

# **AN ASSESSMENT OF THE IMPACT OF CLIMATE CHANGE ON THE FINANCIAL PERFORMANCE OF SOUTH AFRICAN COMPANIES**

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## **Abstract**

South African companies face uncertainty about whether they should commit resources to mitigate vulnerabilities and exploit opportunities arising from climate change. There is ambiguity over whether responding to climate change materially affects the financial sustainability of South African companies. The study sought to establish the extent to which responding to climate change impacts financial performance. Secondary analysis of historic data was used to compare the climate-change performance of 70 Johannesburg Stock Exchange listed companies to indicators of their financial performance. The research concluded that there is a positive and statistically significant correlation between climate-change performance and financial performance.

**Key Words:** Climate Change; Sustainability; Financial Performance; Opportunities

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## **1. Introduction**

Companies are being increasingly pressured to react to the risk of climate-change. However, they face challenges in obtaining reliable information in order to decide how to allocate their capital, management time and other resources in responding to the potential risk of climate change. Researchers have forecasted that significant business investments are required to address climate-change, with global figures ranging from US\$150 billion per annum in 2009, to US\$1 trillion per annum by 2030 (Jolly, 2010:13-15; UN Global Compact, 2009:18). In addition, companies face pressures to retain stakeholder legitimacy by being seen to operate within societal boundaries regarding environmental performance, not only because of ethical responsibilities to minimise environmental harm, but also to be assured of continued social license to operate (Deegan & Unerman, 2011:325-333; Hopwood, Unerman & Fries, 2010:5-9). Strong emotions from diverse stakeholders are invoked as a result of climate-change debates and companies may be pushed into a 'green wave', and thus misallocate capital, without properly evaluating the impact of action or non-action (Esty & Winston, 2006:2-5; UN Global Compact, 2009:18). Conversely, many companies miss this point that true sustainability requires structural changes and when they are put under pressure by stakeholders, their first line of defence could be to merely publish sustainability reports (Ogilvie, 2009:57-58). Nevertheless, companies should not forget basic business principles in managing climate-change risks such as translating

issues into financial metrics (Phyper & MacLean, 2009:10-27).

The purpose of this article is to contribute to the understanding of the relationship between climate-change performance and financial performance. Although extensive research has explored case studies of opportunities that arise from implementing climate-change initiatives (Friend, 2009; Hopwood et al., 2010; Stoffberg & Prinsloo, 2009; Carbon Trust, 2011), significantly less research has quantified the net costs and revenues that arise from adapting to climate-change.

Particularly in developing countries such as South Africa, climate change is projected to ultimately have an up to 20% reduction in per capita consumption, with Sub-Saharan Africa being more exposed to the negative effects of climate-change than any other region due to a combination of environmental and socio-economic factors such as it being a high-risk hydro-climatic environment – factors that will heighten uncertainty for companies (Chevalier, 2010:191-192; Houghton, 2009:233; Munashinghe & Swart, 2005:221; Schulze, 2005:435). This illustrates the need for research in a South African context.

Early research on sustainability issues focused on principles and ethics. Friedman (1970:1-6) regarded social responsibility as a deceptive way of generating company goodwill that went against profit-seeking desires of principals and unfairly increased consumer prices. By 1992, there was increased literature on precautionary, sustainable development, polluter-pays and equity principles (Houghton, 2009). Most companies increasingly took

an accommodationist view where they responded to environmental concerns when profitability was threatened (Doyle & McEachern, 1999:135-146). Subsequently, several forces increased the interest in climate change and sustainability (Ernst & Young, 2010b:1). These included better public access to information, increased expectations of corporate transparency, high profile incidents such as oil spills, shifting consumer expectations, competitor activities, new regulations, increased engagement by the investment community and employee expectations.

As a result, more recent research has started to draw conclusions from surveys illustrating that many executives now feel that sustainability investments can create financial returns; in addition to increased acceptance of positive linkages between profitability and factors such as social performance, pro-environment businesses and ethical responsibility (Brooks & Dunn, 2010:5-11; Ernst & Young, 2010a:2; MacCracken, Moore & Topping, 2008:221; Shaw, 2011:191). Other studies have shown that share prices react, at statistically significant levels, to environmental information disclosures, suggesting empirical evidence that sustainability initiatives create financial value (Deegan & Unerman, 2011; Soyka, 2012).

Despite the above literature, few studies globally and in South Africa have specifically examined the financial returns arising out of climate-change in isolation from other sustainability variables. Even considering companies individually, financial information on sustainability and climate-change is not commonly analysed, disclosed, accounted for or used in decision-making (Bartelmus, 2003:50; Blignaut & de Wit, 2004:429-444; Burns & Weaver, 2008:256; Soyka, 2012:303). As a result, when companies have decided to invest in sustainability projects, a common challenge they face is that information on environmental risks tends to be underdeveloped and is not monetised (Epstein, 2008:103-123).

The objective of this article is to establish the relationship between climate change and the financial performance of South African companies. This entails:

- establishing the correlation between climate-change activity and financial performance of selected South African companies; and
- evaluating the impact of climate-change performance on the financial indicators of selected South African companies.

The remainder of this article is structured as follows: firstly, a literature review that explores the relationship between climate-change performance and various aspects of financial performance. This is followed by a description of the research methods and measures used. Lastly, the results of the research are

discussed, concluding with managerial implications, limitations and recommendations for future research.

