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Sithole, Enoch

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University of the Witwatersrand

School of Geography, Archaeology and Environmental Studies

The nature of climate change communication in South Africa – its past, political and socio-economic undertones

Enoch Sithole

Student Number: 0606329X

Supervisor:

Professor Stefan Grab

DECLARATION

I declare that this research report is my own work. It is submitted for the Doctor of Philosophy Degree at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination in any form.

Signed: 

(Enoch A. Sithole)

19 April 2023

ACKNOWLEDGEMENTS

My decision to study for my PhD was a result of the encouragement I got from many people. After more than three decades out of the classroom, I decided to return to study for my Honours degree in 2016. It was a decision that took some 10 years to implement, owing to a number of other commitments. My children, Carolina, Arashaad and Kashifa played a pivotal role this decision. As they entered university education, and I always spoke to them about the value of education, it became clear to me that I needed to lead by example, through resuming my education and engage in life-long learning. Thus, I wish to acknowledge their immense contribution to this PhD.

My friends Gabu Tugwana, also one of my journalism career mentors, and Phil Molefe played a key role in encouraging me to continue with my studies and their delight at my enrolling for this PhD encouraged me immensely. Their contribution is highly appreciated.

I could not have come this far without the guidance of some excellent academics I have been taught by, particularly during my postgraduate phase: Prof. Franz Kruger, Prof. Anton Harber, Prof. Lesley Cowling, Dr Bob Wekesa, Kevin Davie, Ruth Backer, Indra de Lanerolle, Irwin Manoim and Alan Finlay, among others. Their contribution is highly acknowledged and appreciated. My supervisor in this project, Prof. Stefan Grab, has played an immense role in guiding me from my journalism and media studies background to the science of climate change. It was a daunting choice to study climate change communication, with only a journalism and communication background, but Prof. Grab made it appear natural. I will forever be indebted to him as I navigate in this field.

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ABSTRACT

The United Nation's Intergovernmental Panel on Climate Change (IPCC) has noted that the observed and projected impacts and risks generated by climate hazards, exposure and vulnerability have increased with impacts attributable to climate change. The increase in climate extremes has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt. Climate change has altered terrestrial, freshwater and ocean ecosystems at a global scale, with multiple impacts observable at regional and local scales, where changes in the ecosystem structure, species, geographic ranges, and timing of seasonal life cycles is apparent. Climate change is having diverse and adverse impacts on human systems throughout the world, affecting water security, food production, health, livelihoods, settlements, and infrastructure. According to the IPCC, it is "unequivocal" that human influence is warming the atmosphere, land, and oceans. The world climate body adds that humans are exacerbating climate change through the burning of fossil fuels and other activities. Faced with the global warming challenge, humanity has no choice but to engage in measures to mitigate and adapt to the resulting climate change. Climate change communication has been identified as one of the measures that will need to be applied in addressing climate change. This is so because for action against climate change to succeed, society will need to be mobilised to change behaviour and implement other measures. Climate change communication is the awareness, education, and mobilisation tool thereof.

This PhD thesis investigates climate change communication in South Africa over the past century (since 1902) through an analysis of climate change-related news articles in three newspapers – the *Rand Daily Mail*, *Mail & Guardian,* and *Business Day*. The idea is to establish how key stakeholders – the government, the business sector, the scientific community, non-governmental organisations (NGOs) and the media – have communicated on climate change, and whether their communication on the subject has been underpinned by political and socio-economic considerations. Results show that while the scientific community has been communicating on 'climate change' from about 1935, when the first article on the subject was published by the *Rand Daily Mail*, other stakeholders such as the government, the business sector, and NGOs, only started communicating on climate change in the 1990s. Government and business sector communication has been underpinned by financial and economic undertones. Climate change communication scholarship in South Africa has been limited

compared to that elsewhere globally, especially in western countries. This thesis argues that South Africa will need to massively improve its climate change communication, as such communication plays a fundamental role to ensure a seamless transition from coal and other fossil fuels to a low carbon economy.

DEDICATION

This PhD is dedicated to my children, Carol, Arashaad and Kashifa, who have encouraged me all the way through my studies. May they share the story of my PhD studies with my grandchildren, and future generations, and encourage them to do better.

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ABBREVIATIONS

AFOLU	Agriculture, Forestry and Other Land Use
AIDC	Alternative Information and Development Centre
ANC	African National Congress
AR	Assessment Report
BBC	British Broadcasting Corporation
CCCM	Climate Change Counter Movement
CCEC	Climate Change Education and Communication
CFC	Chlorofluorocarbon
CNN	Cable News Network
COIN	Climate Outreach Information Network
COP	Conference of the Parties
CSM	Climate System Model
DEFF	Department of Environment, Forestry and Fisheries
EEA	Extreme Event Attribution
EU	European Union
FAO	Food and Agriculture Organization
GCIS	Government Communication and Information System
GDP	Gross Domestic Product
GHE	Greenhouse Emissions
GHG	Greenhouse Gas
GTS	Green Transport Strategy
HadCM2	Hadley Centre Coupled Model version 2
HSRC	Human Science Research Council
IEA	International Energy Agency
ILO	International Labour Organization
INDC	Intended National Determined Contribution

IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
IRP	Integrated Resource Plan
IT	Information Technology
LTAS	Long-term Adaptation Scenarios
MEC	Minerals-energy Complex
MMA	Media Monitoring Africa
NAMA	Nationally Appropriate Mitigation Action
NCCAS	National Climate Change Adaptation Strategy
NDC	Nationally Determined Contribution
NDP	National Development Plan
NGO	Non-governmental Organisation
NIMTOF	Not In My Term Of Office
NOAA	National Oceanic and Atmospheric Administration
NUM	National Union of Mineworkers
PV	Photovoltaic
RQ	Research question
RCP	Representative Concentration Pathway
SA	South Africa
SAAN	South African Associated Newspapers
SARVA	South African Risk and Vulnerability Analysis
SDG	Sustainable Development Goal
SR15	The Special Report on Global Warming of 1.5°C
SSP	Shared Socio-economic Pathway
UK	United Kingdom
UKMO	United Kingdom Meteorological Office

UN	United Nations
UNDP	United Nations Development Programme
UNEP	UN Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Emergency Fund
US	United States
USA	United States of America
UV	Ultraviolet
WGI	Working Group I
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	World Resources Institute
WSSD	World Summit on Sustainable Development
WTTC	World Travel and Tourism Council
WWF	World Wide Fund for Nature

NOMENCLATURE

CO_2	Carbon Dioxide
CO_2e	CO_2 Equivalent
EJ	Exajoule
GW	Gigawatt
kWh	Kilowatt-hour
MW	Megawatt
MWh	Megawatt-hour
PJ	Petajoule
ppm	Parts per Million
ppmv	Parts per Million by Volume
tCO_2e	Tonnes of CO_2 Equivalent
TWh	Terawatt-hour
yr BP	Year Before Present

CHAPTER I: FRAMES OF REFERENCE

1.1 Introduction

The changing climate is the leading environmental and human crisis of the present (Tadesse, 2010) and is one of the leading crises faced by humanity at this time (Vulturius et al., 2016). Although climate change now impacts several aspects of human life, according to Hulme (2010), society had only just started to grasp what the notion of the climate debacle is doing to human and other ecosystems. According to the author, the climate crisis is not only affecting the physical and ecological conditions of life on Earth but, more importantly, influencing political discourses, social relationships, and the scientific world. Several scientists (e.g., Riedy, 2016; Engelbrecht & Monteiro, 2021) have argued that the effects of the changing climate are now being experienced in several countries and are proving to be catastrophic to both human and natural systems, presenting a threat to human existence, in particular. The Assessment Report 6 (AR6) released by the Intergovernmental Panel on Climate Change (IPCC) Working Group I (WGI) on the physical science basis of climate change released on August 9, 2021, made it clear that there was certainty that warm weather extremes, among them heatwaves, had become more recurrent and more forceful in several parts of the world from the mid-1900s. Extreme cold weather had become less frequent, pointing to a warming globe (IPCC, 2021). The IPCC WGI also released an atlas which shows climate impacts in all parts of the world (see IPCC WGI, 2021). Closer to home, AR6 reports that the Southern African region is highly likely to experience continued temperature increases, which would be detrimental to several sectors of the economy and the lives of individuals, in general. Discussing the implications of the findings for Southern Africa, Engelbrecht and Monteiro (2021) state:

- Most parts of Southern Africa are projected to become both warmer and generally drier. This combination raises serious concern for future water security and agriculture, among others.
- Cold fronts that usually increase precipitation in the southern regions of South Africa will increasingly track further to the south of the country, thus cause rainfall declines and aridification in this region.
- Tropical cyclones are likely to become stronger, with catastrophic impacts in central and southern regions of Mozambique and certain areas in north-eastern South Africa.

- A “Day zero” drought in the Gauteng province is highly likely in the next 10 to 20 years (counting from about 2020).
- Prolonged and frequent droughts will collapse maize farming and the cattle growing industry, putting subsistence farming on the sub-continent under severe strain and very serious threat.
- Increasing heatwaves will affect human health and result in deaths.

The Working Group II AR6 on impacts, adaptation, and vulnerability was made public on February 28, 2022, and revealed that since AR5 in 2014, there had been various climate events that were attributable to climate change (IPCC, 2022). The increase in extreme weather occurrences is creating irreparable damages to natural and human systems, which have been made to go beyond their capacity to adjust to new conditions (IPCC, 2022). Climate change has altered ecosystems of freshwater, oceans and land at global scale, with multiple effects observable in specific localities and regions where evidence of alterations in the ecosystem structures, geographic ranges, species and timing of seasonal life cycles can be noticed (IPCC, 2022).

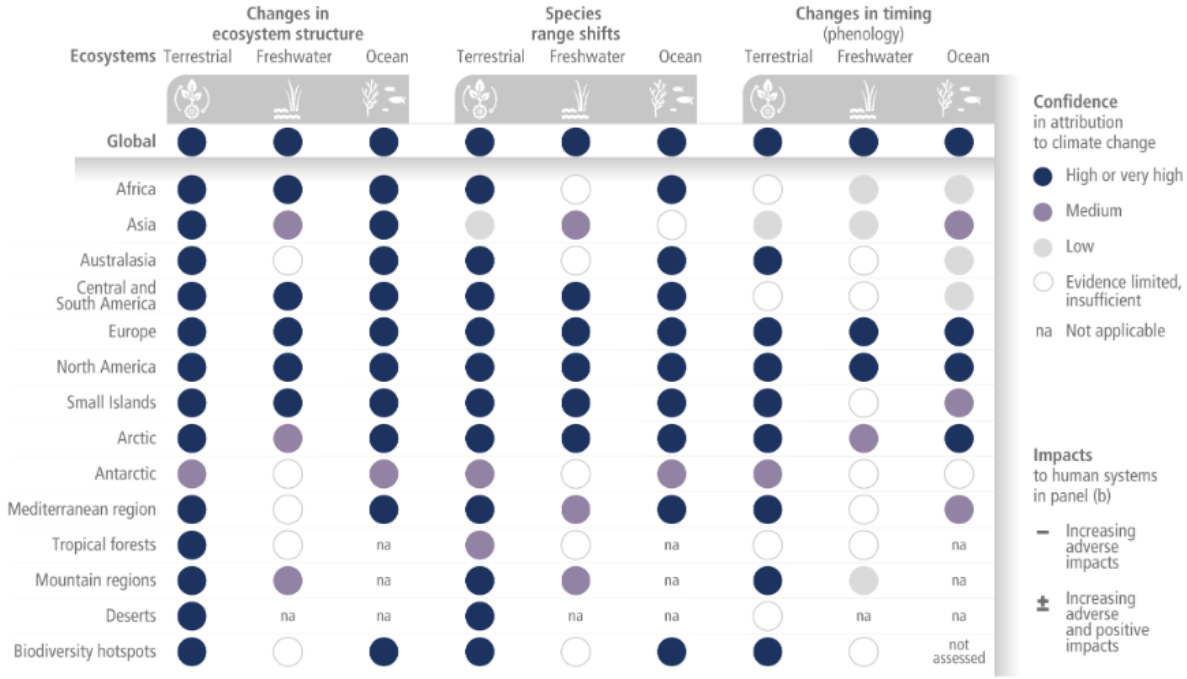


Figure 1: Impacts of climate change on ecosystems.

Source: (IPCC, 2022).

The changing climate is already having varied unfavourable impacts on human survival systems, affecting food production, water security, well-being and health, settlements and infrastructure throughout the world (IPCC, 2022).

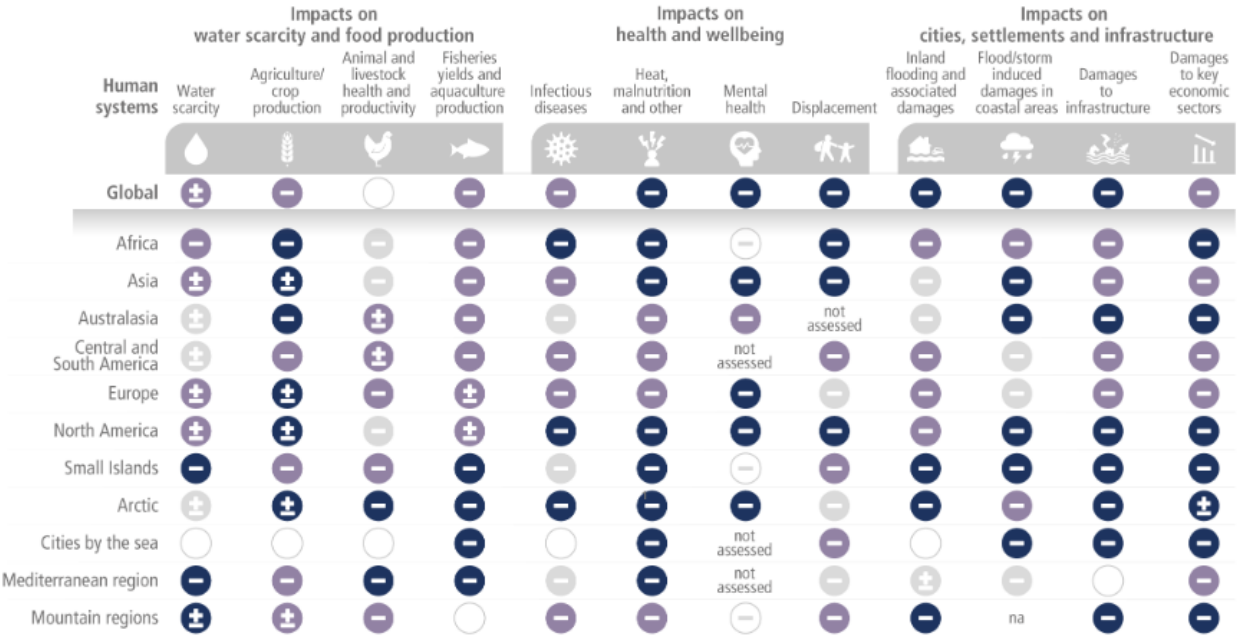


Figure 2: The devastation climate change caused to human ecosystems.

