with generic reporting trends outlined by the CSR Network (2001) who estimated that only a third of global top 100 companies reported full performance data on carbon emissions in 2001.

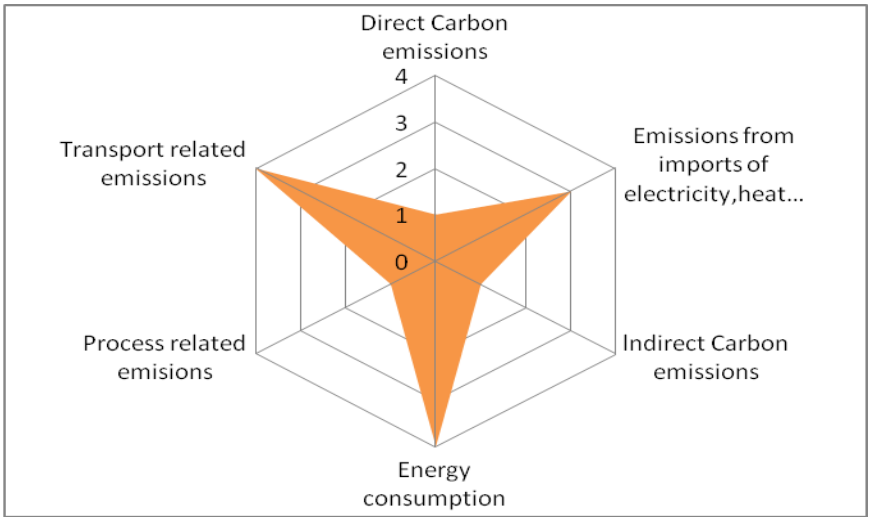

Figure 4.5 Modal codes related to the identification of aspects and impacts, assessed against the principle of completeness.

Within those sources that are identified, however, figure 4.5 demonstrates that indirect carbon emissions from imports of electricity, heat or steam are the most comprehensively discussed. Figure 4.5 illustrates that actual disclosures of carbon performance data related to their significant sources typically encompass energy consumption and transport emissions. Although both categories are reported to the same level of completeness, their frequency of disclosure is not analogous; energy consumption is the most commonly reported carbon emissions source.

In the context of generic environmental reporting practices, KPMG (1999) identified emissions to air as one of the most frequent areas within which targets are defined. In the global top 250 companies, for example, half published plans on their emissions to air in 1999 (KPMG, 1999). Since this survey, however, progress has been made in defining carbon related targets, at least within the UK's division of these organisations; over three-quarters of the companies surveyed made some reference to such targets. This is particularly pertinent as it demonstrates a commitment to continually improving environmental performance (DEFRA, 2001a).