## **1. Literature Review**

### **2.1 Overview of climate change impacts on companies**

Climate change is not often a direct stress on business, but rather triggers other stresses due to the impacts between climate and human systems (IPCC, 2007:361-365). Such stresses inevitably affect the financial position of companies. Climate impacts cost between one and twelve per cent of the GDP annually for different locations (World Resources Institute, United Nations Environment Programme and Oxfam, 2011:12-14). While companies tend to see the ecosystem as separate from the economic environment, climate changes can shift an area's economic patterns and comparative advantage, thus affecting prospects for industry (Gilding, 2011:35-42; IPCC, 2007:362-368). This has led to companies facing commercial pressures to adapt to climate-change from innovative competitors, consumers, non-governmental organisations and governments (Willard, 2005:11). As a result, eighty-three per cent of shareholders now see the long-term material impact on shareholder value that climate-change and other sustainability risks pose (Ernst & Young, 2011:2-5).

Recent research has focussed attention on the correlation between sustainability and financial return. For example, Soyka (2012) made the following observations:

- indicators of return on assets, return on sales and return on equity have been found to improve for companies that have significantly reduced pollutant emissions (Soyka, 2012:269);
- there is a positive correlation between low emissions and a high net margin (Soyka, 2012:269-271);
- cost of equity capital is lower for companies that focus on environmental, social and governance practices and this is reflected in a positive beta (less share price volatility) as well as increased cash flows (Soyka, 2012:273-277);
- cost of debt capital comes at a premium for environmentally weak companies and their bond ratings are typically lower (Soyka, 2012:277-279); and
- there are demonstrated share price movements from positive and negative environmental and social events (Soyka, 2012:280).

Other authors have explored the opportunities arising from climate-change as illustrated in Table 1 below:

**Table 1.** Survey of climate-change opportunities

	<b>Comparative summary of climate-change programme benefits</b>			
	Friend, 2009	Hopwood et al, 2010	Stoffberg & Prinsloo, 2009	Carbon Trust, 2011
<b>Increase revenue and assets</b>	<ul style="list-style-type: none"> <li>• Innovation</li> <li>• Market access</li> <li>• Social license to operate</li> </ul>	<ul style="list-style-type: none"> <li>• Innovation</li> <li>• Winning and retaining customers</li> <li>• License to operate</li> <li>• Capital access</li> <li>• Enhanced reputation &amp; brand</li> </ul>	<ul style="list-style-type: none"> <li>• New technologies</li> <li>• Strategic advantage from carbon integration</li> <li>• New market avenues</li> </ul>	<ul style="list-style-type: none"> <li>• New revenue streams</li> <li>• Strengthened reputation</li> <li>• Customer loyalty</li> </ul>
<b>Reduce costs and liabilities</b>	<ul style="list-style-type: none"> <li>• Waste elimination</li> <li>• Reduced regulatory interest</li> <li>• Easier employee attraction &amp; retention</li> </ul>	<ul style="list-style-type: none"> <li>• Risk management</li> <li>• Operational efficiencies</li> <li>• Attract, motivate and retain staff</li> </ul>	<ul style="list-style-type: none"> <li>• Lower compliance &amp; remediation costs</li> <li>• Increased energy efficiencies</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory &amp; standards compliance</li> <li>• Reduced operating costs</li> <li>• Increased employee effectiveness</li> </ul>

In considering financial return, it is important to look at the various aspects of financial performance. The following sections explore how responding to climate change is expected to affect revenue, costs, assets and liabilities of companies.

## **2.2 Revenue – impact of climate change**

Lowitt (2011:51-84) outlines the following outcomes of sustainability programmes:

- Increasing revenue by charging premium prices for products that are not only less harmful but which deliver demonstrable cost savings for customers.

- Increasing revenue through higher volumes sold through sustainable product offerings.

Sustainable product sales are growing at double-digit levels year on year, albeit from a small base, with clean technology business expected to grow at 30% per annum (Hitchcock & Willard: 2009:227-242; Jolly, 2010:13-15). As a result, by 2013, 30% of all products were forecast to be sustainability-oriented products and this trend is also apparent in emerging economies (Esty & Simmons, 2011:268-286). Different surveys conducted in 2008 by the European Commission and TNS Research concluded that between 45% and 94% of respondents across developed and developing countries were agreeable to buying and paying more for environmentally friendly products (Hopwood et al., 2010:11; TNS Global, 2008:5-18).

It is increasingly seen that embedding sustainability has a direct and positive impact on employees' ability to innovate and create value, with companies that have a discernible green culture

standing out from their peers (Phyper & MacLean, 2009:339-356; Olson, 2010:23-42). Aligning sustainability strategy with performance evaluation systems not only shifts behaviours within a company, but can create improved financial performance (Epstein, 2008:125-142).

South African companies also stand to benefit from regulatory incentives that are used to influence market forces, such as tax benefits, energy subsidies, and information-based incentives that influence customer behaviour (Paterson, 2009:300).

## **2.3 Costs – impact of climate change**

Climate-change has an effect on operational, energy, production, supply chain and direct carbon-costs, as explored below.

Firstly, operational costs are affected by climate-change as reducing environmental impact and carbon emissions can result in cost savings of up to 20% of operating costs (Carbon Trust, 2011:5). Carbon-reduction efforts often go hand in hand with cost-saving programmes, efficiency initiatives, finding energy alternatives, re-examining logistics and human resource management initiatives (Lowitt, 2011:51-84; Willard, 2005:129).

Secondly, energy costs are directly related to climate-change. There remain grounds to believe that the oil price will sustainably rise above \$150 a barrel in future and such energy price volatility is likely to encourage energy consumption initiatives (Olson, 2010:3-22; Phyper & MacLean, 2009:369-391). Furthermore, renewable energy prices are certainly expected to follow a downward trend whereas carbon fuels will inevitably increase in price due to supply

issues and rising difficulties in extraction (Gilding, 2011:168).

