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Climate change disclosures by public sector organisations

Barry Ackers, Adeyemi Adebayo

Department of Auditing, College of Accounting Sciences, University of South Africa, P O Box 392, Unisa, 0003, South Africa
ackerb@unisa.ac.za; adebaao@unisa.ac.za

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Abstract: Global warming and increasingly volatile weather patterns, arguably caused by anthropogenic climate change, are one of the defining challenges facing the world today. Therefore, it is imperative that organisations proactively respond by disclosing the impact of climate change on their operations and describing their initiatives to combat climate change. Against this backdrop, and since public sector organisations utilise public funds, we argue that public sector organisations should be accountable to the public about their stewardship of public resources and are obliged to explain how they are safeguarding the public by acknowledging and combatting climate change. Our study, therefore, explores the disclosure of climate-related activities from a purposively selected sample of government departments and organisations in South Africa, a country that has been lauded for the quality of corporate governance processes. We developed a climate change disclosure quality (CCDQ) index to assess the climate change disclosures of these public sector organisations. The CCDQ index applied to the most recent publicly available annual/integrated reports of the selected public sector organisations took six key disclosure elements into account. While our results reveal that most public sector organisations disclose climate-related issues, not all do. Moreover, the extent and scope of these disclosures vary significantly. Accordingly, we recommend that a framework utilising the disclosure elements described in this paper be developed that could apply to both private and public sector organisations.

Keywords: auditing, climate change, disclosure, public sector organisations, reporting, South Africa

Corresponding author: *Barry Ackers*
E-mail: *ackerb@unisa.ac.za*

1. Introduction

Despite its great potential, development across the African continent remains hamstrung by many socio-economic and political challenges such as inequality, poverty, globalised trade, climate change, population growth, ecological overshoot, geopolitical and social tensions, lack of transparency, and rapid technological and scientific advancement (International Finance Corporation, 2018). Asserting that infrastructure was vital to facilitate sustainable social and economic activity and development, Metcalf and Valeri (2019) recently suggested that its provision was intrinsically tied to achieving the United Nation's Sustainable Development Goals (SDGs) and the African Union's Agenda 2063. The SDGs and Agenda 2063 seek to ameliorate the above challenges to development to achieve a better and more sustainable future for all (UNDP, 2019).

Natural disasters such as cyclone Idai in Mozambique, the impact of climate change in Southern Africa (Fitchett, 2021), and the droughts in the East African region are now common occurrences. Therefore, future infrastructure projects and corporate and state governance policies should be adaptable and resilient to enable countries to meet the threat of climate change (Metcalf & Valeri, 2019), which is rapidly becoming a reality. South Africa, too, is experiencing climate change as exemplified by the abnormal rainfall levels, which have not been experienced in the past three decades, almost rendering daily weather forecast incorrect (Ash, 2021). Rising temperatures and changes in rainfall patterns are synonymous with climate change (Fauchereau, Trzaska, Rouault & Richard, 2003; Van Wilgen, Goodall, Holness, Chown & Mcgeoch, 2015), prompting Jennifer Fitchett (2021) to posit that climate change has already hit Southern Africa

We accordingly suggest that mitigating the adverse effects of climate change involves concerted efforts requiring improved corporate and state governance practices. Although governance is not a magic wand and is not necessarily the sole solution for mitigating all challenges and realising opportunities, governance is an indispensable tool for sustainable socio-economic development (International Finance Corporation, 2018). In corporate environments, governance works through boards of directors, auditors, audit committees and the executive committees (IoDSA, 2016; Prinsloo & Maroun, 2020). To function effectively, boards have always relied on internal control systems, independently audited by internal and external auditors (Forte & Barac, 2015; Maroun & Prinsloo, 2020; Prinsloo & Maroun, 2020; Radasi & Barac, 2015). Alford and Baird (1997) suggest that accountability is about monitoring inputs and outcomes linked to stewardship. Organisations discharge this accountability by reporting on using the resources entrusted to them to meet predetermined objectives. Financial reporting limitations have expanded organisational reporting to include non-financial aspects of organisational performance in annual or integrated reports. These reports should account to shareholders about how organisations have deployed the resources entrusted to them to meet organisational goals and to stakeholders. Contemporary society, therefore, requires these reports to be sufficiently detailed to account for financial issues and important non-financial issues, such as climate change (Caraiania, Lungua, Bratua & Dascălu, 2018).

Climate change represents a challenging policy problem involving multiple causal factors illustrating many of the problematic characteristics facing the world today (Commonwealth of Australia, 2007), as reiterated at the 2021 United Nations Climate Change Conference (COP26) (UNCCC, 2021). COP26 has simplified the debate about the causes and solutions to climate change into three competing dimensions, emphasising different aspects of the climate change issue. The first, profligacy, sees prevailing structural inequalities, particularly between countries, as causing increasingly unsustainable consumption and production patterns. The second is the lack of global planning, identifying the underlying problem as a lack of global governance and planning to control global markets and factoring environmental costs into prices. The third involves efforts by concerned individuals towards making the world a better place (profligacy story) or by international bureaucrats seeking larger budgets and influence (lack of global planning) (Commonwealth of Australia, 2007). Irrespective of which accounts hold, the effects of climate change, if not curtailed, will be deleterious in the coming years (Gelter & Puaschunder, 2021; Lim, Søgaard Jørgensen & Wyborn, 2018; Morris, 2015). Concerted efforts are therefore necessary to find working solutions to climate change issues and track how nations and organisations are responding by mitigating climate change issues, requiring the involvement of all levels of government and a wide range of non-government organisations.