Source: (IPCC, 2022).

The above illustrations make it clear that it is no longer debatable that the heating up of the atmosphere has created climate change. The heating up is mainly caused by the usage of fossil fuels in various activities. According to the IPCC (2021, p. SPM-5), it is “unequivocal” that humans had an influence in the warming of the atmosphere, land, and oceans. Global warming spells disaster for the Southern African sub-continental region where climate extremes are a major obstacle to the pliability of food production systems and livelihoods, and economies are highly sensitive to weather vacillations (Castro, 2021). Similar to other regions of the world, Southern Africa has been warming significantly over the past century, with trend analysis of temperatures across the region suggesting an increase of 0.4 °C in every 10 years between 1961 and 2014 (Davis-Reddy & Vincent, 2017). Should the *status quo* with regards to the emission of greenhouse gases prevail, Southern Africa faces a total of five different climate hazards through to 2050: frequent climate variability, drought, poor agricultural yields, growing season reductions, and high temperatures, which will affect about 30% of the region (Ramirez-Villegas et al., 2021). As an indication of the said warming in the region,

in 2019, Mozambique and Zimbabwe joined the Bahamas as the countries that have been most impacted by distractive climate change events (Ramirez-Villegas et al., 2021). Recent climate extremes, as seen in record temperatures, droughts, and heavy rainfalls, among others, have surpassed long-standing records by excessive margins (Fischer et al., 2021), something that supports scientific findings that climate change is already having severe impacts. Fischer et al. (2021) have warned that the record-breaking climate extremes, which would be nearly impossible without global warming, are certain to be repeated in forthcoming years with more regularity. In high-emissions scenario or Representative Concentration Pathway (RCP) 8.5, they found, heat extremes, lasting for weeks and surpass records by more than three, are two to seven times more plausible during the period 2021-2050, and three to 21 times more likely during the period 2051-2080, compared to the last 30 years. Over the period 2051-2080, climate extreme occurrences are calculated to happen in about every 6-37 years in areas in the northern middle latitudes (Fischer et al., 2021).

Yearly temperature averages in South Africa have increased by at least 1.5 times during the last five decades (Van der Bank & Karsten, 2020). This increase is already negatively influencing the environment, health of humans, water availability, agriculture and infrastructure, as well as biodiversity and ecosystems. The changing climate is expected to yield warmer winters, cause sea levels to upsurge, and extreme climate events to take place with greater regularity in South Africa (Kusangaya et al., 2019). The lack of effective mitigation and mitigation responses will likely heighten the levels of damages in the country (Van der Bank & Karsten, 2020). Unfortunately, the country appears to be ‘fumbling’ with the issue of global warming. While the government frequently conveys messages that agree with the consensus view of climate change, there appears to be very little action to confront the changing climate. The strategy to reverse the changing climate has been premised on funding from western countries. While it is reasonable to expect such funding because the country might not afford the cost of transitioning from coal-powered energy to carbon neutrality, the government message that nothing could be done unless such funding was secured, may have served to stifle various initiatives that could have been adopted to deal with the crisis without the requirement for such funding. As is revealed later in this PhD thesis, various sectors of society, including fossil fuels emitting businesses, often used the government’s stance to withhold action against climate change.

This thesis concerns itself with the question as to how climate change has been communicated by key stakeholders in South Africa. This is an important question because several scholars have argued that public understanding of the climate catastrophe, which can only come from effective communication, is an important measure in efforts to address the crisis (Moser, 2016; Evans & Musvipwa, 2016). Various studies have shown that the African population had an extremely low public understanding of climate change, something that proved to be a key challenge confronting the Africans, governments and the continental body, the African Union (AU) (Tadesse, 2010). The status of public understanding of the climate crisis in South Africa is that 54% of the citizenry didn't know of the concept of 'climate change' concept, according to an Afrobarometer survey in 2018 (Chingwete et al., 2018), which was the most recent comprehensive study on the subject. The survey also found that 63% of rural communities, 58% of women, 65% of citizens without formal education and 37% of South Africans with a tertiary education had not even heard of the concept of 'climate change', let alone understood what it entailed. Further to this, the Human Science Research Council (HSRC) found some signs of climate scepticism among the South African population, where 16% believed that there was no change taking place in the world's climate, and 23% did not believe that the changing climate would have any harmful consequences on the world (Roberts & Struwig, 2021). The same study found that only 9% of adult South Africans saw the environment as a top national concern. This may be driven by ignorance, which points to a serious crisis of communicating climate change in the country. Chingwete et al. (2018) also found that there was limited climate change literacy among the continent's citizens.

There could be a link between the deficit in awareness of the climate crisis and scepticism in that it has been established scientifically that climate science denial can also result from ignorance (Mason, 2020). The denial of climate science is a type of ignorance known as *wilful hermeneutical ignorance*, where ignorance is sustained by a gap in a person's conceptual abilities (Mason, 2020). This characterisation might explain that climate scepticism is more a consequence of ignorance than a case of people holding anti-science views. Such scepticism should not be justified in a scenario where, according to Chingwete et al. (2018), there have been several accounts of worsening living standards and weakening conditions for food production due droughts, which are caused by global warming.

Government's strategy to respond to the crisis contained in the Nationally Determined Contributions (NDCs) of 2021 has been criticised for being inadequate, and not in line with the goal of cutting GHG emissions by 1.5° C to 2° C (Worthington, 2021). There have also been confusing messages coming from the highest echelons of the government, which constitute poor communication from the country's policymakers, something that is not conducive to action to address the climate crisis. While President Cyril Ramaphosa and environment minister, Barbara Creecy, have talked about positive action against climate change, minerals and energy minister, Gwede Mantashe, insists on continued dependence on coal for energy (Phakathi, 2021). This confusion in messages about the fight against climate change, coupled with research findings that over 50% of South Africans have not heard of climate change (Chingwete et al., 2018), are among the reasons for an examination of the ways in which climate change is communicated in South Africa.

There is recognition that involving society in efforts to address global warming requires a massive communication and education drive (Evans & Musvipwa, 2016; Moser, 2016). Since 1992, the necessity for making the public aware of climate change through public access to information, education, training, and public participation has been highlighted by the UNFCCC Article 6, as a way to encourage mitigation of climate change (UNFCCC, 1992). Communication and education were re-emphasised in Article 12 of the 2015 Paris Agreement (United Nations, 2015), and were also included in United Nations (UN) Agenda 2030 on Sustainable Development Goals (SDG) 13, which is specifically outlines the need for improving education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning (United Nations, 2015). The IPCC special report in October 2018, included demands for an increase in climate change education and communication (CCEC) to fast-track changes in behaviour in line with acclimatising to the changing climate and curbing the heating up of the Earth (IPCC, 2018). However, in South Africa, the said communication drive has been lacking in many respects, as this study has found.

Although, scientifically, the notion and existence of 'climate change' are no longer in scrutiny, and there is now overwhelming consensus that recent global warming is to a large extent due to anthropogenic CO_2 emissions (Tickell, 2002; Hansen & Stone, 2016; The Royal Society, 2020), confusion and concern remain about a

general public apathy regarding societal response and behaviour, This can be ascribed to a number of combined factors that include poor/inappropriate communication skills among members of the scientific community involved in studying global warming (McBean & Hengeveld, 2000; Moser, 2010; Kaltenbacher & Drews, 2020). It has been suggested that some climate scientists simply do not see communicating the climate crisis as part of their responsibility. On the other hand, climate change communication theorists have advanced the view that mitigation and adaptation efforts should be supported by effective communication concepts, which should be crafted specifically for the subject, because information about climate change is complex and unknown to many members of the public (Pidgeon & Fischhoff, 2011). Complicating the communication effort is the fact that most messages have tended to create the understanding that the climate crisis is a problem that is distant to them, both geographically and in time (Maiella et al., 2020). In addition, terminology than has been used has failed to place emphasis on the catastrophe that climate change presents to humanity. For instance, in recognition of this problem, United Kingdom (UK)-based newspaper, *The Guardian*, found it necessary to make changes to its style guide to introduce terminology it said would describe the environmental crises in more accurate ways (Carrington, 2019). The publication wrote that in the place of “climate change” or “global warming”, the ideal phrases would be “climate emergency, crisis or breakdown” and “global heating”, respectively. The usage of the original terminology would, however, not be completely terminated. Editor-in-chief, Katharine Viner, was quoted as saying that the newspaper wanted to ensure it was scientifically precise when communicating with readers on the climate crisis. She said using the term “climate change” sounded passive and gentle, in a situation where scientists were warning about human catastrophe (Carrington, 2019, para. 2-3). This indicates the importance of how climate change is communicated. Climate change communication should achieve the goals of public awareness and ultimately encourage response. This PhD thesis also addresses the communication challenges that climate change presents, by investigating the nature of climate change communication in South Africa. In doing so, the PhD project aims to contribute to research and scholarship on the climate change communication subject, in particular, and of climate change, in general.

Scholarship of climate change communication encompasses several disciplines and sub-disciplines, such as public understanding, mass media coverage,

communication effects, and strategic communication (Ballantyne et al., 2016). The mass media sub-field, which is the umbrella under which this study is conducted, focuses on media content in the reporting of climate change as well as conducting content analyses in the theoretical frameworks of discourse analysis, framing, sociology of news theory, or a combination of these concepts (Ballantyne et al., 2016). This sub-field can be described as an "enclave" within climate change communication, which offers commentary about the workings of the media in informing the public about this phenomenon (Ballantyne et al., 2016, p. 10). Therefore, and due to the fact that the media acts as a communicator and a conduit of communication from other organs of society, this study investigated media reporting on the climate crisis over-and-above the nature of climate change communication undertaken by several stakeholders in South African society, through the media. In this regard, the media was used as the source of the study. Through articles in three newspapers, the study established how various stakeholders have communicated climate change over the years, since 1902.

For this PhD, articles on global warming, climate change and related subjects that have been published in three of South Africa's key publications were scrutinised. The three are the *Rand Daily Mail*, the *Mail & Guardian* (previously *Weekly Mail*) and *Business Day*. The *Rand Daily Mail* covers the period 1902-1985, which is the newspaper's lifespan. The *Rand Daily Mail* was chosen for being the only national daily newspaper during its publishing days, which makes its data relevant to studying media coverage throughout the country at the time. During the *Rand Daily Mail*'s publishing days, the global media began to report on connections climate and weather (see Boykoff, 2011). This part of the study is also occasioned by the fact that prior to the IPCC releasing AR1, in 1990, the media had been carrying reports of scientific discoveries that discussed climate change or related phenomena (e.g., Boykoff & Rajan, 2007; Boykoff & Roberts, 2007; Boykoff, 2011). The study also probed the media's socio-economic, political, and other nuances in the media reporting on the climatic changes in that pre-IPCC period in the country. No findings in this regard were made since climate change had not become a political and socio-economic issue in this period. It only became so after the UN took up the issue in the late 1980s, as it is discussed hereunder.

The second period covered by the study is 1985-2021. In this period, the study analysed articles from the *Mail & Guardian* and *Business Day*. The two publications

were born out of the closing down of the *Rand Daily Mail* in 1985. In fact, *Business Day* began publishing on May 1, 1985, a day after the *Rand Daily Mail* closed down and was started by the same newspaper group that owned the *Rand Daily Mail,* the South African Associated Newspapers (SAAN) (Keogh, 2006). The *Weekly Mail,* later renamed *Mail & Guardian*, was started by two journalist who were retrenched when the *Rand Daily Mail* closed down. They were now Wits University Professor Anton Harber and Irwin Manoim (Keogh, 2006). The idea behind selecting these two publications is that the two are regarded as having replaced the *Rand Daily Mail* (as later discussed in this thesis), albeit taking different editorial directions. Thus, they were a continuation of the *Rand Daily Mail,* in some respects. The choice of the two publications is aimed at attempting to cover what could be termed the conservative and progressive sides of the climate discourse in South Africa. Just as the findings of this PhD research reveal, *Business Day*, which largely covers business news, tended to communicate on behalf of often conservative voices, whose commitment to fighting climate was reluctant, at best, in defence of their business interests. On the other hand, the *Mail & Guardian* was found to be more inclined towards progressive voices, propagating for decisive and urgent action to address climate change. Researching the two publications offers the possibility to uncover the political and socio-economic undertones inherent in the communication of climate change in the country, which is the primary objective of this PhD project.

The post-1990 period is particularly crucial for this study as the country underwent profound political changes with the demise of apartheid and the ushering in of a democratic dispensation in 1994. The study, therefore, benefits from investigating two distinct political eras, the apartheid and post-apartheid. It should be noted that climate change started to emerge as a political and socio-economic issue in the early 1990s during the terminal days of apartheid. In this regard, there was very little in terms of involvement of the apartheid government on the issue, even though South African and international scientists were making findings indicating that global warming was taking place. The post-apartheid administration under the African National Congress (ANC), since May 1994, tended to tick all the boxes with regards to climate change discourse, but the study reveals an ambiguous and generally poor communication. Media coverage has been found to have been subdued and focused largely on international climate events such as conferences and disasters, with most articles being lifted from foreign media agencies. The

government's voice is largely heard during climate conferences, particularly those it hosted, such as the World Summit on Sustainable Development (WSSD) in 2002 and the Conference of the Parties (COP 17) in 2011. Events such as these, as the literature suggests, catapulted climate change discourse, media coverage and overall communication. However, communication anchored in such events is less than ideal as it focuses on elite conversations, which often take place in conferences, and ignores daily climate change experiences of ordinary people (see Johannessen, 2013).

In studying government climate change communication, the study departs from the understanding that governments should be at the forefront of communicating the climate crisis as they are responsible for policy formulation on the subject and command most of the resources required to address the scourge. The task of government in disseminating knowledge on climate change was succinctly discussed by the British government's Department of Communities and Local Government when it said it was to ensure that the community was well-informed about issue so as to be able to make the kind of choices that would impact on the global goal to arrest climate change (UK Department of Communities and Local Government, 2006). For the British government, it is vital for governments to communicate climate crisis messages successfully to different stakeholders, including residents and opinion formers (UK Department of Communities and Local Government, 2006).