Production costs are the third element that should be considered. The University of Cambridge Programme for Industry (CPI) (2007:8) highlights that there is a socio-environmental cost differential between sustainable and unsustainable production. This socio-economic cost is concealed through externalities. Creative destruction of fossil-based production technologies will be useful in helping companies see previously hidden inefficiencies and spur breakthrough innovation while reducing the 85% component of production that goes to waste (Benyus, 1997:263-264; Stern, 2006:273). Green inefficiencies typically manifest in other challenges such as overproducing, inefficient product motion, defects, over-processing, delays between processes and an unproductive culture (Esty & Simmons, 2011:221-244). There is therefore significant scope to improve efficiencies and Gilding (2011: 51) forecasts that there may be a 38% technological efficiency improvement in the use of resources by 2050. Fourthly, production is inevitably linked to supply chain where carbon management in supply chains entails benefits arising from identifying the most effective ways of reducing emissions while targeting opportunities for cost savings in logistics (CPSL, 2009:15-16).

The last cost category is termed 'carbon-cost'. Once society is no longer willing to bear the social consequences or cost of carbon, it will make companies bear the cost. It is therefore prudent for emitters to consider signs of future financial costs for carbon (Hardisty, 2010:101). For example, National Treasury (2010:9) proposed in a discussion paper that a carbon tax be introduced in South Africa that will initially value carbon at R75 per ton of carbon emitted, increasing to R200 per ton over a set time. In the 2015 tax-related budget proposals, the Minister of Finance announced the publication of the draft carbon tax later in 2015 (SAICA, 2015). Other carbon costs will include increased duties on carbon-intensive imports by certain jurisdictions and increased insurance premiums for identified climate-change exposures (Phyper & MacLean, 2009:301-333; Wilhelm, 2009:125-132).

#### **2.4 Assets – impact of climate change**

Climate change and the response to it can lead to increments and decrements in the value of production facilities, intangible assets and tangible assets, as outlined in this section.

Deloitte (2007:3,6) outlined concerns about the physical impact of rising sea levels, drought, increased storm intensity, more intense winds and extended summer heat waves. These risk factors are likely to lead to flooding of facilities, plant shutdowns due to water constraints, production outages, as well as impairment of plant operations due to plants

having been designed for historical weather conditions that have changed and are changing (Deloitte, 2007:3;6). KPMG (2008:26) feel that while companies may be protected from some physical risks through insurance products, there are newer forms of risk where they face actuarial exposures.

Secondly, intangible assets have become an important focus as KPMG (2008:32) cite examples to illustrate that intangibles can now form, on average, 70% of the value of a FTSE 100-listed company, up from 40% two decades previously. With 50% to 90% of a company's true market value in intangible assets that are more susceptible to sustainability risks and opportunities (Willard, 2005:114-117), it is expected that sustainable companies have a relatively higher reputation capital than companies that have not embraced sustainability (Epstein, 2008:163-196).

Thirdly, while a sudden shift to climate-related strategies will create innovation, sunk capital in carbon intensive assets and assets in obsolete business models will result in significant financial losses and insolvencies (Gilding, 2011:95). Soyka (2012:104-105) expands on fixed asset impairment by emphasising that impairment is a material risk for businesses with significant invested capital and where usability of assets is affected by new regulations and direct environmental impacts. Vulnerable industries are those whose fixed assets have very long lives and payback periods, are expensive to redesign and commission, and cannot be practically moved (Soyka, 2012:104-105). On the other hand, companies can increase asset value by upgrading tangible assets (for example, energy-efficient buildings have a greater value due to lower use and maintenance expenses) (Lowitt, 2011:51-84).

#### **2.5 Liabilities – impact of climate change**

According to the WRI (2005:4-14), negative repercussions from regulators, activist shareholders, civil society and customers could follow as these parties increasingly draw the link between business degradation of ecosystem services and the impact on societal well-being. The range of costs companies can incur is wide and includes fines, clean-up costs, lawsuits, asset value reduction, product recalls, weather impacts and comparatively higher energy, production and supply chain costs (Phyper and MacLean, 2009:31-73). The three liability types that can arise are criminal liability; civil liability; and financial liability (Soyka, 2012:80). Ogilvie (2009:52) warns that such contingent liabilities that arise from environmental issues such as pollution emissions are not adequately addressed, poorly disclosed, may be incomplete and are unreliably quantified.

As additional legislation is put into place, there will be greater litigation risks as a result of actions against heavy emitters, actions based on government carbon controls, and scrutiny of carbon disclosures

(KPMG, 2008:34). As shown by the asbestos and tobacco industry precedents, companies will be affected directly if countries and individuals take them to court to prove their accountability (Gilding, 2011:182).

The discussion above explored previous research findings that have explored the link between climate-change performance and the shareholder, income statement and balance sheet aspects of financial performance. The next section outlines the methodology followed for the research.

## 2. Methodology

### 3.1 Research method

The research method selected was historical analysis, which made use of quantitative secondary data through secondary analysis. Sources of relevant secondary data included organisations that collate information on:

- climate-change responses, risks and opportunities of companies; and
- the financial performance of listed companies.

Primary analysis, such as the use of interviews and questionnaires, was considered as a research method. However, major listed companies have already disclosed comprehensive climate-change information to bodies such as the Johannesburg Stock Exchange's Socially Responsible Investment Index (JSE SRI Index) and the global Carbon Disclosure Project (CDP). Therefore, while primary analysis would allow further analysis during interviews, it would not add significantly to the existing body of knowledge and would be seen as a duplication of effort by respondents. Secondly, information on the dependent variables, as manifested in the financial performance of listed companies, is widely available and broadly analysed.