Today, it remains difficult to track the global activities to mitigate climate change and assess progress for two reasons. First, environmental concerns are inadequately integrated into international sustainable development strategies and national or regional sector policies, strategies and action plans (Ismail, 2019). Secondly, even when these have been sufficiently established, organisations and governments seldom produce the requisite detailed climate change reports, especially in developing countries, including Africa as a continent. While organisations in some

countries are mandated to report on climate change, others have relied on voluntarily reporting on climate change. In this regard, Romolini, Fissi and Gori (2014) note that in the United States (US), disclosure of certain environmental and climate-related information is mandatory, while the European Union (EU) require the disclosure of certain non-financial key performance indicators related to environmental matters. Whereas the US rules only apply to listed companies, the EU rules have a broader scope applying to other types of organisations.

Being owned by the state, public sector organisations represent vehicles over which the state can exercise a level of control by promulgating regulations to demonstrate its commitment to addressing climate change concerns. Public sector reporting should contain detailed disclosures on how they are addressing the climate change issues relating to their operations or the impact of their operations on the planet. To demonstrate commitment to achieving Brundtland's vision "of meeting the needs of the present without compromising the ability of future generations to meet their own" (UNCSD, 2007), governments and their organisations should disclose what they are doing to improve climate change awareness, activities, disclosure and approaches to mitigating climate-related issues, which should be closely monitored, with governments being held to account.

South Africa is acknowledged as having strong corporate governance practices (Atkins, Solomon, Norton & Joseph, 2015). In this regard, South Africa has been lauded for its reporting, especially relating to integrated reporting (Prinsloo & Maroun, 2020), which takes material non-financial aspects of business operations into account (Ackers & Adebayo, 2022). As such, South Africa represents a good case to understand how government, through its relevant departments and organisations, account for climate change issues and the extent to which they are mitigating the impact of climate change. More importantly, the South African government continues to emphasise its ongoing commitment to achieving the goals and objectives of the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, as well as the Paris Agreement and their components by implementing effective climate change adaptation and mitigation measures (DFFE Integrated Report, 2020). South Africa has also committed to building a low carbon economy and climate-resilient society in the Low Emissions Development Strategy by submitting it to the UNFCCC in December 2020 (DFFE Integrated Report, 2021).

This study makes two contributions. First, we identify the public sector organisations (hereafter collectively referred to public sector organisations, unless specifically required for differentiation) as directly involved in South Africa's climate change arena based on the categorisation by the United States Environmental Protection Agency (USEPA) and the South African National Gas Emission Reporting Regulations Act. Second, we assess how these public sector organisations report on their climate change activities.

Following the introduction, we discuss climate change and corporate social responsibility (CSR) reporting, governance and climate change and the typical annual/integrated report disclosures dealing with climate change. After that, we describe the research approach utilised before presenting the analysis and interpretation of results 4. We continue by discussing the implications and recommendations before concluding by suggesting avenues for further research.

2. Literature review

This literature section discusses climate change and describes how CSR reporting can improve awareness, activities and compliance relating to climate change mitigation through effective disclosure.

2.1. Climate change and CSR reporting

The development of the global economic system failed to offer solutions to many long-lasting problems affecting society (UN, 2015), the most visible environmental examples being climate change and water scarcity. Anthropogenic climate change is a negative externality caused by carbon-intensive production methods and the burning of fossil fuels (Gelter & Puaschunder, 2021; Sachs, Schmidt-Traub, Mazzucato, Messner, Nakicenovic & Rockström, 2019). Global warming represents one of the most pressing contemporary problems facing humankind, introducing unprecedented and more complex environmental risks (Gelter & Puaschunder, 2021), arguably representing one of the greatest examples of market failure (Mazzucato & Penna, 2016). Simply using repetitive language to present climate-related activities year after year (as well as a high narrative content in annual/integrated reports does not necessarily mean that organisations have adequately addressed climate change issues (Eccles, Krzus, Rogers & Serafeim, 2012; Ruiz-Lozano & Tirado-Valencia, 2016).

While some observers assert that focusing on climate change is good for business (instrumental motive), others simply argue that we have a fundamental responsibility to the environment and future generations (Cooper & Morgan, 2013). Within the legitimate climate change debate, it is important to ensure that organisations provide reports that address social issues, especially about making the planet a better place. Cooper and Morgan (2013, pp.428-429) explain: *"while these (debates) are conscious strategies and choices, it is important to recognise that inattention to such concerns also reflects a choice and the assumed value of carrying on business as usual. To focus only on the financial reporting of an organisation or to consider only financial dimensions of decisions sends a message (perhaps unintentionally or for reasons of apparent impracticality) that accounting for social, environmental and other effects are not as important as a financial orientation"*.

Inadequate attention to climate change issues has resulted in a greater focus on the intertemporal effects than on the overwhelming risks it poses (Stiglitz, 2021). Effective reporting on climate change has implications for economic stability and geopolitics, as well as the sustainability of life on the planet (Cooper & Morgan, 2013). Apart from assisting in tracking climate change issues, effective climate change reporting also improves the ability to timeously respond to the needs of decision-makers and stakeholders for complete information about organisations, as well as to reflect the values behind normative concerns for sustainability and stability of society and the planet.