In South Africa, the government promised a "nuanced" climate change communication drive when it released the National Climate Change Response White Paper in 2011. The document stated that society needed to become conscious of individual contributions to the amount of GHG emissions to develop climate resilience (Department of Environmental Affairs, 2011). With this in mind, the policy document stipulated that communication would be made an essential component in the effort to address global warming. It added that different communication approaches would be employed, considering that communities in urban areas were responsible for larger carbon footprints, while communities in rural areas were rather more vulnerable to climate change in spite of generating fewer emissions (Smith, 2013). This PhD project analysed the South African government's communication of its positions on climate change and related activities, through news articles discussing various government documents such

as the First, Second and Third National Communication on Climate Change as part of Article 12 of the UNFCCC, The South African Risk and Vulnerability Analysis (SARVA), the Southern African Handbook on Climate Change (first and second editions), and the National Climate Change Response White Paper of 2011. While the documents contain progressive suggestions of gallant steps to fight climate change, the news articles studied reveal very little communication about them which is directed by the government to the general public. Government's voice is largely heard in international fora, addressing counterparts from foreign governments and global climate bodies rather than the South African public. Needless to state, this approach might create the impression in the public mind that climate problem is an international, not a domestic concern, which is a common perception in several south American countries, as was found by Hellebrandt and Hellebrandt (2010), Mercado (2012), and Dotson et al. (2012).

Furthermore, by probing the media reporting and government communication, this PhD thesis examines the relationship between the frames used by government and media when communicating climate change, thus establishing whether there is any commonality or divergence. This part of the probed is informed by theories that suggest that the media tends to follow government's approaches on climate change. This view was advanced by Evans (2019) who argued that the media tended to follow government narratives on climate change, even when and where they lacked scientific logic. On the other hand, it has also been suggested that in instances where the media takes a progressive stance towards climate change, governments tend to follow suit, and where the government uses progressive frames, the media often adopts them in their reporting on the subject (Mercado, 2012). Ultimately, this part of the study would establish whether communication about climate change has had any ideological or political intentions, and how this may have influenced society's understanding and responses to the climate crisis.

The research in this PhD project employs media theories of framing and agenda-setting. In media theory, agenda-setting explains the media's role in influencing the public focus on crucial issues of the time (McCombs, 2008). The study additionally investigates the frames used by the media, government, corporate entities, and NGOs in their communication of global warming. This is studied within the ambit of the theory of media framing. This concept deals with focusing the audiences'

attention to a particular aspect of an issue, with the aim of encouraging a certain interpretation (Nisbet, 2009a).

In conclusion, because of its calamitous impacts, climate change can no longer be spoken about as something of only future impact. Several recent climate disasters have been directly linked to recent global scale climate change (i.e., warming), both internationally (IPCC, 2021) and locally, such as the recent Durban floods of April 2022 (World Weather Attribution, 2022). In addition, the recent drought in the Western Cape province between 2015 and 2017, which was characterised by three successive years of worse than average rains – the worst in a century – was attributed to anthropogenic or human-inspired climate change (Otto et al., 2018; Freund, 2021). Similarly, when for the first time, during the 2018/2019 summer, Mozambique was impacted by two intense status tropical cyclones, Idai and Kenneth, scientists were in no doubt that climate change was the cause (Mawren et al., 2020). Both weather incidents caused massive human suffering, with water shortages and economic losses in the Western Cape and deaths and destruction in Mozambique, Malawi, and Zimbabwe. In this regard, communicating climate change to society has become imperative. Studying climate change communication becomes an important contribution to knowledge and is among the efforts to encourage action to address climate change.

1.2 Context: Climate change communication

Climate change communication scholarship is a relatively recent academic research field, having begun in the 1980s, following the declaration of anthropogenic, or human-inspired climate change by the IPCC (Moser, 2010; Nerlich et al., 2010). In earlier times, the bulk of climate change communication science research dealt with the often-posed question of whether there was any anthropogenic global warming taking place or not (Nerlich et al., 2010). The media has largely been the platform for climate change communication, mainly reporting about the debates on whether climate change actually existed and whether it was a proven science or not (Moser, 2010). During the 1980s and the 1990s, climate change communication concentrated on findings of scientific research, particularly those released by the IPCC, extreme weather events and proceedings of high-level climate change conferences (Weart, 2003). This does not seem to have changed much as attested by the findings of this PhD study. Media reporting, a pillar of communication on the subject, has since improved in many respects,

resulting in massive public awareness, particularly in western countries (Moser, 2010). Climate change scholarship also examined factors that affected and are affected by the way climate change information disseminated. Most of the research in this field focused on media coverage and framing, media effects, public understanding, factors that affect public understanding, and risk perceptions (Ballantyne et al., 2016; Chadwick, 2017). Public engagement and civic engagement, organisational communication, and strategies to persuade people to affect beliefs, attitudes, and behaviours associated with the climate are relatively less researched fields (Chadwick, 2017).

As a relatively new area of scholarly, climate change communication began to be published in academic publications in the early 1990s with a predominant emphasis on public understanding and perceptions of climate change and the risks it posed (Chadwick, 2017). Developments such as the 2009 Copenhagen conference, which was dominated by discussions to replace the Kyoto Protocol of 1997, moved climate change communication up a gear, to become the platform for public discourse on ways to mitigate and adapt to the new climate reality (Moser, 2016). Thereafter, the subject went beyond the debates of science and policy and added efforts to reach more audiences by using diverse platforms and employing varied frames (Moser, 2016). Additionally, climate change scholarly research has since broadened its scope to include a wide variety of philosophical and research traditions that include social-scientific quantitative surveys, interpretive qualitative studies, and humanistic-rhetorical analyses (Chadwick, 2017). It has also evolved to becoming a "landscape of profoundly influential forces, which created opportunities for the science to advance" (Moser, 2016, p. 2). The said "landscapes" that contributed to the evolvement of climate change communication included the following, according to Moser (2016):

- Extreme climate events such as Superstorm Sandy in the US in 2012 and the extreme hotness in India in 2015, among others.
- Scientific advances and discoveries and IPCC assessment reports.
- Various climate change events such as the COPs.
- The evolvement of the climate change science due to various developments that enabled climate change communication scholars and practitioners to develop new ways to communicate the phenomenon.

- Climate change communication developing into an independent multi-disciplinary field of scholarship.
- Governments in many nations adopting climate change policies and other measures, which created a platform for a role of climate change communication.

In South Africa, recent droughts in the Western Cape and KwaZulu-Natal, the tropical cyclones in Mozambique, which affected parts of South Africa, and the April 2022 flooding in the Eastern Cape, KwaZulu-Natal, and the North West provinces (see Pinto et al., 2022) have also precipitated much research on various issues in the ambit of climate change communication. The discipline is increasingly being recognised as key in efforts to address the climate crisis. The fight against global warming entails mainly the substantial reduction in anthropogenic greenhouse gas emissions (GHE). Since this task falls on individuals, and requires societal action, Evans et al. (2018) asserts that communication is of the utmost importance in empowering society with mitigation and adaptation knowledge. The cruciality of communicating in climate change is derived from the position of communication as the instrument that is able to turn a subject with scientific complexity and conceptually remoteness into a matter of public interest (Driessen et al., 2010). Therefore, climate change communication is vital for the attainment of successful and unceasing normalisation of global warming in collective behavioural change, mitigation and adaptation policies, development, and to improve efforts to reduce GHE (Evans et al., 2018). Media is brought into the climate change communication picture because it is regarded as the main platform of information on the climate crisis and a “definer of reality” in communicating on the subject in Southern Africa (Evans & Musvipwa, 2016, p. 199).

The discipline of climate change communication is at a stage where there are crucial questions about its future direction, especially regarding research and practice (Moser, 2016). These include persistent challenges in communicating climate change, such as inadequate public awareness; moving from mere consciousness and concern to response; conducting communication in situations where communities are divided along political lines; and addressing the prevailing sense of climate change overwhelming and causing people and communities to feel that there is no hope for a solution (Moser, 2016). There has been a tendency to communicate climate change through shocking and fear-inspiring messages,

which, according to Kaltenbacher and Drews (2020), has not always achieved the desired goals and has sometimes led to negative outcomes, such as apathy, helplessness, and dismissal. The same view was earlier held by Whitmarsh (2009), who found that alarmist climate-related images, which are often splashed in the media and other communication vehicles, can help raise awareness, but at the same time, they may have the potential to create mistrust, leading to a shallow awareness of the crisis and related issues. This PhD thesis argues that the likely future pathway for climate change communication should be its evolvement into communicating positive messages such as the socio-economic and sustainable development opportunities that measures to address the climate crisis present to society. For example, the world's leading financial institution, the World Bank (2016), has expected the fight against climate change to bring about massive economic and developmental opportunities, because it will include spending on new infrastructure, among other areas. The International Labour Organisation (ILO) has concurred, saying that new, sustainable jobs would be created from economic activities towards carbon neutrality (ILO, 2018). These opportunities should now be at the centre of climate change communication, conveying messages of hope rather than despair, as well as presenting immediate benefits of action against climate change. Messages of 'action now and benefits later' seem to have failed to encourage immediate action.

1.3 Research problem statement

The introduction section of a research report, or thesis, often discusses the problem statement. This crucial element of a research project articulates the problems and context that prompted the research (McGaghie et al., 2001). As afore argued, this study was occasioned by desire to establish how climate change communication in South Africa is conducted with a view to determining whether or not it has been informed by political and socio-economic nuance. As afore stated, probing how climate change has been communicated is crucial in establishing if such communication has encouraged a societal response to the crisis. With all efforts being made to implement response strategies, the biggest challenge is to involve communities and all stakeholders. Effective communication of the crisis is a massive tool in this activity. Conducting the study through media reporting of the crisis is informed by the important task the institution has in communication, including climate change communication. People tend to believe most of the

information they receive from the media. This was confirmed by Mercado (2012), following a study of climate change communication in Chile, who found the media to play a key role in manufacturing what people accepted as reality. As a result, Mercado (2012) added, research on media reporting of the climate crisis was key to understanding what information was fed to society through this vehicle.

Previous studies of climate change communication concluded that the subject was poorly communicated and researched in South Africa. This was detectable from the country's media's performance in reporting on the issue, which was also reticent – from both quality and quantity points of view (Cramer, 2008; Shanahan, 2009; Tagbo, 2010; Bosch, 2012; Johannessen, 2013; Smith, 2013; Evans & Musvipwa, 2016; Mulaudzi & Kioko, 2020). More recent studies, however, have found that media coverage seemed to have been rising in recent years. Media Monitoring Africa (MMA), for instance, has reported on a considerable jump in news reports about climate change from 2018. The MMA study found that in 2019, 8 870 articles were published by the country's newspapers, representing a substantial increase from the 4 885 reported in the previous year (Ndong, 2020). The numbers of news stories in the years 2014, 2015, 2016 and 2017 did go beyond 1 000 stories in each year, according to data extracted from MMA's internal monitoring tool, known as Dexter (Ndong, 2020). The report concurs with findings by other researchers that media coverage tends to increase during conferences and other events on the subject of climate change. As an example, the report mentioned the fact that President Ramaphosa received much media coverage when he spoke on climate change at the G7 summit in 2019. The issue of climate change also dominated media reporting on the seventh Tokyo International Conference on Africa and the African Union (AU) summit in the same year. A rise in climate change activism also contributed to the spike in media reporting.

Internationally, media coverage of climate change, has largely been studied through disciplines such as political science and media studies (Moser, 2016; Riedy, 2016). As the climate change communication science expands, so does the need for overarching research that goes beyond media coverage of climate change. Such research should cover the public understanding, scientist/policymaker interface, interdisciplinary scientific communication, and international diplomacy (Russill & Nyssa, 2009). Given the afore-mentioned research findings that climate change communication scholarship or the sub-field

of media coverage have been poor, it can be concluded that research gaps in the field are prevalent. Thus, this PhD study established the contemporary situation of climate change communication in the country as a contribution towards closing the research gap and providing new knowledge in these research fields.

1.4 Research questions

Research questions are crucial in any study as they inform decisions about the designing of research and research methodology (Bryman, 2007). They are a critical early step that provides direction to an investigation and thus serve a crucial purpose of informing the designing of the methods that are to be followed in the research process (Bryman, 2007). For Alvesson and Sandberg (2013), a major step in the development of theory is creating research questions that are prudently grounded. Therefore, establishing research questions is perhaps one of the most decisive aspects of an academic study. In short, the role of research questions is to explain the purpose of a study in specific terms (Maxwell, 2005).

In line with the aims and objectives of this study, which are outlined in Chapter 1.7, the following are the research questions underpin this PhD study:

1. How policymakers, climate scientists, NGOs, the corporate sector and the media have communicated climate change, through the media from 1902 to 2021?
2. How have the publications performed in agenda-setting in their coverage of climate change?
3. How did the various stakeholders in South Africa frame various aspects of climate change?
4. What is the correlation between government and media frames on climate change?
5. What is the relationship between the academic/scientific communities and media framing of climate change?
6. What is the relationship between NGOs, the corporate sector and media framing of climate change?
7. What has the role of money and politics been in climate change communication in South Africa?

8. Which institutions have had the strongest impact in their communication of climate change in the country?
9. In comparison with other countries, what is the status of climate change communication scholarship in South Africa?

1.5 Rationale

In research, a rationale is a set of reasons or logical basis that explicate why a scholarly study is necessary to contribute to the field of study under investigation (Moola, 2015). Climate change has often presented a challenge to policymakers and society in general, but the question is why is it that the public doesn't seem to pay more attention to the issue, or at least, respond with behaviour change? Admittedly, global warming is a complex political, environmental, economic, and cultural dilemma. However, the answer to the question of apathy towards behaviour change lies in effective communication, education, and mobilisation. The Yale Program on Climate Change Communication (2022) suggested that climate change communication was would help deal with crisis by informing, educating, persuading, mobilising, warning and, ultimately, resolving the warming crisis.

Thus, this PhD thesis aims to investigate climate change communication in South Africa with a view to establishing whether it has been conducted in ways that will be able to achieve the above objectives and lead to positive societal response. The stakeholders whose communication is under investigation – the government, business sector, scientists, the media, and NGOs – are central to the goals enunciated by The Yale Program on Climate Change Communication (2022) and other researchers. If communication on the climate problem fails to achieve these stated objectives, it is unlikely to lead to a positive response and the climate crisis will persist. This PhD study probes political, socio-political, and economic undertones that may have underpinned climate change communication in South Africa through media reporting. The idea is to establish whether climate change communication intentions have been propagandist over time. The purpose is to determine how potential propagandist intentions, in pursuit of political and financial gains, may have influenced society and the way society, or specific intended sectors of society, may have received and responded to the messages of such communication. In addition, the thesis addresses the challenges posed by earlier

researchers such as Oyedele (2015) and Suliman (2018), who have posited that climate change communication had been studied poorly on the African continent. The exercise aims to contribute to the building of a body of work of creating knowledge of communicating on climate change South Africa.