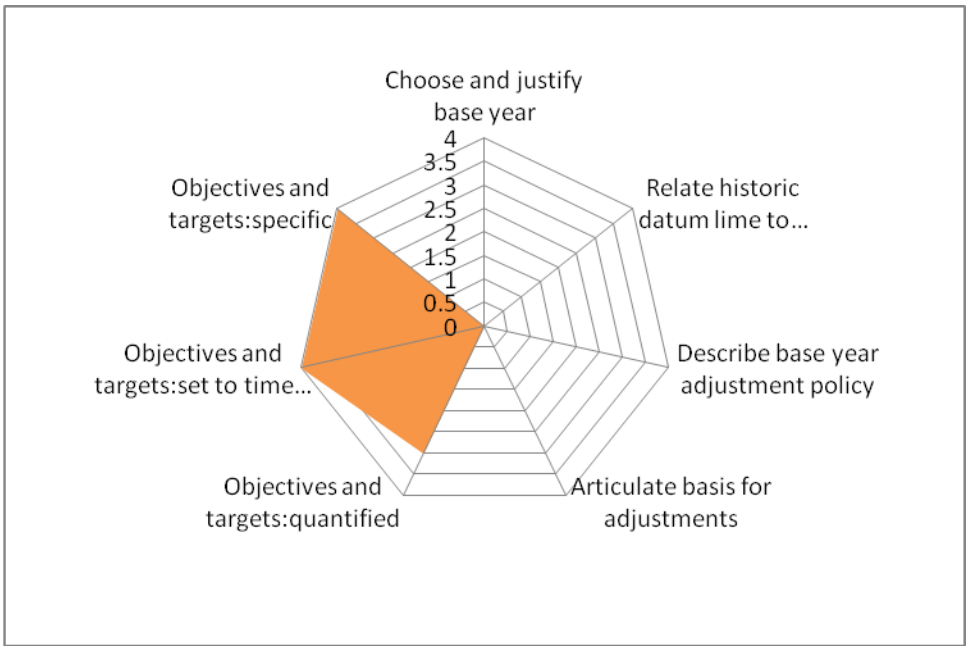

Figure 4.6 Modal codes related to the setting of objective and targets, assessed against the principle of comparability.

Modal codes of the sub-criteria constituting this review area are presented in figure 4.6. These codes demonstrate that although the specific objectives and targets present a best practice approach to this aspect of the carbon reporting process, the consistent lack of a base year against which they are set reduces their comparability. This is particularly pertinent as it demonstrates a commitment to continually improving environmental performance (DEFRA, 2001a). However, to comprehensively identify the scope of these disclosures, it is equally important to

evaluate those aspects depicting weaknesses in the reporting process. For example, figure 4.4 illustrates that the accuracy with which carbon performance is measured (review area 6) and the transparency with which this performance is evaluated (review area 7) are only present in ambiguous statements.

Although quantitative data on carbon emissions performance are often disclosed, demonstrated by review area 3, the means with which they are derived are rarely presented. This is manifest by each criterion and sub-criterion within review area 6 being coded an accuracy level of one. In then evaluating this performance, table 4.1 illustrates that only two sub-criteria, reporting performance against objectives and identifying potential solutions to reducing emissions, have a modal code above zero. This portrays a fragmented approach to the carbon reporting process; current performance is often stated, targets are often set, yet the two are rarely integrated by evaluating the former against the latter. This reduces the potential ability of the targets in demonstrating the organisation's commitment to continual improvement.

Sub criteria	**Description**	**Modal code**
7.1.1	Report the current position of the organisation with respect to its objectives and targets	1
7.1.2	Highlight areas of success and weakness	0
7.2.1	Identify solutions to reduce carbon emissions	2
7.2.2	Describe the commitment and resources necessary for plan implementation	0
7.2.2	Describe the commitment and resources necessary for plan implementation	0
7.2.4	Monitor and commit to continuous improvement	0

Table 4.1 The modal codes for the sub-criteria in review area 7, evaluating performance, assessed against the principle of transparency

Similarly, figure 4.4 illustrates that the second review area, defining the organisational context, depicts a weakness in the carbon reporting process, being predominantly served by an evasive or ambiguous statement. However, the World Business Council for Sustainable Development/ World Resource Institute WBCSD/WRI (2001) argues that clear and appropriate organisational and operational boundaries contribute to the relevance and transparency of the report.

The results from the structured part of the interview guide are depicted in table 4.3 to present a comparable analysis of current carbon emissions management practices between the six case study organisations. There is a clear discrepancy within all companies between the potential sources of carbon identified and those which are currently being monitored or measured.

	General Beltings/ Pigott Maskew	AICO Africa Limited, Olivine lndustries Pvt Ltd	Delta Beverages Transport Pvt Ltd	Delta Lagers Pvt Ltd	Lafarge Pvt Ltd	Murray & Roberts Pvt Ltd
Number of sources of carbon emissions						
Direct emissions	2	4	3	3	4	2
Indirect emissions from electricity, heat or steam	2	3	1	2	3	3
Other indirect carbon emissions sources	2	2	1	3	2	1
Total	6	9	5	8	9	6
Number of sources currently being monitored						
Direct emissions	0	3	1	2	3	1
Indirect emissions from electricity, heat or steam	0	2	0	0	2	0
Other indirect carbon emissions sources	0	0	0	2	2	0
Total	0	5	2	4	7	1
How the sources are currently being measured						
Direct monitoring systems	1	3	3	3	4	1
Using activity data and conversion factors	3	3	2	2	2	0
Other measurement technique	1	2	1	2	1	0

Table 4.3 comparable analysis of current carbon emissions management practices

Table 4.3 indicates that all carbon sources are currently being measured using activity data, largely in the form of meter readings or quantities of energy supplied, which are then converted into carbon dioxide equivalents using conversion factors. Consistent with the findings from the corporate environmental reports, indirect emissions from electricity, heat or steam largely seem to be driving the carbon management strategies of the case study organisations. General beltings, Delta Beverages Transport, Murray and Roberts's respondents disclosed over 60% in direct emissions whilst Delta lagers recorded a minimum of 38% disclosure in these emissions. Lafarge direct emissions are from the high-temperature burning of limestone in the cement kilns and the use of fuels such as coal and diesel.