Since effective organisational governance requires participation by the board of directors, its audit committee, as well as external and internal auditors, implies that auditors should be amongst the role-players involved in climate change issues. Although attempts to introduce environmental accounting have been thwarted in the past (Burchell, Clubb & Hoopwood, 1985; Hoopwood, Unerman & Fries, 2010), auditors and accountants should continue to work closely with governments and organisations to improve the quality and scope of climate change and other CSR disclosures. However, voluntary reporting frameworks from august bodies such as the International Integrated Reporting Council (IIRC) and the Global Reporting Initiative (GRI), may not be binding, especially since they tend to be influenced by corporate concerns, which tend to be motivated by instrumental rather than moral arguments about corporate responsibilities and accountabilities. Nevertheless, determined auditors and accountants can contribute to instilling the appropriate reporting culture within their respective operations, which could yield better solutions to some challenging questions that have configurational drivers, such as climate change (Fainshmidt, Witt, Aguilera & Verbeke, 2020). This may be necessary since many organisations and particularly public sector organisations, seldom comply with voluntary guidelines (Ackers & Adebayo, 2022; Liu, Jubb & Abhayawansa, 2019). In this regard, Mansi, Pandey and Ghauri (2017) note that larger firms appear to disclose their environmental and climate change practices as a strategy to address stakeholder concerns and use perception management to build a credible external reputation, namely for instrumental reasons, as suggested by Jones, Harrison and Felps (2018).

Although traditionally, accounting has been depicted as reporting historical financial performance, recent global dilemmas such as CSR and climate change mean that the broader accounting profession should refocus by taking these global issues into account and reporting on how organisations have been managing and mitigating them (Lehman & Kuruppu, 2017). Roxana-Ioana and Petru (2017) assert that corporate governance discussion must now include climate change. Gelter and Puaschunder (2021) assert that climate change has at least two implications for institutional investors. Firstly, investors are increasingly pursuing public policies regarding climate change. Secondly, institutional investors strive to cultivate a positive media image by showing that they are concerned about climate change. This suggests that climate change is receiving attention in some quarters of the developed world.

2.2. Governance and climate change

It was mentioned earlier that climate change represents one of the greatest examples of market failures that we have recently witnessed (Mazzucato & Penna, 2016), introducing a need for government intervention. Nelson (2010) argues that the alignment of economies with the natural and the social world would assist in addressing such pressing problems as global climate change. Commentators (such as Estrin, Meyer, Nielsen & Nielsen, 2016; Plūmiņš & Ščeulovs, 2016; and Mazzucato, 2013) argue that under certain conditions, state ownership would be preferable to private ownership. For example, to address market failures. Mazuccato (2013) contends that major socio-economic issues, such as climate change, require active involvement by the government, introducing a need to understand the government's role better. Rygh (2018) notes that market failures that motivate government ownership in a domestic setting include cross-border environmental externalities (notably climate change) and transnational public goods (such as infrastructure) that individual countries cannot afford to build by themselves. Therefore, if climate

change truly results from market failure, governments, through their departments and organisations, should be proactively involved in concerted efforts to address climate change activities and mitigate climate change issues while disclosing these efforts in annual/integrated reports. Thus, serving as examples to private sector organisations. While the annual/integrated report disclosures of public sector organisations should conform with provisions that private sector organisations could emulate, reports should disclose the extent of compliance with such provisions. Arguing that public sector institutions must think big and meaningfully contribute to transforming and addressing climate change issues, Mazzucato (2013) concurs that public institutions have a role to play as servants of the common good. Although the theory of the firm appears to suggest that the ultimate goal of a firm is to maximise shareholders' wealth, Wright, Wood, Cuervo-Cazurra, Sun and Grosman (2021) note that there is an emerging debate for a purpose-driven organisation (Henderson, 2020; Mayer, 2020), that extends beyond profit maximisation. Advocates of this line of thought debate the role of organisations in addressing climate change, not necessarily as a consequence of their operating activities (viz. reduce, reuse, recycle), but as powerful actors in the globalising world (Dilling & Caykoylu, 2019; Economist, 2019). Government organisations have always been mandated to achieve non-business goals, conflicting with profit maximisation, such as politically or socially motivated investments (Wright *et al*., 2021). Government organisations should therefore serve as examples to private sector organisations on how to address social and environmental issues, of which climate change is arguably the most challenging.

Gelter and Puaschunder (2021) documented the impact of the US government and some corporations in mitigating the effects of climate change. Gelter and Puaschunder (2021) note that in 2019, more than 600 corporations signed a letter to the US Congress advocating for the reduction of greenhouse gas emissions (GHG) in support of climate change interventions. These signatory organisations undertook to transition to renewable energy, expand public transport and reduce overall emissions. The Institute of Directors South Africa (IoDSA) notes that King IV was prepared and cognisant of fundamental changes in both business and society characterised by the 21st Century, which influenced both its content and approach. These changes include new global realities, which test the leadership of organisations on issues as diverse as inequality, globalised trade, social tensions, climate change, population growth, ecological overshoot, geopolitical tensions, radical transparency and rapid technological and scientific advancement. Moreover, King IV was prepared to take the United Nations SDGs (agreed to by all governments in 2015), the African Union Agenda 2063 and the South African National Development Plan 2030 (NDP) into account. All of which have a common theme of value creation, achieved in a sustainable manner, with a primary driver being climate change (IoDSA, 2016). The impact of excessive consumption of non-renewable assets, as well as acknowledgement that the world is experiencing extreme weather conditions posing new risks, is exacerbated by the IoDSA (2016) contending that this ecological overshoot will be worsened by continued population growth in the African and Asian continents. Consequently, the pressure on finite natural assets will increase, meaning that continuing business as usual is no longer an option (IoDSA, 2016).

Mansi *et al*. (2017) argue that the mission and vision statements of government organisations should describe their CSR practices, and their annual/integrated reports should disclose how they deal with climate change problems. They note that top government organisations appear to pay attention to these issues when compared to smaller ones, which they attribute to larger government organisations having a greater presence and being more vulnerable to public scrutiny, increasing their need for legitimacy and to be seen as paying attention to reducing pollution levels and addressing climate change and global warming threats in their operations (Mansi *et al*., 2017).