1.6 Motivation

The study is inspired by the need to help address research gaps on the subject and grow research in the field in the country and the continent of Africa. As discussed by Moser (2010), climate change research is a relatively new science (about 40 years old) internationally, while several researchers have argued that the subject has been poorly studied in Africa, partly due to it being a new area of academic research (e.g., Cramer, 2008; Shanahan, 2009; Tagbo, 2010; Johannessen, 2013; Smith, 2013; Evans & Musvipwa, 2016; Mulaudzi & Kioko, 2020). Studying key stakeholder communication of climate change has particular relevance so as to determine if such communication encourages change or merely meets propagandist desires of the protagonists. Government communication of climate change warrants an even deeper probe since this institution is a key source of scientific communication in environmental news media (Cramer, 2008; Suliman, 2018).

1.7 Aims and objectives

- To establish how the media has portrayed climate change during two periods, namely: 1902-1985 and 1985-2021.
- To establish how various stakeholders, namely government, scientists, NGOs, businesses and the media have communicated climate change.
- To critically analyse the approach of the post-apartheid government in communicating on the crisis, considering the change of administration in 1994 with the ending of apartheid and the ushering in of democracy, which was also influenced by international views, politics, and communications on the subject.

The study objectives are as follows:

- To establish the extent of communication that has been undertaken by key climate change stakeholders using the media.

- To determine the extent to which the government has communicated its climate change policies through the media and whether such communication has had any political undertones.
- To explore the political and economic dynamics that might have influenced the communication on the climate meltdown.
- To explore the constraints that might have been in the way of effective communication on the crisis.
- To probe the correlation of frames used by diverse stakeholders.
- To establish the degree of similarity or difference between media reporting and broader climate change communication in the country has been similar or has differed from that internationally.
- To determine how effectively, information emanating from climate change scientists has been communicated to different sectors of society.
- To establish the degree to which the communication on the crisis has been informed by science, and whether there has been any conflict between what science has argued for and that which is then communicated through the media.

The broad objective of the thesis is to contribute to close the knowledge gap on the subject and to develop interest in climate change communication as a scholarly discipline.

1.8 Methodological approach

In line with the aim and objectives, the methodology to be used is content analysis, following a qualitative textual analysis. This triangulation enables the study to unearth the fundamental reasoning behind the communication of the climate crisis in the country. The articles that were analysed in the research were accessed from articles published online, as well as digitised PDF articles that were published before the advent of internet publishing.

The articles were analysed for their reporting on communication from the five stakeholders – government, business sector, scientists, NGOs, and the media – to determine whether the messages conveyed had any political or financial undertones, which might not be helpful in addressing climate change but advance propagandist reasons. The articles were selected for their mentioning the terms ‘global warming’, ‘climate change’, greenhouse gas emissions’, ‘CO_2 emissions’,

or related terminology, considering that terminology about the subject has been evolving over time. Factors that influenced the coverage of climate change by the three publications were probed as part of the study, in the context of the media theory of agenda-setting. Framing of climate change by all the stakeholders was probed to determine whether it is conducive to encouraging action and positive behaviour change.

1.8.1 Study parameters

In research a parameter refers to the descriptions used to characterise a population under study, and is used to outline a specific feature of the whole population (CFI Team, 2022). This PhD study was not meant to study the entire climate change communication that was undertaken by the stakeholders in the country in the period concerned in statistical terms. Instead, a sample was used to give a glimpse of how the climate crisis was communicated through the media in South Africa. The idea was not to make any inferences based on the sample, but to provide a window to the communication of the concerned stakeholders communicated. As earlier stated, this exercise is important in that it helps understand whether the communication undertaken would have been useful in influencing behaviour change or it would have merely served to advance the economic and political aims of the protagonists.

1.9 Thesis structure

This thesis is structured to offer a wide-ranging overview of the climate crisis several of its facets, both internationally and domestically. The structure accommodates an extensive discussion of communication as a science to contextualise its role in climate change discourse. Ultimately, the thesis discusses theoretical aspects of the research and presents findings and a discussion thereof.

- **Chapter I: Frames of reference**

This opening chapter sets the tone by introducing the thesis, followed by a brief contextual discussion of the climate change communication discipline. A presentation of study of the discipline internationally and in South Africa is also made. In this chapter, all items are presented in an introductory manner, with detailed discussions following in subsequent chapters.

- **Chapter II: Climate change science, impacts, mitigation and adaptation**

In this chapter, climate change as a scientific concept is surveyed, covering its history, theories, implications to humanity, South Africa's vulnerability and approach to the crisis.

- **Chapter III: Communication and climate change communication**

Here, the concepts of communication science and climate change communication are presented, discussing their role in achieving societal goals to address the climate crisis. The chapter further considers scholarly work on climate change communication to explore what scholars have written about the subject over time.

- **Chapter IV: Overview of climate change communication**

The chapter contains an outline of the scholarship of climate change communication. It furnishes a historical account of the discipline, discusses some of its key concepts and maps international practice.

- **Chapter V: Theoretical framework**

This chapter contains a discussion of the media theories that underlie this PhD study.

- **Chapter VI: Methodology and research strategy**

This chapter discusses the data gathering process. It contains an extensive description of the data sources – mainly the three newspapers, *Rand Daily Mail, Business Day and Mail & Guardian* – research design and data collection tools, among others.

- **Chapter VII: Data presentation and analysis**

The data collected for the research is presented and analysed in this chapter.

- **Chapter VIII: Discussion**

The findings of the study and the various aspects of the fight against climate change are discussed. A critical analysis of how various stakeholders communicated on the climate crisis is also offered.

Chapter IX: Conclusion

This last chapter summarises the thesis and offers some concluding remarks.

Chapter X: Study limitations

This final chapter discusses the limitations that were inherent in the study.

1.10. Summary

This chapter has introduced the PhD study, outlining its purpose and need. Crucially, it sets out the context of the issues the study proposes probing. Apart from being an effort to close the knowledge on climate change communication in South Africa, the project is concerned with probing whether communication on the subject has been aimed at encouraging behaviour change or it has merely been an exercise to further political and financial ambitions of the stakeholders being probed. The literature that has been reviewed indicates the crucialness of climate change communication reversing global warming. This factor makes it important to study the subject so as to establish if communication has been conducted in ways that advance the goal of encouraging a response. The literature also discusses the fact that climate change communication is a new scholarly research subject, more so on the African continent. This assertion highlights the relevance of this PhD project in that it adds to the work that other scholars have already conducted and helps close the knowledge gap on how key stakeholders in South Africa have communicated on the climate catastrophe.

CHAPTER II: CLIMATE CHANGE SCIENCE, IMPACTS, MITIGATION AND ADAPTATION

2.1 Introduction

The central topic of this thesis is climate change communication which entails two science disciplines: climate change and communication. This chapter discusses climate change by outlining the science, its history, political, economic, and social impacts, mitigation and adaptation theories. In short, this section contains an exposition of what should be communicated in climate change communication. The other science, namely communication, is discussed in Chapter III, while the climate change communication science is analysed in Chapter IV.

Since the Industrial Revolution of the eighteenth century, GHG emissions caused by human activity due to fossil fuels combustion, deforestation and agriculture have led to: 1) a steady atmospheric warming which has led to the adoption of the 'global warming' term, and 2) global warming has resulted in changes in the Earth's climate (Riedy, 2016), hence the advent of climate change. The change in climate is observed through increased temperatures, changes in rainfall patterns, and the regularity and geographical spread of extreme weather such as heatwaves, storms, floods, and rising sea levels. Scientists have also pointed out that CO_2 concentrations, nitrous oxide and methane in the atmosphere have increased in a significant way because of human activities since ~1750. The increases exceed pre-industrial values counting from ice cores going back thousands of years (Alley et al., 1999). Furthermore, land use and agricultural activities contribute methane and nitrous oxide, which help to warm the atmosphere (Alley et al., 1999). Thus, simply put, climate change is defined as a long-term change of the atmospheric state, which happens over decades or even longer (Uejio et al., 2015). The climatic changes are already having devastating effects on natural and human systems, which poses an existential threat to human civilisation (Riedy, 2016; Naidoo, 2021). Writing as the global head of Greenpeace and Amnesty International, Naidoo (2021) warned that the planet would survive climate change, but humanity might not. The forests would grow back, and the oceans would recover, added Naidoo (2021).

The changing climate issue has been known to humans long before the establishment of the IPCC (Le Treut et al., 2007). Humans have also understood

most of the processes in the Earth's system that regulate the climate. However, a detailed understanding and quantification of the said processes and how they integrate in climate models have gathered a fast pace after the 1990 releasing of AR1 (Le Treut et al., 2007). AR6, the latest report, concludes with "high confidence" that increases in greenhouse gases engrossments since about 1750 are without a doubt caused by human activities (IPCC, 2021, p. SPM-5). This confidence is based on the evidence (robust, medium and limited) and the degree of scientific agreement (high, medium and low). The combination of evidence and agreement levels is interpreted in five levels of confidence (very high, high, medium, low and very low) (Mastrandrea et al., 2010). Climate scientists also use the terms 'likely' and 'likelihood' to refer to the probability of a climate event or outcome occurring (Mastrandrea et al., 2010).

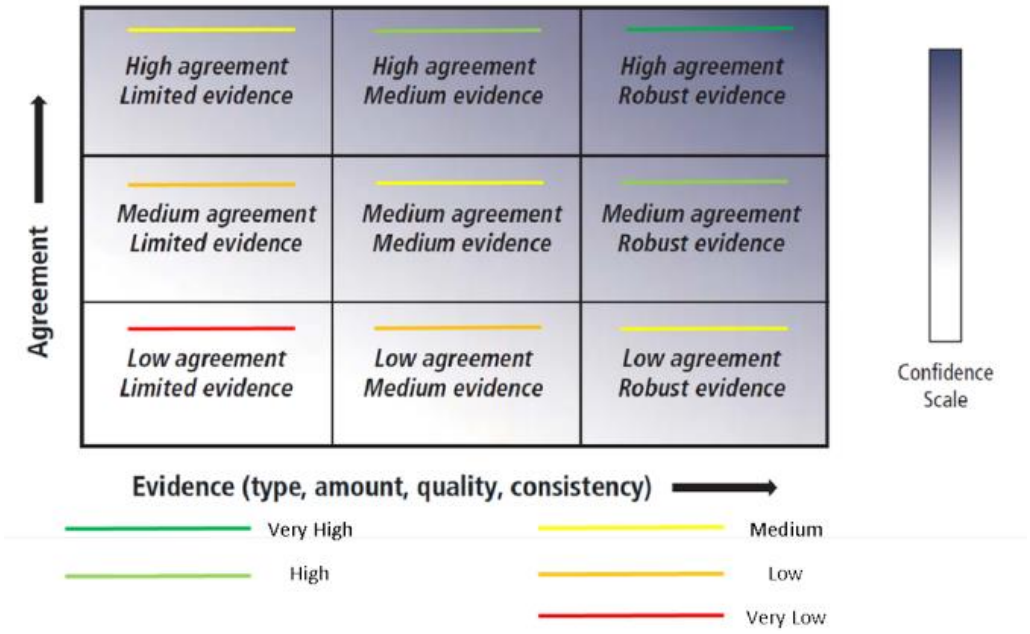


Figure 3: IPCC confidence levels of agreement and evidence.

Source: (Mastrandrea et al., 2010).

Making a strong case of global warming and placing human activities as key drivers, AR6 also revealed the following scientific findings:

- Each of the past 40 years have been increasingly warmer than any preceding decade since 1850.

- The likely total range of the surface temperature increase caused by human activities from 1850-1900 to 2010-2019 is 0.8°C to 1.3°C, perhaps in between at 1.07°C.
- There is medium confidence that averaged precipitation over land has increased since 1950, and accelerated since the 1980s. There is a likelihood that human activities contributed to changes in precipitation changes since the mid-twentieth century. It is extremely likely that anthropogenic causes made a contribution to changes in near-surface ocean salinity. There is also medium confidence that mid-latitude storm tracks have likely shifted poleward in both hemispheres since the 1980s, with marked seasonality in trends. The influence of human most likely contributed to the shift towards the poles closely related extratropical jet in austral summer in the Southern Hemisphere.
- Anthropogenic activities are most likely the main source of the retreat of glaciers since the 1990s and the decrease in the Arctic Sea ice area between 1979-1988 and 2010-2019 (about 40% in September and about 10% in March). There has been no significant trend in the Antarctic Sea ice area from 1979 to 2020 due to regionally opposing trends and large internal variability. In all probability, human influence contributed to the decrease in Northern Hemisphere spring snow since 1950. It is very likely that human influence has contributed to the melting of the Greenland Ice Sheet over the past 20 years. However, medium agreement given the limited evidence of human influence on the Antarctic Ice Sheet mass loss.
- There is virtual certainty that the global upper ocean (0-700 m) has warmed from the 1970s and extremely probable that human influence is the main source. It is virtually certain that human-caused carbon dioxide emissions are the main driver of the current acidification of the surface open ocean. There is high confidence that oxygen levels have dropped in many upper ocean regions since the mid-twentieth century, and medium confidence that human influence has made a contribution to this drop.
- There is high confidence agreement among scientists that there has been a global mean sea level increased by 0.20m (0.15m to 0.25m) between 1901 and 2018. The rate of sea level rise averaged 1.3mm (0.6mm to 2.1mm) per year between 1901 and 1971, increasing to 1.9mm (0.8mm to 2.9mm) yr-1 between

1971 and 2006, and further increasing to 3.7mm (3.2mm to 4.2mm) a year between 2006 and 2018.

- There is also high confidence that changes in the land biosphere since 1970 are as a result of global warming, where climate zones have shifted towards the poles in both hemispheres. The growing season in the Northern Hemisphere extra tropics has lengthened by up to two days per decade, on average, since the 1950s.

Global warming will have several impacts on the environment, humans and other ecosystems. The impacts of climate change were simplified as follows by Uejio et al. (2015):

- Greater variability, with 'wetter wets', 'drier dries' and 'hotter hots'.
- More regular and extreme heatwaves and related events.
- More severe droughts.
- More intense precipitation, such as severe rains, winter storms and hurricanes.
- Longer frost-free seasons as a result of higher average temperatures.
- Worsening in wildfires and longer wildfire seasons.
- Earlier spring runoff and loss of snowpack.
- High sea tides and storm surges resulting in recurrent coastal flooding.
- Intense precipitation and spring snowmelt resulting in frequent and more severe floods.
- Worsening air quality.
- Increased pollen production and longer pollen seasons.