### 3.2 Population

The Carbon Disclosure Project (CDP) (2012) was found to hold the most significant and comprehensive collection of self-reported company climate-change data. Based on the above, the population was defined as the top 100 JSE companies per the CDP, as well as those that have voluntarily disclosed climate-change data to the CDP, in the years 2011 and 2012.

### 3.3 Sample and sample size

Given that the population as defined above was sufficiently small, the entire population of JSE-listed companies that have disclosed climate-change data to the JSE was selected for study. The final sample size was 70 companies after excluding those that did not provide publicly accessible information. The above sample size appeared to be adequate for analysis to be undertaken, given that the largest companies on the

JSE by market capitalisation typically set the trend for the rest of the JSE. Further, Welman and Kruger (1999:64-65) recommend that a sample should comprise of at least 25 units of analysis as a general rule.

### 3.4 Secondary analysis overview

In summary, the empirical research was performed by comparing the climate-change performance of companies to their historical and projected financial performance. The process is indicated in the steps outlined below:

- obtained access to the CDP database and analysed the reports of the 70 selected companies so as to extract climate-change data ( CDP, 2012);
- obtained access to the McGregor BFA database through the UNISA library and extracted financial data and statistics for the 70 companies indicated above . McGregor BFA (2012a; 2012b; 2012c; 2012d) is a provider of financial data feeds and analysis tools with a database of JSE company information for the last 40 years; and
- compared the information as per the steps above to determine correlations in order to confirm or disprove the hypothesis of this paper.

### 3.5 Statistical analysis techniques applied

Techniques employed for statistical analysis were primarily:

- contingency tables (also known as pivot tables), which describe the relationship between two nominal variables (Keller, 2005:52);
- simple regression analysis, which quantifies the relationship between a single independent (explanatory) variable with a dependent (response) variable (Albright, Winston & Zappe, 2004:548-550); and
- the chi-squared test for independence, which empirically tests whether there is dependence between selected attributes (Albright *et al.*, 2004:522). The chi-squared test supplemented the contingency tables referred to above as it quantified whether trends observed between climate-change performance and financial performance were statistically significant or not.

### 3.6 Limitations of the empirical research

The limitations of the empirical research are as indicated below:

#### Limited size of population

The extent of visible and uniformly structured reporting of climate-change information, risks and opportunities within the JSE appears to be largely concentrated on the largest companies by market

capitalisation. While more companies prepare integrated reports, these vary greatly in terms of content.

#### **Limitations of secondary analysis**

Inherent limitations of secondary analysis could be the complexity and understandability of data, absence of key variables and lack of control over data quality (Bryman & Bell, 2007:334-336).

#### **Limitations of quantitative analysis**

Correlations established from statistical analysis cannot be used as evidence of a causal relationship in the absence of a plausible theory or other methods (Repko, 2012:249).

#### **Challenges in inferring climate change as a causality variable**

Even if the study concludes that companies that respond to climate change perform better than those who do not respond, it is difficult to infer what came first: their response to climate change or their financial performance. Climate change is just one risk out of a myriad of variables that influence the results of companies.

### **4. Findings**

In this section, the analysis questions are discussed individually and reported in the relevant figures.

#### **4.1 Relationship between improved climate-change performance and recommendations of equity analysts**

Indicators of climate-change performance were compared between 2011 and 2012 to identify companies that have improved by adding one or more indicators. This was then compared to the average sell, hold or buy recommendations from equity analysts.

The three indicators of climate-change performance used were as follows:

- Integration of climate change into company business strategies;
- Incentives for the management of climate change;
- Adoption of emissions targets by companies that were active in the current year.

The analysis revealed that 47% of companies that had improved their climate-change performance in the previous year had a 'buy' recommendation. Conversely, only 24% of companies whose climate-change performance had not changed attracted a 'buy' recommendation. The chi-test for independence ( $p = 0.081$ ) indicated a statistically significant greater

likelihood of a 'buy' recommendation for companies that had improved climate-change performance compared to those that had not improved their climate-change performance.

A further analysis of the results revealed that, for companies that were already leading climate-change performers in 2011 and 2012, there was no additional effect on equity analysts' recommendations, suggesting that improvements had already been factored by analysts during previous years.

#### **4.2 Relationship between carbon emissions decreases and equity analyst recommendations**

Companies that decreased their emissions between the 2011 and 2012 CDP reports were identified. Thereafter, these identified companies were compared to the recommendations made by equity analysts.

The analysis demonstrated that 31% of companies that decreased emissions attracted a "buy" recommendation while 33% of companies that did not decrease emissions attracted a 'buy' recommendation. This difference was insignificant and the chi-test result indicated an 84% probability of randomness, in other words, there is no apparent relationship. The lack of relationship may indicate that decreasing carbon emissions was either not pertinent or not visible information to equity analysts. It was interesting that analysts appeared to recognise indicators of climate-change performance but not decreases in carbon emissions. Why is this the case? A cursory review of CDP disclosures revealed that in a number of cases companies reported that they were more carbon-efficient than in previous years but they did not reflect decreases in the gross value of carbon emissions due to factors such as acquisitions and significant organic business growth. Gross carbon emissions do not seem to be a useful indicator for the market in relation to whether a company is successfully managing its climate-change risks.