2.3. Typical climate change disclosures

There does not appear to be a developed body of literature on the disclosures which should be included in a climate change report. Although the media has a way of reporting climate change (Belfer, Ford & Maillet, 2017; Boykoff, 2011), this is not sufficient for the purposes of this study. Notwithstanding the paucity of literature, Gelter and Puaschunder (2021), the climate-related reporting report (FRC, 2019), the United States Environmental Protection Agency (2019) and the South African National Gas Emission Reporting Regulations Act (2017) offer particular insights into what organisations and governments should typically disclose relating climate change in their annual/integrated reports. Nevertheless, based on the contemporary climate change academic discourse, reports in the media as well as by professional bodies, we suggest that climate change disclosure should at least cover the following six disclosure elements:

- Oversight body – consideration and assessment of climate change by the organisational oversight body

- Operating model – the extent to which organisational operating models are affected by climate change
- Current mode – sustainability of the current mode of operation and how organisations may respond to climate change challenges
- Opportunities and risks – a description and prioritisation of risks and opportunities, as well as their likelihood and impact
- Likely changes – strategic interventions to capitalise on emerging climate-related opportunities
- Impact measurement – the extent to which organisations measure the likely impact of climate-related challenges and the strategic success through correctly aligned, reliable and transparent metrics.

Collectively, these elements constitute the climate change disclosure quality (CCDQ) index used to conduct the empirical part of this study. In this regard, the primary objective of the CCDQ index is to assess the extent to which the organisations included in the study disclosed the climate change issues impacting their operations, risk mitigation strategy, strategic opportunities, and future outlook.

3. Methodology

Extant literature on the adoption of environmental and sustainability practices and guidelines does not adequately cover organisations' reporting of climate change practices. Reacting to stakeholder pressures to improve legitimacy and signal commitment to sustainability (Rosati & Faria, 2019), we attempt to bridge this gap.

From a population of hundreds of South African national, provincial and local public sector organisations, we purposively selected five national government departments and 20 national government entities listed in the Public Finance Management Act (PFMA) based on the perceived impact of their operations on climate change (South Africa, 2020; 2017; USEPA, 2019). Hence, as reflected in Table 1, our study selected a sample of 25 South African public sector organisations.

Table 1: Schedule of purposively selected public sector organisations

Government entities	PFMA Schedule categorisation[1]	Government departments
Air Traffic and Navigation Services (ATNS)	2	Department of Energy (DoE)
Central Energy Fund (CEF)	2	Department of Forestry, Fisheries and the Environment (DFFE)
Development Bank of Southern Africa (DBSA)	2	Department of Science and Innovation (DSI)
ESKOM	2	Department of Transport (DoT)
Industrial Development Corporation (IDC)	2	Department of Water and Sanitation (DWS)
Land and Agricultural Bank (Land Bank)	2	
South African Forestry Company (SAFCOL)	2	
South African Nuclear Energy Corporation (SANEC)	2	
South African Airways (SAA)	2	
South African Express (SAX)	2	
Telkom	2	
Trans-Caledon Tunnel Authority (TCTA)	2	
Transnet	2	
Agricultural Research Council (ARC)	3	
Council for Geoscience (CGS)	3	
Council for Scientific and Industrial Research (CSIR)	3	
Public Investment Corporation (PIC)	3	
South African Maritime Safety Authority (SAMSA)	3	
South African Weather Service (SAWS)	3	
Water Research Commission (WRC)	3	

In addition to the initial literature review that identified some relevant documents, the empirical data for this study was collected using content analysis, guided by the approach

[1] PFMA Schedule 2 - Major public entity
PFMA Schedule 3 - Other public entity

exemplified by Thomas (2012). In the first phase, we analysed the contents of the most recently available annual/integrated reports of the 20 government entities and five government departments in South Africa, seeking pertinent information relating to their disclosure of climate change issues, leading to the results discussed in the next section. In the second phase, we scrutinised the same set of reports to document the extent to which individual public sector organisations have disclosed their climate change practices, leading to the discussion in the second part of the next section.

3.1. Content analysis of reports

We use the CCDQ index to illustrate how these public sector organisations have disclosed climate change issues in their most recent annual/integrated reports, publicly available on their respective organisational websites. Abishek and Divyashree (2019) note that annual/integrated reports provide a good means of tracking organisational activities and processes. The rating scale was developed from themes emerging from the literature, particularly regarding what a typical report should disclose about climate change. The climate change disclosures of the various purposively selected public sector organisations included in the sample were thematically analysed. Daly, Kellehear and Gliksman (1997, p.3) submit that "*thematic analysis is a search for themes that emerge as being important to the description of the phenomenon*". The themes included in the CCDQ index are posterior indicators that emerged during the review of the scholarly and professional literature and reports on climate change, internal organisational documents as well as documents from independent professional bodies. As suggested by Miles and Huberman (1994), a matrix was used for comparability and cross-indicator analysis.

The content analysis coded and categorised the resultant observations based on whether or not climate change elements were disclosed in the reports of the respective public sector organisations. We deployed semantic content analysis, with coding based on the perceived meaning of the textual narrative or diagrams and not merely the occurrence of specific words or images (Liu *et al*., 2019). Other studies using content analysis that have evaluated reporting quality, or the extent of adherence to frameworks, have either tended to use disclosure indices (Abhishek & Divyashree, 2019; Chariri, 2019; Liu *et al*., 2019) or scoring systems (Eccles, Krzus & Solano, 2019; Ghani, Jamal, Puspitasari & Gunardi, 2018). Thus, informing the approach deployed in this study.

The data emerging from the examination of the annual/integrated reports of the selected public sector organisations were analysed using scores calculated on a CCDQ index, according to whether or not the predetermined elements were disclosed (Gerged, Cowton & Beddewela, 2018). Therefore, the CCDQ index provides a mechanism to assess the disclosure of the identified climate change elements. We use ordinal measures based on the following two-point scale to interpret these disclosures in the annual/integrated reports of public sector organisations with reference to the six disclosure elements.