Science has now reached a stage where it can link a particular weather event to climate change. This area of research is called the Extreme Event Attribution (EEA), also called the attribution science. It resides in the fields of meteorology and climate science, and it studies how climate change directly affects extreme weather (see National Academies of Sciences, Engineering, and Medicine, 2016). This is a crucial science in a situation where some people have disputed the link between climate change or global warming to extreme weather events. Such doubting has caused timidity to implement progressive policies in response to global warming (see Cook et al. 2013). Attribution science also aims to make a distinction between extreme climate events that can be linked to climate

change and those that are simply due to natural Earth variations. In Chapter 8.1 of this thesis, it is revealed how media reports on droughts in various parts of South Africa in the 1990s were not linking the developments to climate change because scientists at the time were not able to do so.

When conducting EEA studies of a particular weather event, scientists determine the event's scale and frequency based on the data observed. This enables them to determine whether the said event has broken records in terms of magnitude and frequency. The other method is to run climate models, using computers, and compare the results with observed data from the climate events. EEA is also studied by defining the baseline environment that would pertain had there been no climate change, "essentially create a virtual world of the Earth as it would be if no human activities had warmed the planet. Then run the same climate models again. The differences between the second and third steps represent the impact of human-caused climate change. The last step is to quantify these differences in the magnitude and frequency of the extreme event, using statistical methods" (Zeng, 2021, p.2). As the science advances, its next steps are to estimate the amount of climate change that would have impacted an individual climate event's scale or occurrence probability (National Academies of Sciences, Engineering, and Medicine, 2016).

Although science has made considerable advances in the theory, observations, and modelling of the Earth's climate system, all literature on climate change admits that there is uncertainty, which according to Oppenheimer and Anttila-Hughes (2016), is caused by the fact that understanding the physical and biological world is work in progress and should not be estimated in ways that would compromise accuracy. Furthermore, the calculations that underpin atmosphere-ocean general circulation models, which are climate modelling computer programmes used to predict climate change, are solved numerically on computers with limited capacity. The uncertainty can also be caused by the fact that it is not possible to predict the amount of CO_2 that human activity will emit in future since it depends on factors such as the consumption of CO_2 emitting energy, among others. Palmer and Smith (2014) argued that the Earth's climate had entered a new era in which humans are causing and adapting to environmental changes. This should also be modelled, they argued. They added that projections based on suggestions that cuts in

emissions of greenhouse gases would limit pollution in the atmosphere and reverse climate change, are not realistic (Palmer & Smith, 2014). The argument is rather interesting because most climate change mitigation models are based on the cutting of GHG emissions, particularly in economic activity.

The IPCC AR4, released in 2007, argued that even the most rigorous mitigation measures would not prevent future climate disasters because the amount of carbon dioxide already in the atmosphere is sufficient to induce climatic change into for several years to come (IPCC, 2007). Under business-as-usual scenarios with emissions continuing in vast quantities, the situation would be worse, and the effects of climate change would eventually impact all aspects of human well-being the world over. The impact of climate change is what necessitates studies such as this: to ensure that society is adequately-informed and is prepared to respond accordingly communication.

2.2 The climate science

The climate science is concerned with studying the dynamics and structure of the climate system to understand the ways in which the climate is maintained and the processes that inform their changes over time (Parker, 2018). The science uses theory and observations from a variety of fields, including physics, chemistry, meteorology, and oceanography. Climate science, as a field of academic study, started in the latter half of the twentieth century, although there was a similar science known as climatology before (Parker, 2018). This science studies the nature of climate, its causes and understanding of spatial variations as well as its relationship with human activities and the natural environment (Malik, 2018). While climatology largely focused on calculating statistics from weather observations (Edwards, 2010), climate science seeks to predict and explain the processes of the global climate system, encompassing the land surface, the oceans, ice sheets, and the atmosphere, among others (Parker, 2018).

Anthropogenic climate change rather than climatology, as a field of study, has given rise to climate change science. The climate system is an interactive combination which encompasses the atmosphere, oceans, land surface, snow and ice as well as living organisms and other bodies of water (Le Treut et al., 2007). This interaction results in what is identified as climate, which is the atmospheric component of the climate system. Climate is subsequently defined as average

weather. The variability is studied in a minimum period of 30 years and could extend to millions of years (Le Treut et al., 2007). The climate system evolves over time influenced by natural dynamics and changes in factors climatic factors known as *forcings* (Le Treut et al., 2007). These include natural occurrences such as solar variations, volcanic eruptions, and anthropogenic changes in the composition of atmosphere. In scientific terms, climate is a derivative of a climate system (Parker, 2018) or the state of the climate system, including a statistical description (IPCC, 2013). Other scholars choose a more descriptive definition such as that offered by Riedy (2016, p. 1):

> Climate is the average of the weather conditions at a particular point on the Earth. Typically, climate is expressed in terms of expected temperature, rainfall and wind conditions based on historical observations.

According to AR6, the climate of Earth has been through several changes since the existence of the planet (IPCC, 2021). The modern climate era of human civilisation started some 11 700 years ago, following seven cycles of glacial advance and retreat during the last 650 000 years, and the abrupt end of the Ice Age (IPCC, 2021). AR6 adds that most of the Earth's climatic changes were occasioned by variations in the orbit of the Earth that changed the amount of solar energy of the planet. Therefore, these changes would be considered organic, instead of anthropogenic. The current warming trend is of is unequivocally anthropogenic and is happening at an unprecedented rate (IPCC, 2021).

According to Riedy (2016), the Earth has had a stable climate from the ending of the Ice Age into the Holocene or the past 11 700. The year from which the 11 700 years are calculated, or yr 0, is established as the year 1950 AD. The Holocene climate comprised 2 000 years of accelerated warming, then 4 000 years of humidity and higher temperatures, and a faster cooling and drying for the last 6 000 years (Javier, 2017). The US National Oceanic and Atmospheric Administration (NOAA) suggests that palaeoclimatologists have long held suspicions that the mid-Holocene, roughly between 7 000 to 5 000 years ago, was hotter than the present days (NOAA, 2021).

During the whole of the Holocene, carbon dioxide in the atmosphere increased at a rate of approximately 0.003 ppm/year or about 40 ppm during the entire period (WMO, 2017). In the early years of the Holocene, the peak rate reached about

0.024 ppm/year. After industrialisation (in the 1900s), the rate grew exponentially, exceeding 2 ppm/year in 2017. Arguing the case for anthropogenic warming of the globe, the World Meteorological Organization (WMO, 2017) shares the view that the rate of increase of CO_2 concentrations in the atmosphere over the past 70 years is almost a hundred times bigger than that observed at the end of the Ice Age. This is something that has not been observed before. Human activities are presently adding approximately 3 ppm of carbon dioxide to the atmosphere, every year, which amounts to more than a hundred times faster than the highest Holocene rate and thousand times faster than the Holocene average rate (WMO, 2017). Therefore, Weyler (2019) argued that this unequivocally dismisses deniers' claims that CO_2 emissions cannot be regarded as a major contributor to the warming of the atmosphere and seas. The scientific evidence is simply overwhelming and unchallenged, they add.

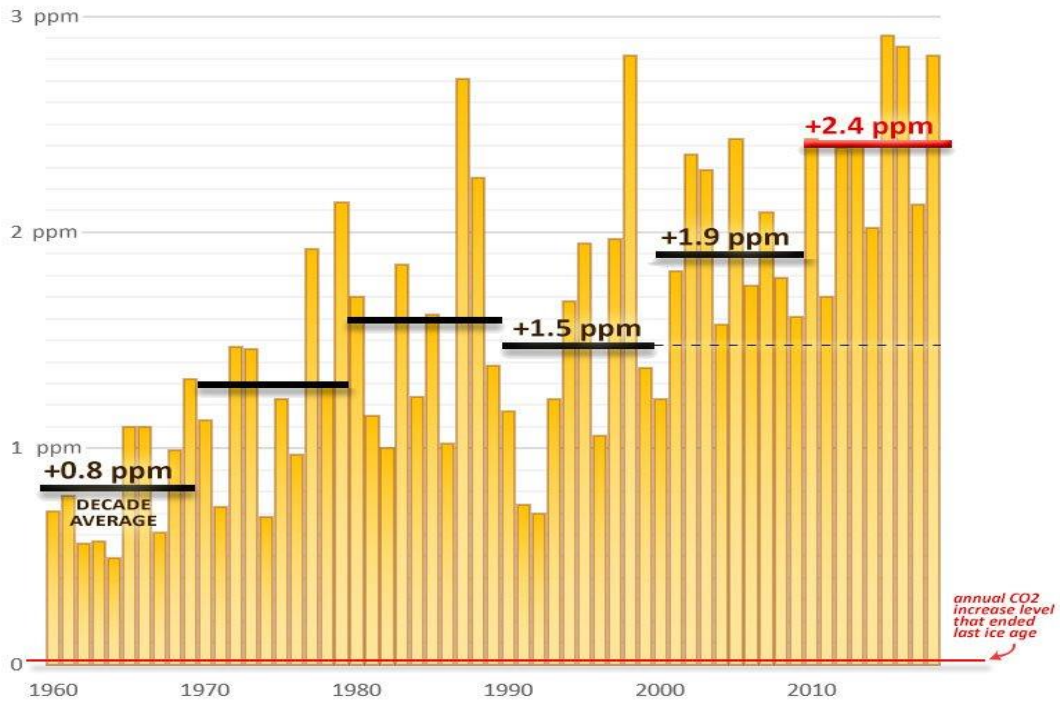


Figure 4: NOAA data showing ppm increases per year in the last 60 years.

Source: (Weyler, 2019).

While the matter of global warming has been occupying the minds of scientists for several years, it only became a political and policy issue after the UN took up the issue and commissioned an assessment of global temperatures in the late 1980s

(Folland et al., 1990). The IPCC First Assessment Report (AR1) was an eye-opener as it revealed that:

- Global temperatures have been on the increase in an irregular fashion since the nineteenth century.
- The majority of mountain glaciers have been markedly receding in an irregular manner since the nineteenth century.
- Sub-Saharan Africa has seen a great variation in precipitation over decades.
- Rainfall has gradually increased in the former Soviet Union over the 100 years.
- The USA has registered a continual increase of cloudiness since 1950.
- Australia too has observed a much larger, more abrupt, but less predictable increase of cloudiness.

Since AR1, the IPCC has now released several assessment reports, up to AR6 and several ancillary documents. All such documents tend to reinforce the findings of a changing climate resulting from the heating of the globe. AR6 also pointed out that rapid and widespread changes in the atmosphere, oceans, cryosphere, and biosphere had occurred since AR5 (IPCC, 2021), which suggests an acceleration of warming. Over the years, climate change has become a major political and socio-economic subject that has been debated in various fora such as COPs, Earth Summits, etc. Most recently, climate change is seen as presenting sustainable development opportunities in response to its impacts.

2.3 Global warming powering climate change

The phrase ‘global warming’ refers only to the rising of surface temperature of the Earth, while ‘climate change’ refer to much broader issues, including warming and its impacts, such as melting glaciers, more frequent droughts, heavier rainstorms, etc. (Kennedy & Lindsey, 2021). The term ‘global warming’ is now used for human-caused warming generated by increases in carbon dioxide and other GHG emissions from the burning of fossil fuels such oil, gas, and coal (Kennedy & Lindsey, 2021). Global warming and climate change are closely related in that as the atmosphere heats up because of CO_2 emissions, it collects,

retains, and drops more water, which in turn, changes weather patterns (Denchak, 2017).

The story of global warming has some of its origins in the works of French scientist, Jean-Baptiste Joseph Fourier (1768–1830), who found that the climate was determined by the balance between incoming solar radiation, or light heat, and outgoing radiation, known as dark heat (Fleming, 1999). Another French scientist, Claude Pouillet (1837 in Bolin, 2007), concurred, finding that the atmosphere served as a layer that absorbs the radiation going to space. The surface temperature of the Earth might be considerably higher than it would without the said absorption. As research on the subject and resulting debates gained pace, Swedish scientist, Arrhenius (1896, cited by Bolin, 2007) remarked that Fourier and Pouillet, had established a theory that the atmosphere acted favourably in raising the temperature of the surface of the Earth.

Tracing the climate from the nineteenth century, Masson-Delmotte et al. (2013) asserted that the century started as one of the coldest periods of the last thousand years, at least for the Northern Hemisphere, which followed after a somewhat warmer eighteenth century. The eruption of Mount Tambora in 1815 resulted in two years of cooling (Raible et al., 2016). This was followed by temperature increases, which were interrupted by a cooling that resulted from volcanic eruptions in the 1830s (Brönnimann et al., 2019) and later the1883 eruption in Krakatoa, Indonesia (Hegerl et al., 2019). Temperatures began a particularly rapid rise during the early years of the twentieth century, displaying abnormal heating between the 1920s and the 1940s (Hegerl et al., 2018). Temperatures stabilised in the 1950s and 1960s, followed by strong constant increase thereafter (Hegerl et al., 2019). Various drought spells were experienced in South Africa during this period, but barely any media reports linked them to climate change, although some scientists aired concerns of warming of the Earth.

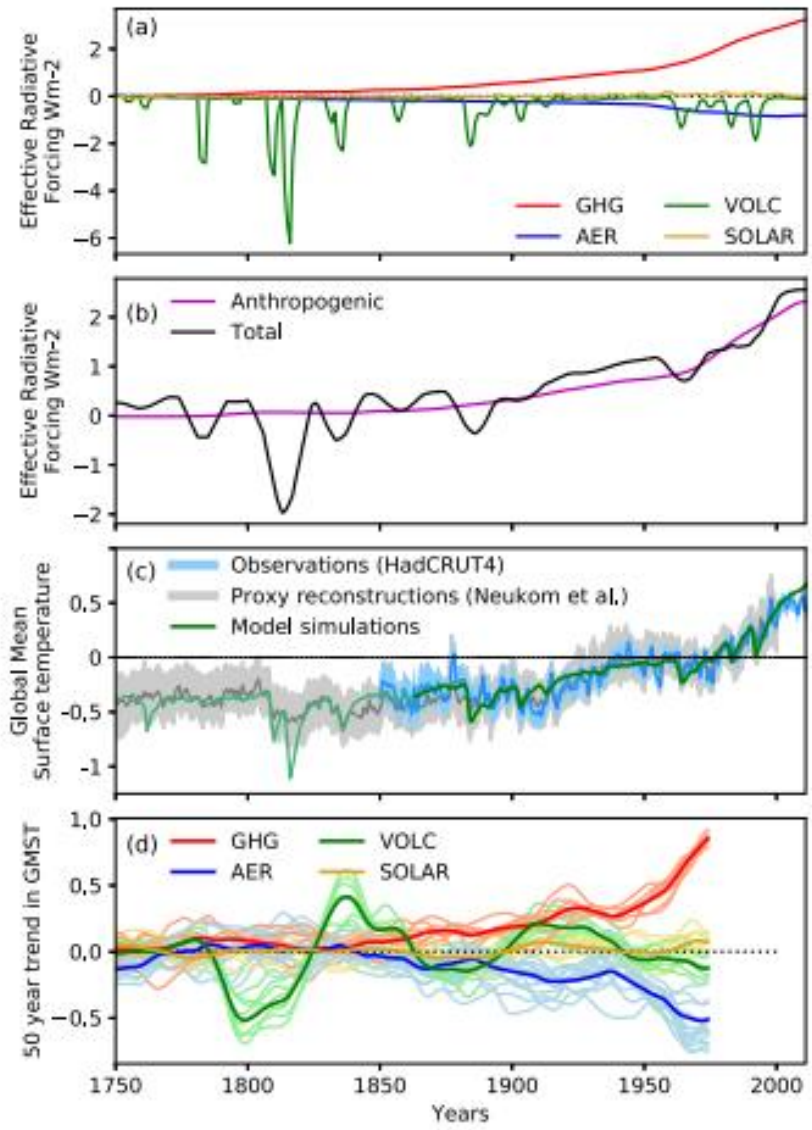


Figure 5: A comparision of external forcing with observed global temperature data.