#### **4.3 Relationship between climate-change performance and the weighted average cost of capital (WACC)**

Two independent variables were deduced and compared to whether they resulted in WACC being lower than the median of the sample of 70 companies:

- leading climate-change performers as defined previously in 4.1;
- companies that indicated that their climate-change risks were high (impact at least 'medium', likelihood at least 'more likely than not' and time frame of risk less than five years).

The results are shown in Figure 1 below.

**Figure 1.** Relationship between climate-change performance and WACC

Category	WACC less than median of sample
Leading climate-change performer	50%
Not leading climate change performer	49%
(chi-test of independence p = 0.91 /91% probability that variables are not dependent)	
Climate-change risks high (as per definition)	51%
Climate-change risks nothigh	47%
(chi-test of independence p = 0.70/70% probability that variables are not dependent)	

The results indicated that, whether a company is a leading climate-change performer or has identified high climate-change risks, there is a minimal to nil effect on the cost of capital. This appears to indicate that providers of equity or debt capital to companies are not yet factoring in climate-change performance and climate-change risks in determining the returns they require from their invested capital. It is unknown whether this pattern may be different for certain industries that may be more climate-sensitive.

**4.4 Relationship between climate-change performance and internal rate of return (IRR)**

Leading climate-change performers (as defined in 4.1) were separated from lesser climate-change performers and analysed against whether they achieved a positive or a negative IRR. IRR was based on historical accounting records for the previous five years as published in 2012.

The findings indicated that 73% of leading climate-change performers had a positive IRR whereas just 48% of those who were not leading climate-change performers had a positive IRR (chi-test of independence p = 0.043). Compared to those that were not leading in climate change, a leading climate-change performer was 1.5 times more likely to be a company with a positive IRR.

**4.5 Relationship between climate-change performance and market value premium over book value (M/B)**

The purpose of this analysis was to determine if increased climate-change performance coincides with higher M/B ratios. The premise was that, as companies invest in sustainability endeavours, the value of their intangible assets (market value premium) increases. This analysis was performed by comparison of the M/B ratios based to climate-change performance as illustrated by the findings in Figure 2.

**Figure 2.** Comparison of climate-change performance to M/B ratios

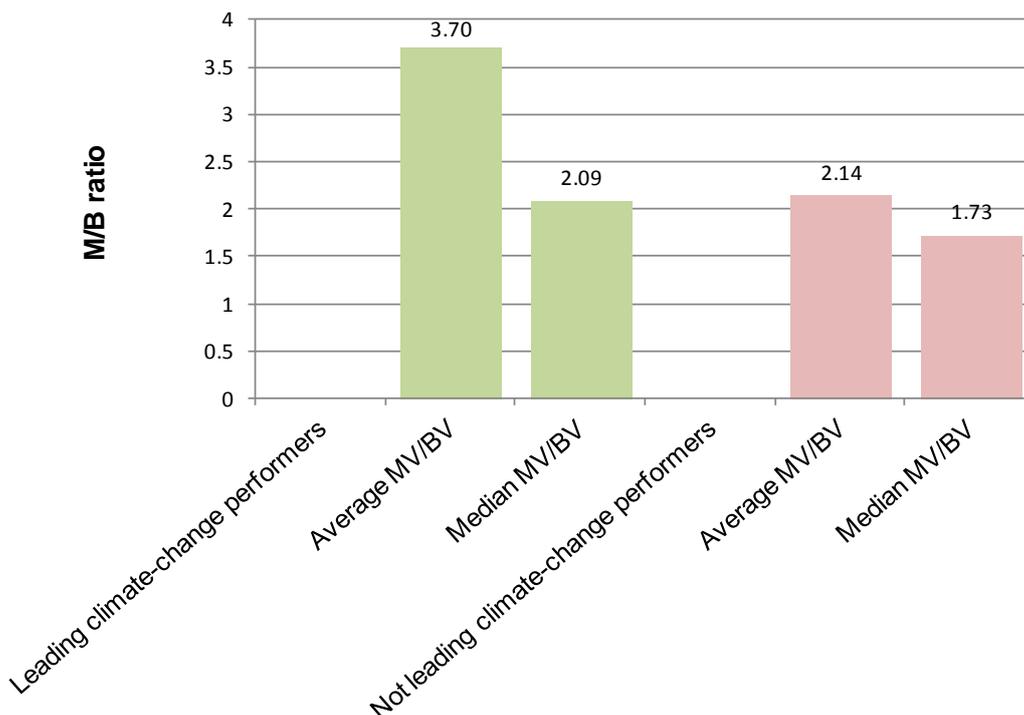
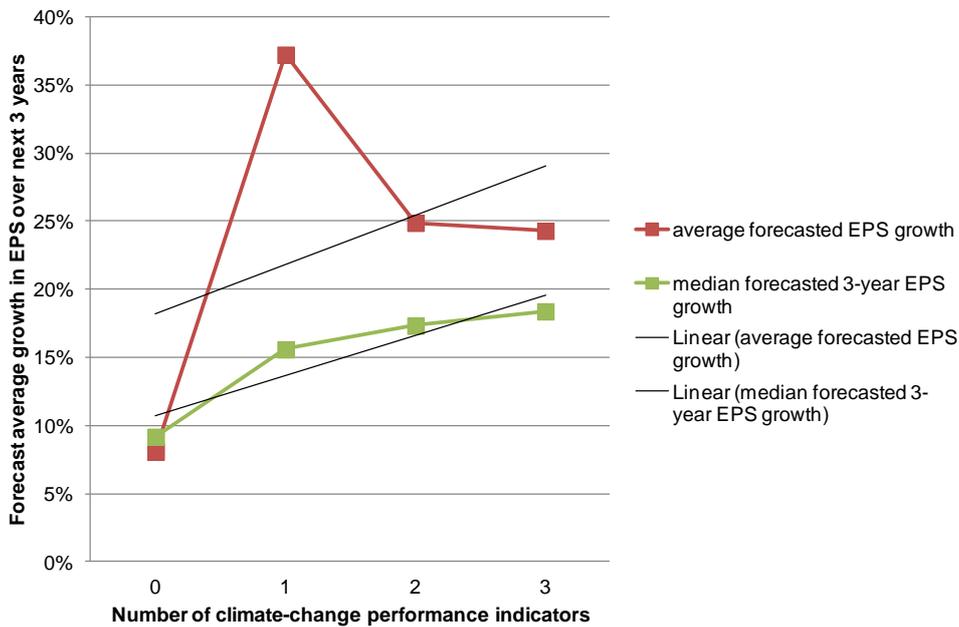