- 1 – no relevant disclosures
- 2 – relevant disclosures

We used a two-point scale rather than three or four to limit researcher bias by simply assessing whether or not an issue was disclosed. The resultant maximum cumulative CCDQ index score for the six elements accordingly equals 12 (i.e. 2x6) for each government department and entity, as reflected in the following formula.

$$\text{CCDQ} = \frac{OVERSIGHT\ BODY + OPERATING\ MODEL + CURRENT\ MODE + OPPORTUNITIES\ AND\ RISKS + LIKELY\ CHANGES + IMPACT\ MEASUREMENT}{6}$$

3.2. Research control

To counter the researcher bias usually associated with qualitative research generally, and the analysis of archival records (Mackieson, Shlonsky & Conolly, 2019), purposive and not convenience sampling was used to minimise selection bias (Smith & Noble, 2014). To reduce the risk of analysis bias (Smith & Noble, 2014), especially since the study data were unstructured, a rating scale was developed to ensure a systematic and rigorous analysis of the data as part of the applied thematic approach (ATA) advocated by Guest, MacQueen and Namey (2012) and used by Mackieson *et al*. (2018) to limit researcher bias. The ATA framework ensures that qualitative research is purposeful and systematic and facilitates the planning and preparation for text-based qualitative analysis. To reduce bias, analysis was done in three different phases in this study with insights from Mackieson *et al*. (2019) and Guest *et al*. (2012). In the first phase, the rating tool was developed according to previous studies and observations by credible professional bodies. In the second phase, each author independently analysed the reports of the selected public sector organisations. Finally, the results were compared and deliberated upon in the third phase before reaching conclusions.

4. Analysis and interpretation of results

4.1. Climate change disclosures

Table 2 shows that not all the oversight bodies of the selected public sector organisations (μ=1.76) presented a general overview and assessment of climate change, which may be considered the first step to optimally disclosing climate change and maximising the cumulative climate change disclosure score. Since this element does not achieve the maximum disclosure mean, it implies that the oversight bodies of some public sector organisations failed to disclose any climate change issues in their reports. In contrast to the oversight bodies with the highest mean score, impact measurement has the lowest mean score (μ=1.24). Most public sector organisations do not appear to have described the impact of their climate change activities in their annual/integrated reports. Overall, most government entities and some government departments should improve their climate change disclosure. Thus, failing to provide a reliable measurement of the impact of climate change and related changes.

Table 2: Climate change disclosure by public sector organisations in their annual/integrated reports

		Oversight body	Operating model	Current mode	Opportunities n Risks	Likely changes	Impact measuremnt
N	Valid	25	25	25	25	25	25
	Missing	0	0	0	0	0	0
Mean		1.76	1.72	1.44	1.48	1.44	1.24
Minimum		1	1	1	1	1	1
Maximum		2	2	2	2	2	2

The DFFE requires certain public and private organisations to report on their GHG emissions, which is arguably one of the greatest contributors to climate change. In this regard, Section 7(a1) of the National Environment Management: Air Quality Act No. 39 of 2004 states that: "*A Category A data provider must submit the greenhouse gas emissions and activity data as set out in the Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry for each of the relevant greenhouse gases and IPCC emission sources specified in Annexure 1 to these Regulations for all of its facilities and by the data and format requirements specified in Annexure 3 to these Regulations for the preceding calendar year, to the competent authority by 31 March of each year"* (South Africa, 2017, p.8). Section 7(4) of the Act further prescribes that the reporting must be done on the National Atmospheric Emission Inventory System (NAEIS).

While not all organisations – particularly whose reporting threshold is reflected as being not applicable in Annexure 1 – are compelled to report on the NAEIS, most of the public sector organisations required to report failed to do so. Only ESKOM explicitly stated that it submitted an annual GHG report, and the IDC disclosed its scope 1 emissions data in its integrated report (IDC Integrated Report, 2020, p.65). In this regard, ESKOM disclosed: "*We submit an annual report to the DFFE based on the DFFE Technical Guidelines (for scope 1 emissions). These are based on the 2006 Intergovernmental Panel on Climate Change (IPCC) GHG Guidelines and 2019 IPCC Refinements*" (ESKOM Integrated Report, 2021, p.105).

Table 3: Disclosure of public sector organisations on the six climate change disclosure elements

KEY No relevant disclosures = 1 Relevant disclosures= 2	**Oversight body**	**Operating model**	**Current mode**	**Opportunities and risks**	**Likely changes**	**Impact measurement**
Lack of relevant disclosures by public sector organisations	6 (24%)	7 (28%)	14 (56%)	13 (52%)	14 (56%)	19 (76%)
Relevant disclosures by public sector organisations	19 (76%)	18 (72%)	11 (44%)	12 (48%)	11 (44%)	6 (24%)

4.1.1. Oversight bodies

Implicit in King IV Principle 1 is that organisational leadership should "set the tone for an ethical organisational culture" (IoDSA, 2016, p.43). Therefore, since oversight bodies are an integral part of the governing body, conformance with the remaining five elements is contingent on the extent to which the oversight bodies of organisations formally acknowledge the risk of climate change and

commit to reporting thereon. As identified in Table 2 above, most public sector organisations dealt with this aspect, as revealed by the mean score (μ=1.76). Table 3 further shows that 19 of the selected organisations (76%) had relevant climate change disclosures by their oversight bodies. In describing the oversight of the board over climate-related risks and opportunities, Telkom noted that:

"The Board has overall responsibility for overseeing risk and compliance (including climate-related topics) across the Group. The board is supported by Group Exco, the Social and Ethics Committee and the Risk Committee which monitor and advise the board on matters related to climate change. The highest level of responsibility for climate change matters in Telkom rests with the Social and Ethics Committee and the Risk Committee. These Committees monitor Telkom's activities, consider any relevant legislation and prevailing codes of best practice including safety, health and environment, and climate change" (Telkom Integrated Report, 2021, p.79).