Source: (Hegerl et al., 2019).

The issue of warming has continuously preoccupied scientists over the years, leading to an April 1960 launching into space of the USA's first meteorological satellite, TIROS 1 to trying to find out what was causing the heat (Bolin, 2007). However, this was primarily a meteorological tool without much involvement of other Earth sciences, prompting leading US scientists to argue that the use of satellites for observations should inspire a major research effort (Bolin, 2007, p. 20). Nonetheless, US scientists led in various efforts to study the factors behind the Earth's warming and consequent climatic changes, resulting in a report in the early 1980s that concluded that global warming was happening. Bolin (2007, p. 34) commented as follows about the findings:

> It appears that the warming will ultimately occur, and the associated regional climate changes so important to the assessment of socio-economic consequences may well be significant, but unfortunately, the latter cannot yet be adequately projected.

Other similar research was conducted by the then US rivals, the former Soviet Union, in the same period. The *Rand Daily Mail*, reported on 26 February 1983 in an article titled *The World is Warming Up,* citing Soviet climatologist, Georgy Golitsyn, saying that global temperatures would increase by 1°C by 2000 (RDM, 1983). However, Golitsyn believed that the increase would not cause problems by melting glaciers – instead it would be good for agriculture (in the Soviet Union) and would result in a rise in humidity. The argument of warming being good for agriculture and overall economic activity in usually cold regions, was confirmed by Diffenbaugh and Burke (2019), who found that hotter weather moves north European countries closer to the empirical optimum of 13°C, which is said to be conducive to economic viability and growth.

Following TIROS 1 and other assessments involving scientists from various countries inspired the UN General Assembly to start looking into the issue of warming of the Earth in 1987 and stimulated debates and studies about global warming (Bolin, 2007). Thereafter came the famous testimony to the US Senate by scientist James Hansen, which is regarded as one of the events that catapulted climate change into the socio-economic, and societal arenas not only in the USA, but globally. Hansen (1988, p. 1) presented a graph that showed the temperatures over the “period of instrumental records”, which was for ~100 years between 1880 and 1990.

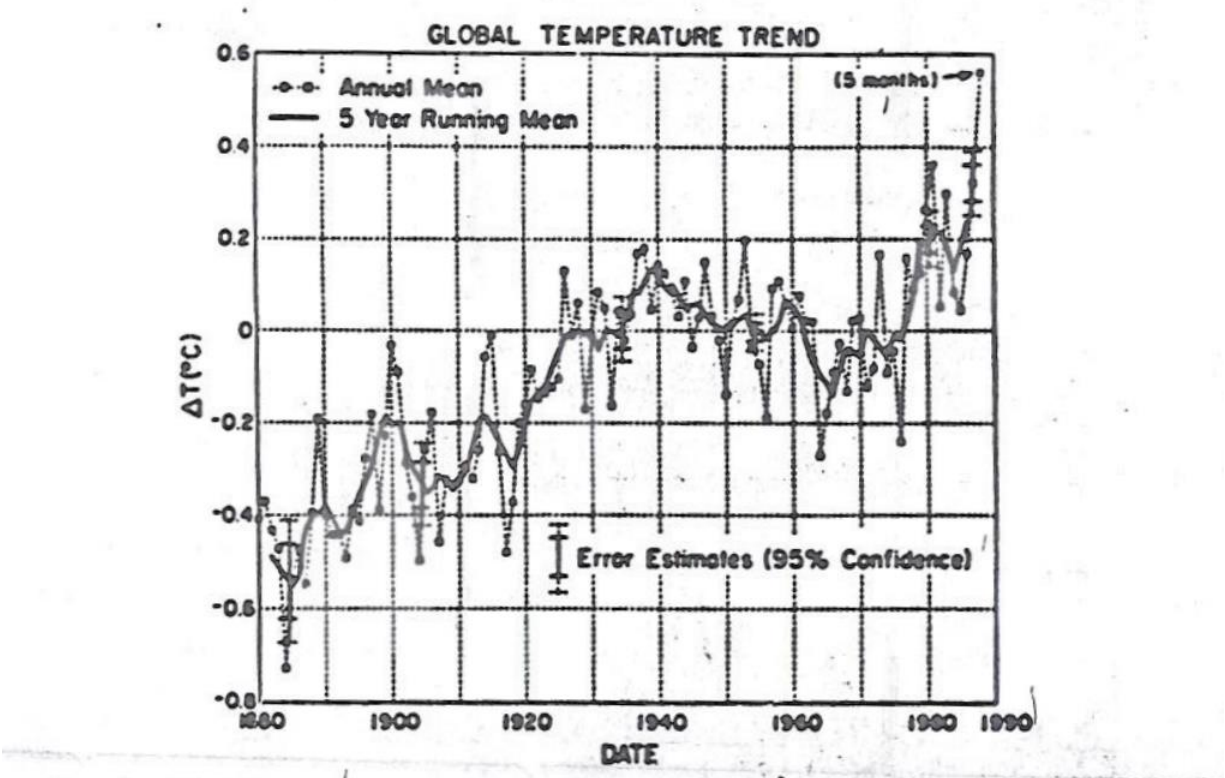


Fig. 1. Global surface air temperature change for the past century, with the zero point defined as the 1951-1980 mean. Uncertainty bars (95% confidence limits) are based on an error analysis as described in reference 6; inner bars refer to the 5-year mean and outer bars to the annual mean. The analyzed uncertainty is a result of incomplete spatial coverage by measurement stations, primarily in ocean areas. The 1988 point compares the January-May 1988 temperature to the mean for the same 5 months in 1951-1980.

Figure 6: The graph presented to the US Congress by James Hansen on 23 June 1988 showing global temperature trends.

Source: (Sealevel.info, 1988).

Hansen remarked:

> … The present temperature is the highest in the period of record. The rate of warming in the past 25 years, as you can see on the right (Figure 10), is the highest on record. The four warmest years, as the Senator mentioned, have all been in the 1980s. And 1988, so far, is so much warmer than 1987, that barring a remarkable and improbable cooling, 1988 will be the warmest year on the record.

Several years later, on December 6, 2005, Hansen presented to the American Geophysical Union and stated: “We are on the precipice of climate system tipping points beyond which there is no redemption” (Hansen, 2005, p. 8). His presentation kickstarted a flurry of climate change communication that forced a public debate on global warming (Russill & Nyssa, 2009). The media also picked up the warnings

and generated eye-catching write-ups. *The Washington Post,* for instance, wrote on 29 January 2006, that debate had shifted to the fact that climate change would bring about irreparable change to the environment, adding that some experts foresaw a tipping point at a time when it would be too late for action (Eilperin, 2006). In Western Europe, a speech by former British prime minister, Margaret Thatcher, to *The Royal Society* on 27 September 1988 put the issue of global warming on the public agenda (Margaret Thatcher Foundation, 1988). Thatcher stated:

> For generations, we have assumed that the efforts of mankind would leave the fundamental equilibrium of the world's systems and atmosphere stable. But it is possible that with all these enormous changes (population, agricultural, use of fossil fuels) concentrated into such a short period of time, we have unwittingly begun a massive experiment with the system of this planet itself.
>
> Recently, three changes in atmospheric chemistry have become familiar subjects of concern. The first is the increase in the greenhouse gases – carbon dioxide, methane, and chlorofluorocarbons – which has led some to fear that we are creating a global heat trap which could lead to climatic instability. We are told that a warming effect of 1°C per decade would greatly exceed the capacity of our natural habitat to cope. Such warming could cause accelerated melting of glacial ice and a consequent increase in the sea level of several feet over the next century (para. 37-38).

The speech helped galvanise media and public attention to global warming in the UK (Anderson, 2019). Over-and-above placing the issue of global warming firmly on the scientific, political, media and public agenda, the above-mentioned events started a debate that pitted the two schools of thought, against each other: one known as the *consensus* and the other, the *sceptics*. The former agreed with scientific findings that the Earth was warming, while the former took a contrarian view.

2.5 Climate consensus vs climate sceptics

The consensus view holds that climate change is happening, concurs on its anthropogenic nature, and agrees on its potentially devastating impacts (IPCC, 2013; 2021). This view is held by the majority of scientists on the subject, the UN, several governments, and NGOs, and it is largely the world's dominant understanding. The consensus side of the debate is adamant that the warming of the atmosphere is behind the climatic changes, which drive phenomena such as rainfall patterns changes and the regularity and geographical spread of weather events such as heatwaves, droughts, storms, and floods (Riedy, 2016), even though there could be other causes. Nonetheless, by and large, the world has moved beyond scepticism in spite of lingering views from deniers and the emergence of climate obstructionism (see Chapter 2.5.1). Defending scepticism, Berkeley Earth (2014), a conservative US-based non-profit organisation focusing on environmental data science, argued that there is reason for scepticism about climate change because there are many people, it claims, who ignore the science, and do not distinguish between facts and alarmist declarations. The think-thank further claimed that there is an exaggeration of the harmful impacts of global warming, which has caused many people to be sceptical of all the reported climate science (Berkeley Earth, 2014). Its lead scientist, Richard A. Muller, is a well-known critic of several climate studies (Ros, 2012). While acknowledging that anthropogenic emissions increase carbon dioxide in the atmosphere and that CO_2 is a GHG, and more its concentration in the atmosphere leads to the warming of the planet, they contended that attributing "cause-and-effect" to individual weather events is "fiendishly difficult" (Berkeley Earth, 2014, pp. 3–4). They appeared to not have presented a view on the new EEA science. Berkeley Earth presented a table on weather events as they relate to global warming (Table 1), which they claimed was an assessment of the various scenarios in the relationship between certain climate events and global warming.

Extreme weather event	No global warming link	Chance of global warming, but amount not established	Evidence of some global warming link
Hurricanes		X	
Tornados	X		
Droughts		X	
Forest fires		X	
Heatwaves			X
Costal floods			X
Earthquakes	X		
Floods		X	

Table 1: Berkeley Earth's assessment of weather events as they relate to global warming.

Source: (Berkeley Earth, 2014).

The concept of global warming scepticism has several meanings, with Rahmstorf (2004) suggesting three categories:

- Those who deny that the Earth is warming altogether. They are known as trend sceptics.
- Those who accept that warming might happening but reject the idea on anthropogenic causes. They are called attribution sceptics.
- Impact sceptics who agree that warming and the consequent change in climate is taking place and that it is anthropogenic but disagree it will lead to catastrophic impacts, as often suggested.

The consensus view about scientific certainty has also been evolving over the years. Figure 7 illustrates such evolvement.

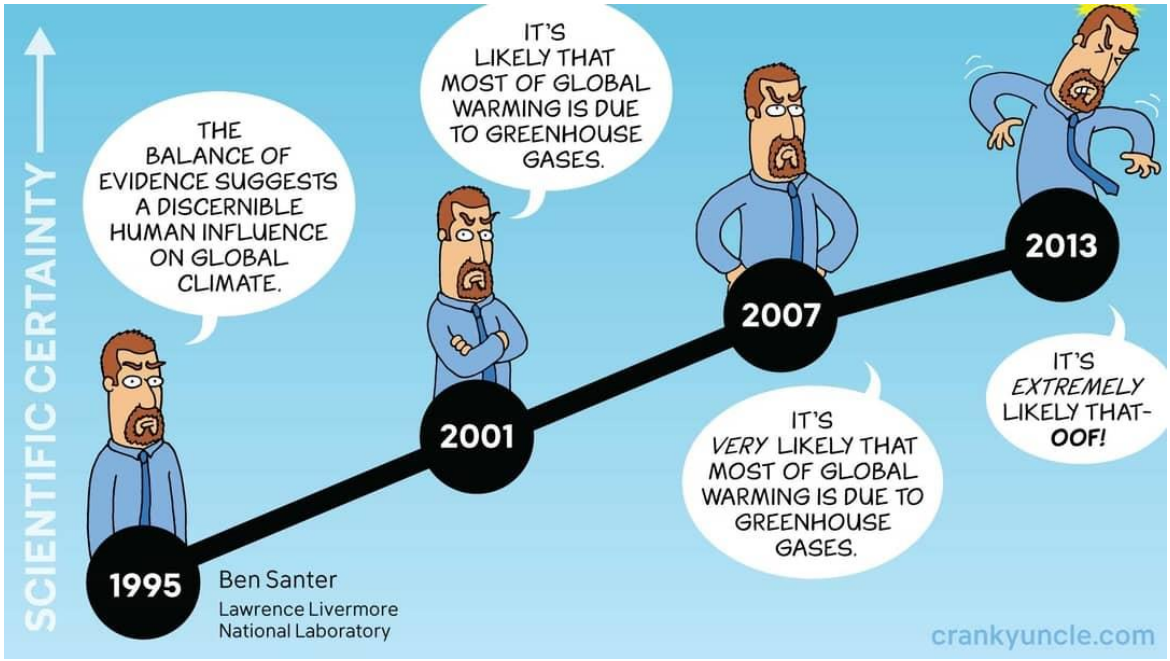


Figure 7: The evolvement of the climate change consensus view.

Source: (Cook, 2021).

The IPCC, which uses over 2 500 scientists in its climate change research, has long reached consensus that the planet's temperatures are on the rise, and that the most plausible cause is human activities (Bray, 2010). Making this assertion, the 2009 IPCC report cited by Bray (2010) stated that the Northern Hemisphere average temperatures from the 1950s onwards were most likely higher than during any other period of 50 years in the past 500 years. It was further likely that the temperature averages in same period have most likely been the highest in the past 1 300 years, at least. This led to the IPCC concluding that it was probable that there has been considerable human-influenced warming over the past 50 years observed on each of the world's continents except Antarctica (Bray, 2010).