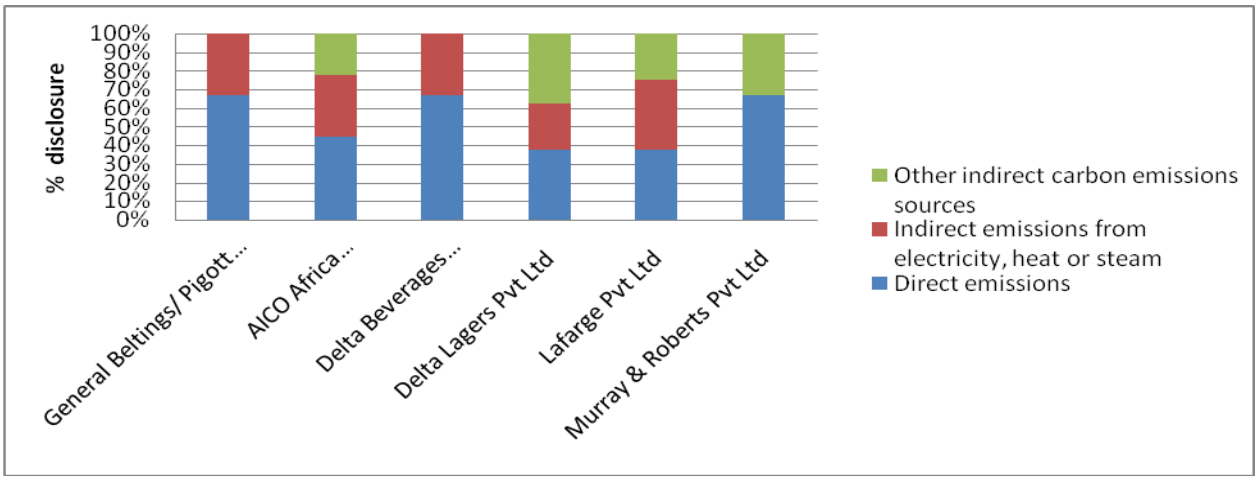

Figure 4.14 :Number of sources of carbon emissions

The indirect CO_2 emissions stem from electricity consumption. The carbon footprint of cement production is dominated by the direct emissions created during the manufacturing process. Olivine industries and Lafarge are the only companies to incorporate direct emissions within its management policy, by considering the carbon emitted from chemical processing and from the generation of electricity and heat from its combined heat and power plants. Olivine industries respondent indicated that direct GHG emissions occurring from sources that are owned or controlled by the company (i.e. sources within Olivine Industries organisational boundary). Recording direct emissions are collected as monthly energy figures as following amount of diesel and petrol used by the company fleet, paraffin consumption, amounts of refrigerants consumed, coal consumption, and hexane consumption. This involves quantification of the percentages of different energy sources in the Zimbabwe Electricity Transmission and Distribution grid electricity supply mix to obtain the weighted factor for the mix. Olivine industries Indirect GHG emissions are from international travel. These occur as a consequence of the activities of the company, but generated from sources not owned or controlled by the company. The number of flight distances, routes followed, road distance covered and the number of people per flight/road travel are captured monthly for analysed.