Despite Telkom noting that climate change was only added as a reporting theme in the current reporting year, the information provided was sufficiently detailed to inform stakeholders that attention was being given to climate-related issues.

4.1.2. Operating model

Incorporating mitigating measures into the operating model disclosures is imperative to reduce the impact of climate change, creating an expectation that organisations should disclose these measures. Although combatting climate change requires a concerted effort by both private and public sector organisations, being funded by taxpayers, accountability theory argues that governments and their entities have a greater obligation to account to the public (Ştefánescu, Oprişor & Sîntejudeanu, 2016). Therefore, a normative expectation arises that public sector organisations should describe the effects of climate change on their operations, providing sufficient detail to address the concerns of the general public and private organisations. Table 2 reveals that the mean disclosure relating to the operating models of public sector organisations (μ=1.72) is marginally below the disclosure on oversight bodies. This is further illustrated in table 3, which indicates that 18 of the selected public sector organisations (72%) disclosed relevant information about the effects of climate change on their operating models. Disclosure by government departments is expected to be more detailed since the mandate of government includes providing guidelines, regulations and legislation that both public and private sector organisations should apply. A good example of climate change operating model disclosure is provided by the Land Bank, which noted that:

"*Land Bank uses relatively little natural capital in its own business operations, but factors associated with climate change pose a fundamental risk to the bank's business to the extent that these factors affect our clients' ability to repay their debt and even their business viability. The heightened risk profile of our lending and investment value chain, therefore, requires close management to mitigate risk to Land Bank's medium- and long-term viability"* (Land Bank Integrated Annual Report, 2020, p.110).

This statement, suitably customised for the unique features of the Land Bank, informs relevant stakeholders and annual/integrated reports users that the organisation's operations are affected by climate change and describes how climate change affects the bank's operating model. This disclosure example reflects an enlightened awareness of climate change and the need for comprehensive reporting, thereby providing their stakeholders with more pertinent information.

4.1.3. Current mode of operation

It may be argued that the impact of climate change on the mode of operation is the most important disclosure, especially since climate change issues are dynamic and not static (Gelter & Puaschunder, 2021; Cooper & Morgan, 2013). Therefore, it is imperative that organisations constantly assess the sustainability of their existing mode of operation in relation to combating climate change and its potential threats to ongoing operations. We submit that apart from the first – oversight body – the other four factors rely thereon, with assessment usually cutting across and informing the other disclosure elements. Table 2 shows that this element has the (joint) second lowest mean (μ=1.44) of the six indicators. Table 3 reveals that only 14 of the selected public sector organisations (56%) failed to disclose relevant information about the sustainability of their current mode of operation in addressing climate change. However, for organisations to meet this requirement, they require detailed measurement of the impact of climate change on operations, which is consistent with the results for the impact management element reflected in Table 2, having the lowest mean across all six elements (μ=1.28).

The disclosure in ESKOM's Integrated Report (2021, p.46), depicted in figure 1 below, clearly articulates how ESKOM responds to climate change.

Figure 1: ESKOM (2021) disclosure of the impact of climate change on the mode of operation

Responding to climate change

We have to transition from a coal-based to a lower carbon and more climate-resilient company. As we embark on this transition, we are implementing other mitigation and adaptation measures to reduce our climate change impacts. Mitigation refers to all activities undertaken to reduce greenhouse gas emissions (GHGs) and mainly includes the use of lower carbon-emitting technologies, such as renewables and nuclear and the promotion of energy-efficient technologies and activities. Adaptation to climate change seeks to reduce the vulnerability of systems to the effects of short- to long-term changes in climate. The response includes adapting to the weather change impacts, climate variability and long-term climate change impacts, thus slowing systems to build adaptive capacity and long-term resilience, such as investing in drought- or flood-resilient technologies.

The production of electricity from a coal-fired power station results in just over 1 ton of CO_2 for every MWh produced. There is no commercially viable retrofit technology available to capture and store CO_2 from our large coal-fired power stations. Therefore, the reduction in future GHG emissions from South Africa's electricity sector is projected to come from the gradual deloading and closure of existing coal-fired power stations as they reach their end of life, while simultaneously building new, lower carbon faculties such as wind and solar plant combined with gas and battery storage. This change in the future electricity generation mix of the country is detailed in the IRP 2019.

As the energy mix transitions, we are undertaking a number of activities to support this process:

- Investigating the opportunity to repurpose coal-
- fired electricity generation facilities for lower carbon electricity production, grid support and/or community development
- As the counterparty to DMRE's Renewable Energy Independent Power Producer (RE-IPP) Programme
- Construction and operation of our own renewable energy sources
- Investigating new opportunities for demand-side management, combined with ongoing operation of existing measures
- Technology demonstration projects in off-grid and battery storage systems
- Ongoing research into new renewable energy, storage and grid stabilisation technologies, as well as technologies that improve the environmental performance of coal-fired electricity generation, including future opportunities for biomass co-firing and carbon capture, utilisation and storage
- Expanding the transmission grid to connect utility-scale renewable energy projects from around the country
- Expansion of the distribution grid to accommodate the connection of mini-grid systems
- Studies to enable the deployment of gas and/or hydrogen infrastructure to support the electricity and as the supply mix transitions
- Promotion of market models that accommodate demand-side management, self-generation and IPPs
- Ongoing promotion and deployment of smart metering systems
- Engaging with NERSA on tariff structures that send accurate price signals to all market participants to drive the optimal mix and use of electricity

4.1.4. Climate change risks and opportunities

Mapping risks and opportunities assist organisations in better managing their risks and optimising opportunities. While it is important to understand the climate change issues and their impact, it is also important to identify possible opportunities, provide organisations with a full picture of the situation, and better balance and prioritise risks and opportunities. Table 2 shows that the mean (μ=1.48) is marginally below the sample mean ($\bar{x}$=1.5). Table 3 reveals that only 12 selected public sector organisations (48%) of the total sample disclosed this information. It is important to note that while most organisations disclosed climate-related risks, many failed to identify and describe possible opportunities. Telkom's disclosure in its 2021 annual report (p.79), presented in Figure 2 below, provides a good example of how of climate-related risks and opportunities could be disclosed.