Figure 2 shows that the average M/B ratios of leading climate-change performers are 72.8% higher than those of none leading climate-change performers. For the same comparison, median M/B ratios are 20.8% higher. Both average and median statistics are shown in this comparison to illustrate the effect of a positive skew whereby leading climate-change performers tend to have more extreme M/B ratios. It thus appears that there is a tendency for leading climate-change performers to demonstrate higher M/B ratios. Over time, growth in the M/B ratio of a company creates higher returns for shareholders as the value of their investment increases.

#### 4.6 Relationship between climate-change performance and forecasted three-year growth in earnings per share (EPS)

Firstly, companies that had between nil and three indicators of climate-change performance were identified. A comparison was then made between the levels of climate-change performance and the extent to which EPS growth is forecast to exceed the median of the 70-company sample. Categorised results are shown in Figure 3, and the actual numeric increases are demonstrated in Figure 4.

**Figure 3.** Relationship between climate-change performance and forecasted three-year growth in EPS



**Figure 4.** Average forecasted EPS growth and climate-change performance

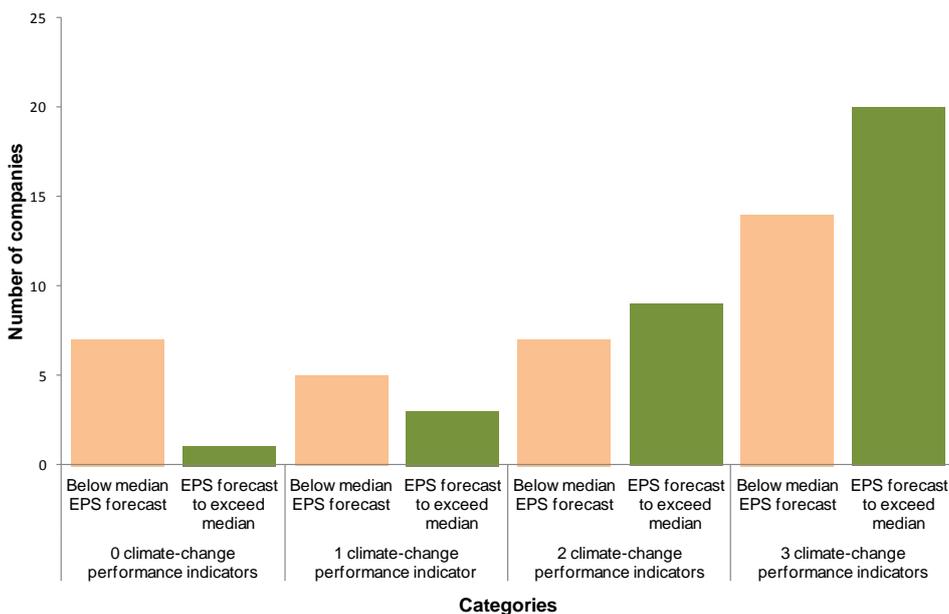


Figure 3 indicates that 12.5% of companies with zero climate-change performance indicators are expected to exceed the forecasted median 3-year EPS growth. Thirty-eight per cent of companies with one climate-change performance indicator are forecast to exceed the median 3-year EPS growth. These percentages increase to 56% and 59% respectively as companies demonstrate two to three climate-change performance indicators (chi-test of independence  $p = 0.097$ ). The results are statistically significant and show a strong correlation between climate-change performance and EPS growth.

Figure 4 confirms the pattern and demonstrates that the more climate-change performance indicators companies have, the greater the forecasted EPS growth. Both the average EPS growth and the median EPS growth are illustrated and they show the same positive linear pattern. The average EPS growth line is not as smooth as the median EPS growth line due to outliers that create a skew.

#### 4.7 Relationship between companies with high climate-change opportunities and the beta coefficient

The purpose of this analysis was to determine if the beta coefficient (an indication of non-diversifiable risk) is more favourable for companies that have indicated high climate-change opportunities than those that have low climate-change opportunities. The premise for this was that, as companies detect more opportunities; their risks are mitigated to the extent that their performance volatility decreases. Firstly, companies with high opportunities were determined as those whose climate-change opportunities had at