Dismissing scepticism about anthropogenic climate change, Oreskes (2018) argued that although it was not entirely possible to be certain that scientists' conclusions are correct, the various means available to evaluate their claims lead to the conclusion that it is extremely probable that they are not mistaken about the certainty that there is human-caused climate change. Nonetheless, despite enormous advances to project future climate change in theory, observations and modelling of the climate system, science on the subject cannot predict several major issues on the evolvement of the system with precision. In spite of this, sceptical views of climate change appear ungrounded in science or not supported

by empirical evidence. The fact that almost all the scientific predictions about the changing climate are proving to be correct, with heatwaves, droughts, storms and flooding being a daily occurrence in several regions of the world, it is clear that something other than nature is exacerbating the warming and consequent change in the climate.

2.5.1 Climate change obstructionism

Despite all the scientific proof about the reality of climatic change, and the need for a response, various actors have been working tirelessly to drive counter messages. At the forefront is the Climate Change Counter Movement (CCCM), which consists of individuals and organisations who use money and powerful discourses to mould public opinion and policy to drive the agenda that there should be no response to global warming (Supran & Oreskes, 2021). This network of actors includes the corporate world, multinationals, including the fossil fuels industry, public relations firms, NGOs, conservative, libertarian and partisan think tanks, contrarian scientists, and the media (McKie, 2021).

According to Supran and Oreskes (2021), corporates entities such as ExxonMobil use rhetoric that downplays the reality and seriousness of global warming and present the usage of fossil fuels inevitable and reasonable and shifting the responsibility for climate change to consumers, away from themselves. The oil multinational uses the rhetoric of climate ‘‘risk’’ to downplay the reality and seriousness of climate change; it employs the rhetoric of consumer ‘‘demand’’ - versus fossil fuels supply – to shift the responsibility to address climate change to individuals (Supran & Oreskes, 2021, p. 696).

Governments have used the ‘obstruction’ tool to stifle climate change negotiations at the international level with a view to preventing the reaching of agreements. Saudi Arabia has been presented as one such example, where the country has consistently sought to negotiate no action or delayed action to address global warming (see Depledge, 2008). The example in South Africa would be found among those who tend to oppose the just transition from coal to renewables as sources of energy. Coan et al. (2021) found that conservative think-tank websites and contrarian blogs have focused on attacking the integrity of climate science and scientists and, increasingly, has challenged climate policy and renewable energy. Lamb et al. (2020) introduced the notion of ‘climate delay discourses’ to

describe tactics where contrarians focus attention on the negative effects of climate action and raise to block response. Obstructionism may crumble when people begin to experience the positive outcomes of measures to reverse climate change, such as new economic opportunities and sustainable development.

2.6 Different meanings of climate change

According to Hoesung Lee, Chair of the team of scientists that compiled the IPCC AR6 (IPCC, 2021), climate change is no longer simply about the globe's temperature, it is imposing multiple changes in several regions, which are expected to increase amid increased warming. The IPCC (2021) highlighted the following potential changes:

- The water cycle is intensifying due to climate change. As a result, the rainfall is more intense, leading to flooding and droughts in several regions.
- Rainfall patterns have been affected by global warming and it is predicted that there will be an increase in precipitation in high latitudes areas. Precipitation is expected to decrease over large some regions of the subtropics. There will also be changes to monsoon precipitation, which will region.
- Low-lying coastal areas will experience flooding due to sea level rises throughout the twenty first century. By the end of the century, there would be yearly extreme sea level events that used to occur once in hundred years.
- The warming of the oceans will result in acidification of the seas, more frequent marine heatwaves, and reduced oxygen levels. The changes will affect both ocean ecosystems and the people who rely on them.
- Increased warming will widen permafrost thawing, leading to the loss of seasonal snow cover. There will also be loss of summer Arctic Sea ice, melting ice sheets and glaciers.
- In cities, some aspects of climate change may be amplified, including heat and flooding from heavy precipitation and sea level rises in cities on the coast.

The above characterisations of climate change drive most of the world's actions to address the crisis, but there is a need to extend them to include the economic and

sustainable development benefits responding to climate change. This is highlighted by US president Joe Biden's plans arrest climate change, for instance, which have been billed to create new, sustainable jobs, over-and-above saving the Earth. In Europe, the Government of Ireland (2021) has highlighted the socio-economic opportunities and advantages, rather than a mere averting the doom and gloom scenario predictions. It said action to deal with climate change would bring about the following:

- Heathier communities, which will enjoy cleaner air and water.
- Investments in areas such as offshore wind, cutting-edge agriculture and retrofitting of old industries will create thousands of new jobs and catapult economic growth.
- Dependence on imported fossil fuels will be cut, and energy will come from renewable resources including solar and wind.
- Cleaner public transport through the rolling of electric vehicles.
- There will be certainty that farming industries will be viable and they will produce world-class food with a lower carbon footprint.

2.6.1 Anthropogenic climate change

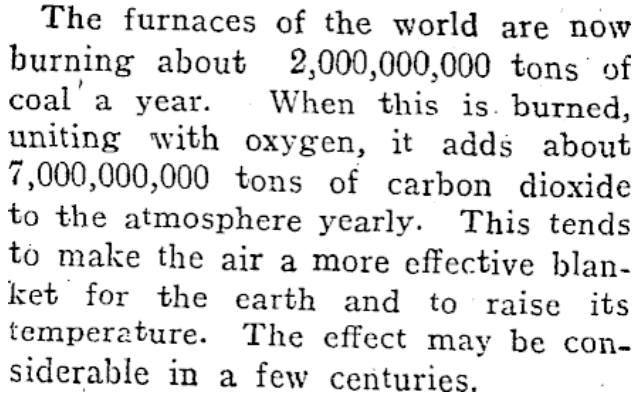
The word *anthropogenic* is derived from *anthropogenes*, a Greek word which means born of man (Vocabulary.com, 2021). Thus, anthropogenic climate change precisely means change to the climate which is originated by human activity. It has been accepted that the climate has been changing all the time due to natural and human-inspired causes. During certain times of the history of the universe, environmental and climatic changes were regarded by some as being God's will to complete the creation of the Earth (Von Storch & Stehr, 2006). In this regard, climate change, either with natural or anthropogenic causes, has been under discussion for several centuries. However, the term 'anthropogenic climate change' entered public lexicon in the 1980s when concerns of global warming potentially causing the climate to change began to preoccupy scientists, politicians, and society, in general (Von Storch & Stehr, 2006). Anthropogenic climate change has been talked about long in limited circles, although the term was not widely used. One important milestone in this regard came in 1890 from geographer Eduard Brückner, who theorised that if forests contributed to precipitation, their

absence or reduction (caused by human activity in agriculture) would mean less precipitation, thus suggesting that the climate would have been altered by such human activity (Stehr & Von Storch, 2000).

According to Von Storch and Stehr (2006), Greek philosopher Tyrtamus Theophratus (c. 371–287) may be regarded as the pioneer of climatic determinism because he was the first to speculated about impacts of climatic changes on humans. Several centuries later, Scottish historian and philosopher, David Hume (1711-1776), made a speculation about the warming that was being experienced at the time could have been caused by deforestation, which allowed the solar rays to reach the Earth's surface (Von Storch & Stehr, 2006). These and several other theorisations continued throughout the centuries, although some of them were mere perceptions and speculations without any empirical evidence. Other most salient early pronunciations of anthropogenic climate change included:

- In 1771, American physicist, H. Williamson, wrote about the climate of the north American colonies (Von Storch & Stehr, 2006) and analysed the changes of climate in the region. According to Von Storch and Stehr (2006), Williamson concluded that the changes were caused by the settlers clearing the landscape for agriculture, a clear case of anthropogenic climatic change.
- In the nineteenth century, north American and European scientists, such as Brückner, were preoccupied with the notion that deforestation, which was a human activity, caused climatic changes.
- Wet summers in the 1910s and 1920s were blamed on the World War I gunfire and the early short-wave trans-Atlantic radio communication (Von Storch & Stehr, 2006), thus illustrating the existence of anthropogenic climate change.

Commenting on the role of fossil fuels emissions in warming the Earth, an article in the early twentieth century forecasted negative consequences for the climate. It was published by New Zealand's *Rodney and Otamatea Times*, *Waitemata and Kaipara Gazette* on 14 August 1912.



The furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the air a more effective blanket for the earth and to raise its temperature. The effect may be considerable in a few centuries.

Figure 8: An article in 1912 decrying pollution from the burning of coal.

Source: National Library of New Zealand (2021).

Following a warming spell in several parts of the world, the American peer-reviewed scientific journal, *Monthly Weather Review,* contained an article in September 1933 titled *Is Our Climate Warming? A Study of Long-time Temperature Trends* that stated:

> The phase of weather, or climate, that is attracting attention at the present time is not these short-period changes from warm to cool, and vice versa, for they are always present, but rather an apparent longer-time change to cool periods that seem to be less frequent and of shorter duration, and warm periods that are more pronounced and persistent (Kincer, 1933, p. 251).

In 1938, Callendar (1938, p. 133) linked the said heating to CO_2 emissions which were induced by human activity, arguing that:

> Few of those familiar with the natural heat exchanges of the atmosphere, which go into the making of our climates and weather, would be prepared to admit that the activities of man could have any influence upon phenomena of so vast a scale.

As earlier stated, Arrhenius had earlier speculated that CO_2 anthropogenic emissions would cause significant climate changes in years to come. In the 1940s, global mean temperatures experienced a fall, leading Flohn (1941 in Von Storch & Stehr, 2006) to speculate that the Earth was heading to a new Ice Age. This cooling continued throughout World War II, leading some scientists to follow Flohn's speculation of a move towards a new Ice Age. Some scientists speculated that the fall in temperatures was caused by human activity through industrial pollution. According to this theory that seemed to move against the thesis of industrial

pollution warming the universe, the likes of Rasool and Schneider (1971, p. 141) argued that:

> It is projected that man's potential to pollute will increase six to eightfold in the next 50 years. If this increased rate of injection of particulate matter in the atmosphere should raise the present global background opacity by a factor of four, our calculations suggest a decrease in global temperature by as much as 3.5°K. Such a large decrease in the average surface temperature of the earth, sustained over a period of few years, is believed to be sufficient to trigger an Ice Age.

Even if this projection was to be accepted, it would mean anthropogenic climate change, because it would have been influenced by human activity.

2.7 Climate change as a social issue

Apart from being a physical science issue, climate change is also recognised as a social issue because its impacts lead to major social challenges. Dealing with it and finding solutions to the said social issues will further require social interventions, over and above scientific, technological, or economic measures. Clearly, climate change is laden with socio-ecological consequences. Examples of these include typhoons impacting the South Pacific with greater regularity and severity; hurricanes such as Katrina prompting the largest forced migration of Americans since the Civil War (1861-1865); civil conflicts and instability in the Middle East and Africa being linked to climatic changes (Lindberg, 2017); Tropical Cyclones Idai, Kenneth and Eloise in Southern Africa (2019 to 2021) causing massive destruction, including deaths, damage to property, displacement of people and water-borne diseases (see UNICEF, 2021a); and rainfall causing flooding in eastern South Africa in 2022 (see Pinto et al., 2022), resulting in deaths, massive damage to property and the dislocation of thousands of people. The social effects of the cyclones in Southern Africa were also felt in Madagascar, Mozambique, Malawi, and Zimbabwe (Reuters, 2021a). They caused massive social upheavals with the displacement of some 100 000 people and the damaging of infrastructure estimated at some $2.2 billion (see WMO, 2021).



Figure 9: A picture of the destruction caused by Cyclone Idai in the city of Beira in Mozambique.

Source: (UNICEF, 2021a).

Communication scholar, Moser et al. (2010) has argued that while a lot of attention was given to extreme weather disasters, the impacts of climate change were equally important to humans. Riedy (2016) lamented that sociological terms were being less focused upon while natural science or technological and economic responses were prioritised. According to the UN's Food and Agriculture Organization (FAO), global warming had cascading impacts from physical features to people, with economic and social consequences that affect livelihoods (FAO, 2015). For Riedy (2016), the inseparability of climate change from the natural science and economic responses perspectives leads to a realisation that climate change is also a social problem. Climate change is also of interest to sociology because the activities that are responsible for anthropogenic climate change are part of social life. Social activities such as working, eating, heating and cooling homes, among others, lead to GHG emissions that fire up the globe (Riedy, 2016). The World Bank Group (2021) suggested that climate change was inter-connected to patterns of inequality across the world, where the most vulnerable people were more exposed to the wrath of global warming, the most, yet contribute the least to the crisis. This is the case with the African continent which emits the least GHG (just over 3% of global emissions), yet it is more vulnerable to the effects of global warming because of its ecological conditions and economic underdevelopment. As the impacts of climate change increase, millions of people face serious challenges

from extreme weather events, health issues, food insecurity, security, water scarcity, and cultural identity (Basaninyenzi, 2021). The responses often advanced to deal with climate change also have social consequences that are not distributed in an even manner. It is thus that some African scholars and policy makers are questioning whether the continent should not be more concerned with adaptation rather than mitigation of the climate crisis (e.g., African Development Bank Group, 2022). Pushing the case for increase adaptation action on the continent, the African banking group decried that adaptation and resilience do not have the same prominence as mitigation, because global attention has largely focussed on mitigation which gets 90% of global climate finance (African Development Bank Group, 2022).

Victor (2015), a critic of what is regarded as the marginalisation of social sciences in climate change, went as far as claiming that the IPCC was losing its relevance when it came to climate policy formulation because it avoided controversy trying to reach consensus on every respect. They charged world body suffered from what is called the ‘streetlight effect’, which is focusing immense attention on a well-lit pool of the brightest climate science, while ignoring crucial insights by not looking at places that are faraway and the natural sciences alone cannot reach (p. 27). The said insights are from fields such political sciences, anthropology and sociology, which are held as being crucial to public understanding and response to changes on the environmental which are imposed by global warming (Victor, 2015). Generally, social scientists agree and are adamant that these fields effective policy-making towards reduce carbon dioxide in the atmosphere and engender climate change collaboration across the globe. Communication would add to the list.