Figure 2: Disclosure of climate-related risks and opportunities

Climate-related risks	Climate-related opportunities
- The introduction of carbon tax legislation, of which the second phase (2023 onwards) is expected to have a significant impact on Telkom due to the potential broadening of the tax base to include scope 2 emissions - increased seventy and frequency of extreme weather events, such as floods and cyclones. This is an acute physical risk the network, as unpredictable weather events and disasters can damage infrastructure and increase network faults - Chronic changes in precipitation patterns, extreme variability in weather patterns and more severe weather conditions (e. g. acute winter rains in Western Cape) can increase our vulnerability to downtime and network faults - An increase m temperature will likely increase the air conditioning energy consumption requirement in the data centre and offices, and may potentially stress any water resources	- On-site solar energy generation can reduce operating costs, vulnerability to load shedding and carbon tax liability - Sensor technologies and light-emitting diode (LEO) lighting can reduce energy consumption and costs - increased resource efficiency, especially through improved building energy consumption, can reduce operating costs and carbon tax liability, and a green star rating can enhance Telkom's reputation - Efficient water consumption can reduce operating costs, possible drought impact and the possible impact of water-cooled IT infrastructure - Arranging sustainable finance may lead to cheaper financial capital ring-fenced to sustainability projects that reduce natural capital impacts

4.1.5. Strategies to capitalise on emerging climate-related opportunities

Despite the devastating impact of climate change, it may present opportunities for organisations to capitalise upon. However, table 2 reveals that, not unexpectedly, the lack of a commercial motive or profit orientation has resulted in the mean score (μ=1.44) for this element being below the sample mean ($\bar{x}$=1.5). Table 3 shows that only 11 selected organisations (44%) disclosed this information.

Reflecting the expected leadership of the national government in this area, the DFFE disclosed its outlook for climate change as follows:

"Despite the reprioritisation of the budget of the DFFE, it has been able to meet and in some cases exceed its goals for the 2020/2021 financial year. Funds were allocated to assist its entities, which rely on tourism and other sources of finance for their income, and supporting programmes assisted communities hard hit by the pandemic. Issues such as climate change and air quality and biodiversity loss have received much attention in the year under review. A key area in addressing climate change is reforestation. Trees, as we all know, are one of our most important sources of oxygen. South Africa is vulnerable to climate change. This environmental threat can be reduced not only by accelerating the transition to alternate energy sources, but also through tree planting. The planting of trees is considered a mitigating factor in slowing down climate change. It is for this reason that the DFFE is spearheading the Two Million Trees Programme, which is being rolled out alongside an awareness and education campaign so that all communities understand the importance of forests in food provision, and as a source of medicine for especially rural communities. Through the District Development Model (DDM), the DFFE is committed to ensuring that municipalities conserve resources and use them sustainably. Through the 'One Plan' of the DMM, the DFFE will continue to ensure that all our infrastructure programmes are always carried out with the required environmental authorisations" (DFFE, 2021, p.14).

4.1.6. measurement of impact on operations

Measuring impact, which aids in tracking activities for informed decision making, is a key climate change-mitigation operational strategy that all organisations should emulate. The truism that "what is not measured, cannot be managed" applies. However, indicative of the lack of specificity around climate change metrics, Table 2 indicates that organisations fared rather poorly for this element, with the lowest cumulative mean (μ=1.24). Table 3 reveals that only six (24%) of the selected public sector organisations provided relevant disclosures. A more detailed analysis shows that two of the five (40%) government departments (the DoE and DFFE) and four (20%) of the 20 government entities disclosed this element, implying that three (60%) government departments and 16 (80%) government entities failed to disclose this element.

Under the heading "Monitoring and measuring our environmental impacts" ATNS noted that:

"We recognise the environmental impacts resulting from our business operations and report on direct and indirect greenhouse gas emissions generated by our activities and services on a quarterly basis. Our reporting ambit includes that of our facilities, operations at regulated airports, our head office and our training academy, as well as at our remote sites. To manage our climate change impacts, we collect data from our various facilities and operations and categorise these as follows: ***Scope 1*** *– ATNS-owned stationary and mobile emission sources* ***Scope 2*** *– Indirect emissions from electricity supplied by Eskom* ***Scope 3*** *– Business travel emissions (air, road, and accommodation). During the reporting year, our biggest contributor to emissions was from electricity supplied by Eskom, mainly at sites located at ACSA airports, which approximately contribute 80% to the overall consumption, while those from business travel reduced, due to limited travel in March 2020, given pandemic-related travel restrictions"* (ATNS Integrated Report, 2020, p.119).

Table 4, extracted from the ATNS Integrated Report (2020, p.119) provides the following breakdown of these metrics compared to the previous reporting period.