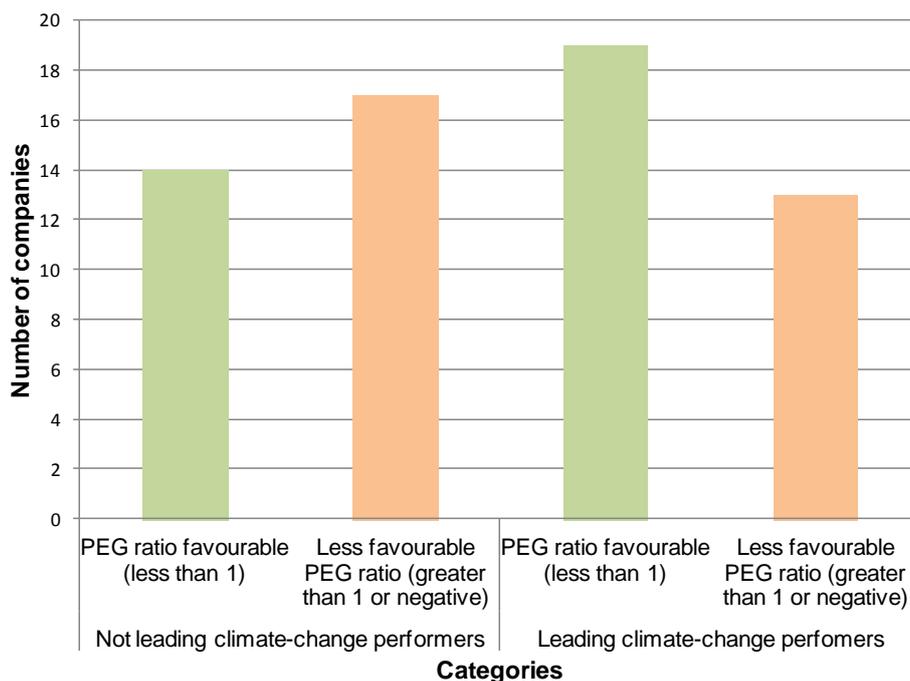
least a ‘medium’ impact and a ‘more likely than not’ likelihood as well as a time frame of less than five years. This was compared to companies whose beta coefficient had improved (decreased) between the years 2010 and 2012.

Of the 70 companies, 74% that indicated high climate-change opportunities demonstrated an improvement in the beta coefficient while 51% of companies with low climate-change opportunities had an improvement in the beta coefficient (chi-test of independence  $p = 0.047$ ). It was not possible to assess from this study whether opportunities identified had actually been tapped into. However, there appears to be a positive and statistically significant relationship between the level of climate-change opportunities and improvements in the beta coefficient.

#### 4.8 Relationship between climate-change performance and the price/earnings to growth analyst consensus ratio (PEG ratio)

The purpose of this question was to determine if PEG ratios (an indicator of a company’s potential value) bear a correlation to the degree of climate-change performance. Companies with PEG ratios between zero and one are expected to provide better growth in returns. For the climate-change variable, companies were categorised between those that were leading climate-change performers and those that were not. In respect of PEG ratios, companies were categorised between those whose PEG ratios were positive and less than one and those whose PEG ratios were greater than one or negative. Figure 5 illustrates the results:

Figure 5. Climate-change performance in relation to PEG ratios

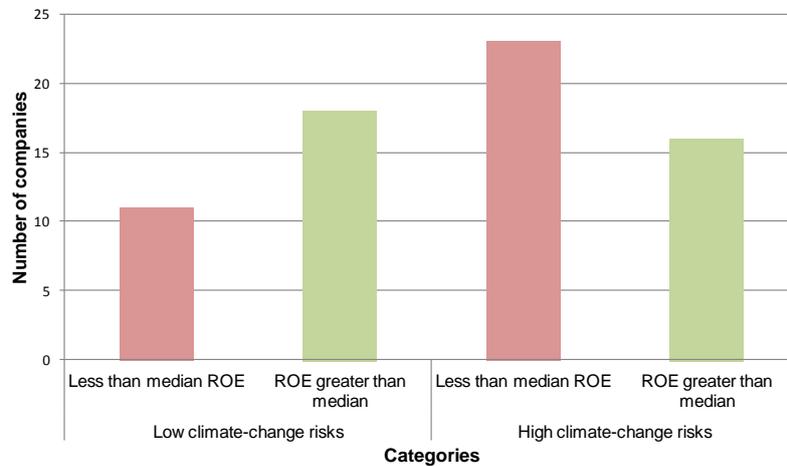


The results above show that 59.4% of leading climate-change performers had favourable PEG ratios (between 0 and 1) while 45.2% of leading climate-change performers had favourable PEG ratios (chi-test of independence  $p = 0.259$ ). However, the statistical chi-test indicated a low confidence level for this result. Accordingly, it appeared that there is a weak but positive suggestion that leading climate-change performers have more favourable PEG ratios.

#### 4.9 Correlation between climate-change risks and opportunities on return on equity (ROE)

The premise for this analysis was that risk events will negatively affect ROE while opportunities realised have a positive effect on ROE. Companies whose median risks and opportunities were high were identified. These were companies whose median risk or opportunity impact was at least 'medium', the likelihood was at least 'more likely than not' and time frame was 'less than five years'. This was then compared to the instances where the ROE of the sampled companies was greater than the median of the sample. The analysis is split into Figures 6 and 7 where risks and opportunities are separately analysed.

**Figure 6.** Climate-change risks: relationship with ROE



Based on Figure 6, it was determined that 58.9% of companies that had high-climate-change risks had a less than median ROE as compared to 37.9% of companies that had low climate-change risks (chi-test of independence  $p = 0.086$ ). There is therefore a

statistically significant indication that ROE is negatively impacted by high climate-change risks.