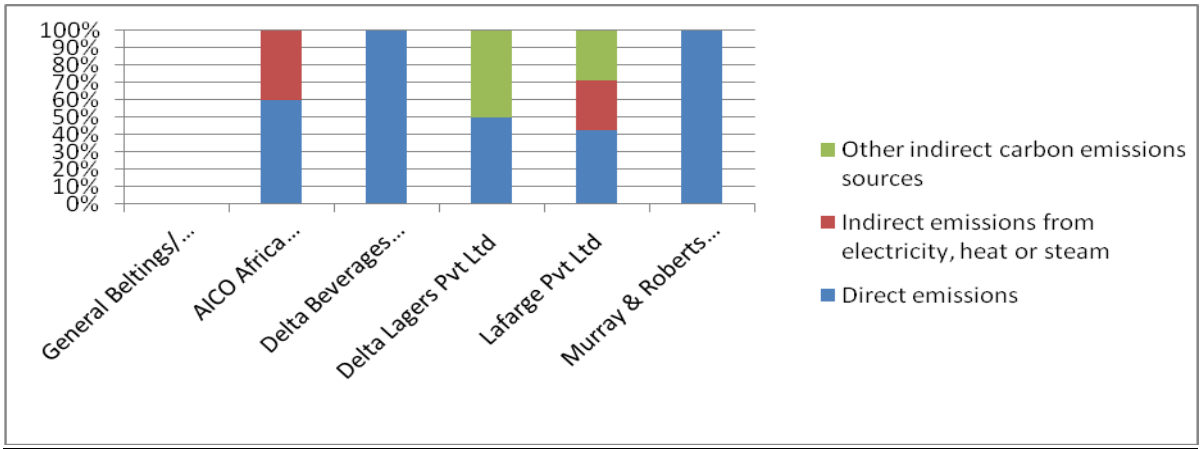

Figure 4.15: Number of sources currently being monitored

Murray & Roberts 60% direct emissions from the group's operations are due to the release of hydrocarbons, air pollution, particulate matter and dust emissions, water/ground water pollution. The Group monitors 50% of its direct emissions in relation to the following indicators resource efficiency and carbon footprint and emissions, effluents, and waste management. Murray & Roberts operations are required to implement and comply with ISO 14001, a standard that addresses environmental management systems. On a negative it the construction sector group leaves 83% of its carbon emission unaccounted for.

Table 4.4 untapped carbon emissions

	General Beltings/ Pigott Maskew	AICO Africa Limited, Olivine lndustries Pvt Ltd	Delta Beverages Transport Pvt Ltd	Delta Lagers Pvt Ltd	Lafarge Pvt Ltd	Murray & Roberts Pvt Ltd
Total number of carbon emission sources	6	9	5	8	9	6
Total number of sources currently being monitored	0	5	2	4	7	1
Untapped carbon emissions	6	4	3	4	2	5
Untapped carbon emissions %	100%	44%	60%	50%	22%	83%

Table 4.4 indicates the untapped carbon emissions from the case studies as illustrated. General beltings records the most at 100% resulting from zero monitoring at all from its carbon emissions. Murray & Roberts Pvt Ltd is the second with 83% untapped carbon emission meaning it only monitors and measures 17% of its operations as illustrated in figure 4.16. Delta Beverages Transport division accounts for only 40% of its emissions leaving 60% of its carbon emissions unaccountable for. The least is Lafarge with 22% untapped carbon emissions which shows it has systems in place to monitor and measure 78% of its carbon wastes by reducing the clinker proportion of used for cement hence The specific heat consumption of our plants is improving since 2010.

These findings, in conjunction with those from the environmental reports, demonstrate that the scope of carbon emissions management is predominantly limited to those sources associated with the production of electricity and gas. However, Loreti *et al*. (2000) argue that restricting this focus minimises opportunities for carbon reductions and hence inhibits the effective use of resources and efforts to meet reduction targets. Widening this focus will demand a systematic approach to identifying all potential sources of carbon material to the organisation, an issue which needs integrating into any carbon emissions management tool. A potential solution to this identification process centres on

the checklist approach used in the interviews, which promoted a time-efficient and comprehensive consideration of all carbon sources.