Table 4: Disclosure of measurement of the impact of climate change on operations

Carbon Footprint 2019 versus 2020 reporting period

TONNES CO2e	2018/19 ACTUAL	2019/20 ACTUAL
Scope 1 (fuel)	252.76	254.57
Scope 2 (electricity)	19 417.54	28 460.45
Scope 3 (business travel)	4 335.31	3 766.45
Annual emissions	24 005.61	32 482.09

EMISSION INTENSITY	UNIT MEASURE	2018/19 ACTUAL	2019/20 ACTUAL
Per air traffic movement	CO2e/ATM	0.02	0.03
Per revenue	CO2e/revenue	14.35	19.29
Per employee	CO2e/employee	4.76	6.25

4.2. Climate change disclosures by individual public sector organisations

The initial analysis does not reveal significantly different reporting patterns for the disclosure of climate change activities by the selected public sector organisations, apart from some government departments providing additional disclosures relating to regulatory requirements applicable to both public and private sector organisations. This section describes the results of a more thorough analysis of the individual scores of the selected public sector organisations.

As illustrated in table 5, four public sector organisations achieved maximum cumulative mean scores (μ=2) – two government departments (40%) and two government entities (10.5%) in respect of the six disclosure elements. Taken together, this means that only 16% of the selected public sector organisations achieved full conformance with all six climate change disclosure elements. By comparison, five of the organisations (20%), including one government department, failed to refer to climate change in their annual/integrated reports; five only disclosed two of the six elements (μ=1.33), and four only disclosed three and four elements respectively. While this level of disclosure is considered far from ideal, it is nevertheless encouraging that most public sector organisations appear to have recognised the potential impact of climate change on their organisations and have resolved to report on this phenomenon, albeit not for all six dimensions. Nevertheless, it is acknowledged that public sector organisations still need to do much more to contribute to the imperative to combat climate change.

Table 5: Contribution of individual public sector organisations to climate change disclosure

Cumulative mean	**2.00**	**1.83**	**1.67**	**1.50**	**1.33**	**1.00**
Sampled public sector organisations	ESKOM Land Bank DoE DFFE	SAFCOL SAWS DWS	ATNS DBSA IDC ARC	SAA Telkom CGS DoT	SAX CSIR PIC SAMSA WRC	CEF SANEC TCTA Transnet DSI

5. Implications and recommendations

Little doubt exists that achieving sustainable socio-economic outcomes depend on healthy environments (Fleming, Wise, Hansen & Sams, 2017). In this regard, reporting on climate change issues represents an important area for organisations to account to society about the impacts of their activities on climate change, their strategies to reduce its impact, and their relative performance. To assist with understanding the important dimensions, we identified important elements relating to the disclosure of climate-related issues that organisations wishing to be perceived as responsible corporate citizens (both in the private and public sectors) must address. This led to the development of the CCDQ index, which was used to assess the quality and extent of climate-related disclosures by the purposively selected South African public sector organisations. We submit that the diversity of disclosure conformance observations by the various public sector organisations suggests organisations should consider appointing "climate change champions", to increase awareness and advocate for the adoption of measures to combat climate change.

As indicated by King IV, since those charged with governance effectively set the organisational tone, it is submitted that the audit committee and the organisational leadership should be more directly involved in efforts to combat climate change. Given the audit committee's role in implementing an effective combined assurance model, it suggests that the various providers of assurance (including the accountants and auditors) should play a more proactive role, which should assist in refocusing accounting to the providers of capital, to better address the needs of government and society (Cooper & Morgan, 2013; IoDSA, 2016).

The integrated report of the DFFE appropriately exemplifies the climate change disclosures that organisations should consider adopting. In addition to organisations reporting their climate change using the NAEIS, a web-based Climate Change Information Management System (CCIMS), exists. Both private and public sector organisations should ensure that their annual/integrated reports adequately describe how these climate change reporting requirements are conformed with. Even when organisations are not compelled to report, they should nevertheless disclose such information. Therefore, an annual/integrated report should comprehensively provide stakeholders with useful financial and non-financial information about the organisation and provide links to where additional relevant information may be found, such as organisational websites.

By revealing how South African public sector organisations disclose their climate change activities, the study observations assist those working in or advising public and private sector organisations by improving their understanding of the impact of climate change and the measures necessary to counter it. Our observations identify areas requiring improvements and the organisational actors that should be involved. Our observations, therefore, have important strategic and operational management implications that the South African government and its entities and private sector entities should consider.

6. Conclusion and further research

This exploratory paper set out to understand the extent to which selected public sector entities publicly disclose the impact of climate change as well as their efforts to combat it. For organisations to comprehensively incorporate climate-related activities into their operations, their annual/integrated report disclosures should meaningfully inform report users and stakeholders, as confirmed by the ESKOM integrated report. Thus, the complete disclosure of relevant information relating to climate-related activities underpins the adoption and implementation of a standardised corporate governance framework and demonstrates the commitment of those changed with governance in organisations to good corporate governance. Thus, producing quality climate-related disclosures provides stakeholders with a good understanding of how organisations pay attention to climate change issues. It is accordingly submitted that, at a minimum, the following information should be disclosed in annual/integrated reports:

- The process by which an organisation has considered and assessed the impact of climate change (oversight body, operating model, current mode and opportunities and risks); and
- Information about how the organisation is performing relative to its climate change strategy (likely changes and impact measurement) (Gelter & Puaschunder, 2021; FRC, 2019; USEPA, 2019).

Therefore, although most of the selected public sector organisations included some climate-related disclosures, the extent and scope of these disclosures were not always consistent. Thus, it is clear that despite significant progress, much more still needs to be done. To improve conformity, it is therefore suggested that a public sector climate change reporting framework be developed and implemented, which private sector organisations could emulate.

This study could be replicated using private sector organisations, both in South Africa as well as in other jurisdictions. Similarly, further studies could compare the climate change disclosures of public sector organisations with private sector organisations.

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