Figure 7 provides an analysis of climate-change opportunities below:

**Figure 7.** Climate-change opportunities: relationship with ROE

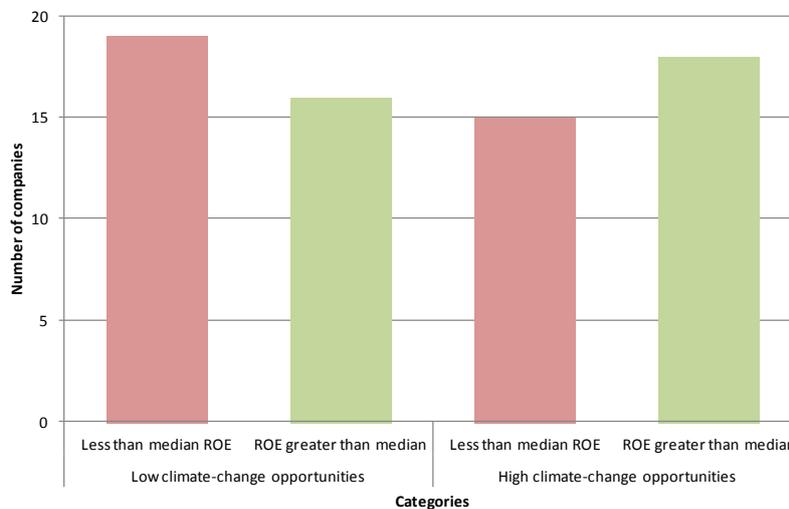


Figure 7 demonstrates that 54.5% of companies that had high climate-change opportunities had an ROE that was above the median as compared to 45.7% of companies that had low climate-change

opportunities, which appears statistically insignificant ( $p = 0.466$ ). An analysis of the actual ROE values indicates the following pattern in Figure 8:

**Figure 8.** Analysis of ROE in relation to climate-change risks and opportunities

	Average ROE	Median ROE		Average decrease/increase	Median decrease/increase
High climate-change risks	16	13	] ROE decreases as climate-change risk increases	-33%	-31%
Low climate-change risks	23	18			
High climate-change opportunities	21	16	] ROE increases as climate-change opportunities increase	19%	2%
Low climate-change opportunities	17	15			

Taking the above three figures into account, it appears that the variables are showing a logical pattern in that:

- as climate-change risks increase, ROE is negatively impacted (strong correlation), and
- as climate-change opportunities increase, ROE is positively impacted (weak correlation).

## 5 Summary of Findings

The empirical research findings largely confirmed that there is a relationship between climate-change performance and financial performance. The following conclusions have been reached:

- Companies that recently improved their climate-change performance were 1.95 times more likely to attract ‘buy’ recommendations from equity analysts. This may indicate greater market expectations of higher returns from implementing climate-change response strategies.
- Decreases in carbon emissions were not found to have a statistically significant impact on analyst ratings. It was observed that climate-change performance does not consistently lead to decreases in emissions and this may be due to acquisitions and organic business growth that make gross carbon emissions a less reliable indicator.
- Leading climate-change performers did not demonstrate different costs of capital, suggesting that providers of equity and debt capital do not yet factor climate-change responsiveness into financing costs.
- Leading climate-change performers were 1.5 times more likely to have had a positive historical IRR.
- For leading climate-change performers, the ratio of market value to book value (M/B ratios) was more likely to be above the median of the market than was noted for companies that were not leading climate-change performers. M/B ratios for these

companies were observed to be more than 20% higher than for the rest of the population.

- It was found that there was a positive relationship between companies improving their climate-change performance, and increased EPS for the next three years as forecasted by equity analysts.
- Companies that indicated higher climate-change opportunities reflected improvements in their beta coefficients.
- There was a positive but weak indication that leading climate-change performers have more favourable PEG ratios (a measure of expected growth in returns).
- A strong correlation was found between high climate-change risks and lower return on equity (ROE). A weak correlation was found between high climate-change opportunities and higher ROE.

The literature review confirmed that climate change is a material risk to companies and their stakeholders. Furthermore, it was illustrated that inappropriate or inadequate responses to climate change may negatively affect the financial performance of companies. Conversely, the literature review demonstrated that there are material opportunities for companies to enhance their returns and sustainability by successfully adapting to climate change. This will be manifested in enhanced value-creation capabilities, expanded revenue sources, improved efficiencies, reduced costs and increased competitive advantage.

The empirical research findings confirmed that there is a relationship between climate-change variables and financial variables. There was a strong indication of a relationship between climate-change performance, risks and opportunities and the financial returns of companies. Statistically significant correlations were identified between climate-change performance and financial indicators such as internal rate of return, market value to book value, earnings per share, beta coefficients, price/earnings to growth

ratios and return on equity. It was also observed that there appears to be a correlation between improving climate-change performance and the recommendations of equity analysts.

The empirical study focused on climate-change performance and not the broader definition of sustainability. Broader sustainability performance would encompass the other parts of environmental sustainability such as water usage and the social aspect of sustainability. A possible hypothesis is that if all aspects of sustainability are considered, the link between sustainability performance and financial performance should show an even stronger correlation.

The population of this study was limited to South African companies. As information collated by the CDP is global, it would be useful for global decision-makers to understand how climate-change impacts differ in various developing and developed countries.

## 6 Recommendations

The key recommendations from this research are as follows: **Creation of consistent measures of climate-change performance to enable peer review between companies.**

The greater part of reporting on the performance of companies is dedicated to financial information. However, if it is accepted that climate-change responses, in addition to other components of sustainability, are a useful indicator of future performance, it is recommended that:

- frameworks be devised to enable sustainability information, such as climate change, to be reported periodically in a manner that facilitates quantitative comparison between different companies;

- models be created for individual companies to measure their sustainability performance, based on predetermined variables that are assigned a statistically appropriate weighting; and

- ranking of climate change or sustainability performance be prepared regularly on all publicly listed and public interest companies.

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