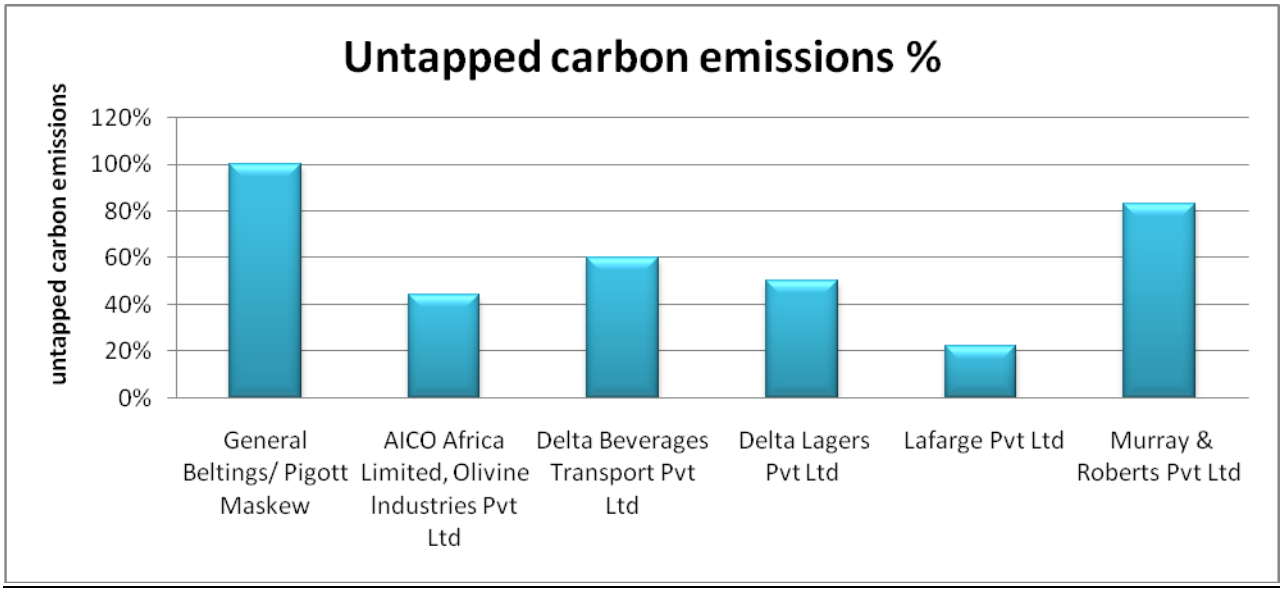

Figure 4.16 Graphical presentation of the untapped carbon emissions

6.0 Conclusion

Much needs to be done to transform the broad pledges made by Government of Zimbabwe (achieve emission reduction targets) into actionable policies and measurable results. Policy measures in relation to climate change are not developing fast. Moreover, there is no national response strategy to climate change (or a climate change policy) to help deal with the effects of the science in an effective and co-ordinated manner but to date progress has been slow. Despite the absence of national climate change policy. Corporates should have proactive business attitude towards climate change by developing plans to manage emissions and establishing the necessary mechanisms and incentives to put those plans into practice throughout the company and its operations. Beyond emissions accounting, a proactive business attitude involves reducing emissions. Three quarters of responding companies mentioned "Harmonisation of reporting requirements" and "Harmonisation of methodologies for estimating emissions". One respondent argue that establishing an international standardized methodology for GHG accounting would promote fair competition between companies and help companies being recognised for their true performance in managing their emissions. A third of the respondents highlighted that companies also need to reach out of their boundaries and interact with others if they are to contribute to a low carbon future in a meaningful manner. Often, the bulk of emissions are produced throughout the supply chain and in the use and disposal of products. As a result, an increasing number of leading companies have undertaken to lower their carbon footprint by

involving their suppliers. Another key actor is consumers. Because consumers have such an important impact on climate change, companies are making increasing efforts to engage with them. Companies have a crucial role to play to raise consumer awareness and support informed consumer choices by providing meaningful climate related information on their products. Another important area of corporate engagement is participation in the policy debate and in the development of national and international climate change and emission reduction policies. Companies are also key actors in reaching out to developing countries through the development and transfer of low carbon technologies and know-how. Two thirds of the companies indicated the need of recognition and rewards for achieving a target reduction in GHG emissions. These need to be reviewed and made standard per sector so that if a company achieves its sectoral target it is clearly communicated and coordinated and there is a special function for it. Management needs to give their subordinates a pat on the back for an achievement. Companies that integrate climate change considerations in their board and executive structure are more likely to maintain the long-term commitment needed to address climate change according to (UN Global Compact, Goldman Sachs, 2009.

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[i] Meteorological Services of Zimbabwe …It will, according to a study released on March 21, 2012 titled Strengthening national capacity for climate change programme in Zimbabwe,