2.8 Climate change mitigation

All climate stakeholders have found mitigation and adaptation to be the only plausible ways to reverse the climate crisis. These are the only ways the peoples of the world have in their possession to respond to the climate crisis (Brügger et al., 2015). Mitigation reduces the size of GHE, because entails avoiding and reducing CO_2 emissions to prevent warming of the Ea. The World-Wide Fund for Nature (WWF, 2020) has argued that the reduction of will make it easier for the world to adapt to forthcoming changes in climate. However, mitigation will take decades to affect rising temperatures. Therefore, adaptation is necessary to

respond to the changes already taking place. In spite of the climate crisis being one of the greatest challenges of the present times, it should be possible to avoid some of its most severe effects if efforts are made to shift from fossil fuels, in particular, to renewable energy sources to displace CO_2 emissions, an IPCC panel on climate change mitigation report found (Seyboth et al., 2012). Although UN Secretary-General, António Guterres, referred to AR6 a “code red for humanity”, he also affirmed that scientists were confident that disaster could still be prevented if the people of the world were faster to act. It is hoped that deep cuts in GHG emissions would be able to prevent the further rising of temperatures and avert climate disaster (McGrath, 2021). Displacing greenhouse gas emissions that result from the burning of fossil fuels is regarded as being among the most ideal forms of climate change mitigation. If properly implemented, sources of renewable energy not only could reduce the devastating impacts of fossil fuels-based power sources on the environment and the health of humans but could also catapult socio-economic development and allow greater access to sustainable and secure energy (Seyboth et al., 2012).

Mitigation is being taken seriously through efforts to achieve net zero emissions in the next few decades. In this regard, four out of the globe’s six largest economies have now determined timetables to end their carbon emissions (Rathi, 2020). These are the European Union (EU), USA, China, and Japan. Announcing their decision at the UN climate meeting in September 2020, Chinese president, Xi Jinping, said that China, the second largest GHG emitter in the world, would work to reduce emissions before 2030 and reach carbon neutrality by 2060 (Rathi, 2020). Xi’s Announcement was welcomed by many observers, including Climate Action Tracker (2021), who stated that the impact of China’s carbon neutrality before 2060 would be immense because it would reduce global warming estimates by 0.3°C. This would be the single biggest cut from climate policy interventions in a single country (Rathi, 2020). The EU’s is to cut 55% of its emissions by 2030, although they are behind their 40% target, relative to 1990 (Rathi, 2020). The war in Ukraine has propelled European leaders to take energy security and independence from Russian fossil fuels seriously and decide to strengthen energy efficiency measures, accelerated the build-out of renewable energy and move faster to reduce greenhouse gas emissions (Fjellheim, 2022). Thus, the Ukraine war could accelerate the implementation of a more sustainable energy policy in Europe and hasten the achievement of carbon neutrality. However, there have

been concerns that countries such as Germany were resorting to coal for their energy needs to replace gas supplied from Russia that have been reduced as a result of sanctions against that country to punish it for its invitation of Ukraine. The German government has moved to bring around a dozen plants back on the electricity grid and extended the lifespan of several that were supposed to be closing down (Pladson, 2022). Japan pledged a 26% reduction below 2013 levels by 2030, a target that Kuriyama et al. (2019) believe is achievable. Achieving climate targets was boosted by the USA re-joining the Paris Agreement under President Biden, following former President Donald Trump's withdrawal. Under Biden, the USA will achieve net-zero emissions by 2050 (Biden, 2019). The Biden administration will rally the world in efforts to reverse the climate crisis by encouraging major polluting countries to increase their emission reductions targets. America will make sure the commitments that countries make are transparent and enforceable (Biden, 2019). Biden's measures were made law by the passing of a bill, in August 2022, to finance climate change action (see Cowan et al., 2021). However, the world's third largest emitter, India, has targeted 2070 to achieve net-zero, a date that is much later compared to several other nations (Menon, 2022). India has often resisted setting target dates, arguing that western countries should bear a much bigger share of reducing emissions as they have emitted more carbon dioxide and contributed more to global warming (Menon, 2022), through the burning of fossil fuels to power their economies and achieve high standards of living for their citizens. India, a developing country, appears to have made use of the UN framework, which allows developing nations to lower their emissions much later than developed countries (Rathi, 2020).

India's approach that developed nations should bear a greater share of decarbonisation, is shared by several climate stakeholders in Africa. Chuku and Ajayi (2021) have indicated that because of the continent's relatively low emissions some stakeholders have argued that the continent should not concern itself with the cleaning-up process, or mitigation, through emissions reductions. It has been suggested that Africa contributed very little to CO_2 emissions, only 3.8% of the world's total (Sy, 2016). This means that there is little the continent's people could contribute with regards to mitigation. Despite the continent's least responsibility for the world's climate crisis, it faces most of the consequences of the changing climate (Ordu et al., 2021). As much as 48 Sub-Saharan countries, excluding South

Africa, emit a mere a mere 0.55% of global GHG, even though Africa is home to seven out of 10 most exposed countries to the wrath of global warming (Ordu et al., 2021). Arguing the case for Africa to continue using fossil fuels for its energy needs, the scholars indicated that the continent's electrical power demand was guesstimated at 700TWh, which is about 4 000 times the 175GW of solar and wind capacity that was added by the entire world added during 2020. This means the continent could not rely on solar and wind power alone to industrialise (Ordu et al., 2021, para. 2). Thus, it has instead been suggested that the continent should continue to use fossil fuels to power its development. Complicating matters is the fact that abandoning fossil fuels would rob some countries with much-needed income to finance their developmental programmes. This led Ghana's deputy-minister of oil, Mohammed Amin Adam, to tell a conference in Cape Town in November 2022 that there was no doubt that energy transition would be disruptive to oil producers and the economies of the African continent. The deputy-minister argued that the effects of the transition, which ranged from underinvestment in hydrocarbon and consequent revenue losses, would keep Africa the rest of the world (Salau**,** 2022).

Some scholars and policymakers have argued that the continent should instead prioritise adaptation measures to withstand the effects of the climate crisis which tended to be more severe in Africa, compared to other regions of the world mainly due to its economic underdevelopment and poor social infrastructure. However, Africa could benefit from the decreasing costs of renewable energy sources and the sustainable development opportunities they offer. These technologies would also help the underdeveloped continent to extend energy to remote areas, much faster and relatively cheaper. With fossil fuels-based energy sources, it will take much longer to extend energy to some of the most remote areas of the continent. Therefore, renewable energy on the continent is more than a global warming mitigation measure, it's also a path to faster and sustainable development.

2.9 Climate change adaptation

Adaptation to the effects of the climate crisis is necessary because no matter how much success can be achieved from mitigation, past polluting actions have already committed the Earth to warming and climate change and cannot necessarily be

reversed by present and future actions (Brügger et al., 2015). The definition of ‘adaptation’ has been advanced in IPCC reports, which have been evolving over the years. Other stakeholders have also advanced their own characterisations of ‘adaptation’. This proliferation of definitions could be a result of ongoing work in studying climate change rather than an indication of conflicting positions. These descriptions of ‘adaptation’ should rather be referred to as *various* rather than *different* since they reflect an evolution rather than a difference (Cramer, 2008). The IPCC’s AR1 defined adaptation as efforts to minimise the adverse impacts of the climate debacle (IPCC, 1990), while AR2 contended adaptation could be planned or spontaneous and could be undertaken in anticipation or in response to climate disasters (IPCC, 1995).

AR3 offered a rather broad definition that introduced the notion of various types of climate adaptation. It said adaptation was about the adjustment of natural or human systems to respond to expected or already happening climatic changes or their impacts. It adds that the adjustment, should result in the moderation of harm, but also draw beneficial opportunities (IPCC, 2001). This definition establishes a number of types of adaptation, which include prevenient and reactive, autonomous and planned, private and public adaptation. In AR4, the IPCC advanced the definition that adaptation is about initiatives and actions to minimise the exposure of human and natural ecosystems in the face of expected or already happening impacts of global hoping. Writing in the IPCC’s Adaptations Needs and Options report, Noble et al. (2014) took the discussion further when they noted that since the publishing of AR4, the framing of adaptation had gone beyond the focus on biophysical vulnerability to the wider social and economic drivers of vulnerability the ability of people to take action in response The WWF (2020) defined adaptation as the altering of society’s behaviours, systems and ways of life to protect individuals, the environment and economies from the disasters brought about by climate change. AR5 put the definition as follows (IPCC, 2014b, p. 118):

> The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

In AR6, adaptation is defined as measures in response to the changing climate, which are aimed at minimising climate risks and vulnerability through the

adjustment of existing systems (IPCC, 2021). This multiplicity of definitions is an indication that climate change is rather a complex subject beset with contingencies, uncertainties, value-based contestation and feedback, bringing in the need for planning, management and governance approaches that are conducive to addressing the realities that the climate crisis poses (Termeer et al., 2013; Davison et al., 2015). In practical terms, adaptation will entail engaging in action to diminish the harm caused by the changing climate to allow communities to continue with their normal lives in the face of hardships that will be brought about extreme weather events and consequent social upheavals. For Noble et al. (2014), adaptation is necessary since the expected hazards or already experienced consequences of the climate crisis require action to protect people or assets, including ecosystems. Therefore, they add, the need for adaptation is the gap between the potential outcomes of climate change and what would be desired to happen. Accordingly, the goals of adaptation are frequently expressed in a framework of growing resilience. The said resilience should encourage the consideration of multiple objectives, including broad developmental goals and interactions between the environment and society (Noble et al., 2014).

However, in spite of the importance of adaptation, particularly for climate-vulnerable Africa, more resources are spent on mitigation. The African Development Bank Group (2022) suggested that climate adaptation and resilience were yet to gain the same prominence as mitigation as only 3% of global climate funding went to mitigation adaptation. Due to the fact that Africa is highly exposed to climate change disasters, it would make sense to embark on massive adaptation initiatives, including communication, to help communities gain the knowledge to protect themselves.

2.10 Economic opportunities of adaptation and mitigation

While global warming has been portrayed as a catastrophic and a potentially doom and gloom affair, opportunities resulting from addressing the crisis, are now being considered and are entering the lexicon of climate change dialogue. The Global Commission on the Economy and Climate has indicated that bold steps to address the crisis could deliver economic benefits of at least $26 trillion by 2030 compared with a business-as-usual (see 2.11) or *status quo* approach (UNFCCC, 2018). This investment would create 65 million jobs globally (UNFCCC, 2018). While some people fear mitigation actions could harm jobs, the ILO (2018) suggested that

global low-carbon economies would create up to four times the jobs they would destroy around the world. Renewable energy would create some 2.5 million jobs would, offsetting the loss of some 400 000 jobs in fossil fuel-based energy production (ILO, 2018).

Having turned the page on its climate change policy, the US administration under Biden conceptualised the Green New Deal, which it said captured “two basic truths”, namely that the country urgently needed to embrace greater ambition to meet the scope of the climate change challenge, and that the US environment and economy were “completely and totally” connected (Biden, 2019, p. 9). The administration argued that if the country was to harness all its energy and talents, it could turn the threat of the climate crisis into a chance to revive the American energy system and catapult economic development. In terms of the Green New Deal, fresh industries would be established to “reinvigorate our manufacturing and create high-quality, middle-class jobs in cities and towns across the United States” (Biden, 2019, p. 11). This and other initiatives, suggest that steps to mitigate and adapt to climate crisis have inherent immense economic opportunities.

Climate change has given rise to new low-carbon technologies, services and overall industries, which will, in turn, create the possibilities for businesses and countries to take a lead in national and international market in these new technologies (McNamara, 2010). Massive industries and products, ranging from equipment for energy efficiency, renewable energy and low-carbon packaging, have experienced some significant growth in the past years. Opportunities are also observable in clean coal technologies, green information technology, and low-emission vehicles (McNamara, 2010). In its mitigation drive, then UK prime-minister, Boris Johnson, said that to tackle climate change, the country would spend £160 million to generate wind power to make Britain what Saudi Arabia is to oil (Holland, 2020). Although the amount is regarded as falling short of what is needed to make a meaningful dent to emissions (Holland, 2020), the policy indicates an economic opportunity, through the investment of such capital, emanating from efforts to address climate change.

2.11 Business-as-usual approach: costs and benefits

In climate change discourse, the business-as-usual approach is a situation where no climate policies to cut GHG emissions are implemented (Teng & Xu, 2012). This

approach would mean that there would be action to curtail GHG emissions and warming would deliver its full might, resulting in economic impacts mainly affecting in poor countries. When a hot and poor country gets 1°C warmer than usual, it is estimated that it registers a fall in income of 1-2% points in the immediate to medium term. Wealthy countries would not suffer much decline in their incomes because there would be very little impact on their economies from an increase of a 1°C (Kahn et al., 2019). Nonetheless, a 2019 report released by Britain's National Bureau of Economic Research indicated that academics from the University of Cambridge found that all the world's countries would be affected economically by 2100 if they adopted a business-as-usual approach (Matthew et al., 2019). Kahn et al. (2019) argued that all regions of the world would be faced with a huge decline in per capita GDP by 2100 under a business-as-usual approach.

Business-as-usual would shrink the global GDP by 7% because of the destruction that would be caused by various adverse climate change events, with richer countries, such as the USA and Canada losing as much as 10%, or more, of their GDPs by 2100 (Kahn et al., 2019). In this scenario, global temperatures would rise by over 4°C by 2100, affecting economic activity in many countries, with the world's largest economy, the USA, losing 10.5% of its GDP (Kahn et al., 2019). In their estimations, the UK's GDP would go down by 4%, Russia's by 9%, while India, Japan and New Zealand would lose some 10% each. However, they also found that should Canada and the USA keep to the stipulations of the Paris Agreement and cut emissions to limit global temperature increases by 2°C, their GDPs would shrink by just under 2%. Biden's new policies on climate change of reaching climate neutrality by 2100 appears to be gunning for an ambitious goal of growing rather than seeing a decline in GDP.

Needless to state, there will be a cost to implementing mitigation and adaptation measures, although an optimal adaptation to climate change would deliver benefits of approximately four times the costs (De Bruin et al., 2009). A study on adaptation costs conducted by the World Bank (2010) estimated that $70 to $100 billion would need to be spent globally, every year, between 2010 and 2050. Furthermore, a transition to a carbon neutral economy entails risks to both public and private sectors, with governments bearing more of the risk (Huxham et al., 2019). The transition will result in a reduction in the demand and, consequently, the price of commodities such as coal and oil, something that would hurt the economies of

countries that depend on the production and exportation of these commodities. Supportive infrastructure behind the production and distribution of these assets would need to be replaced or abandoned. This infrastructure includes railways, power plants, ports and vessels built for fossil fuels industries, among others. Investors and workers could suffer losses as a result of lower prices of fossil fuels. Governments would have to take lower tax income, yet they would spend immensely to finance transition costs and cushion the blow to workers (Huxham et al., 2019). These are complex issues that would be inherent in transition to low carbon economies. On balance, however, it appears the business-as-usual approach would be unsustainable. The benefits of mitigating and adapting to climate change would have far more long-term benefits to the economy, the environment and the overall sustainability of life on Earth.

2.12 Climate change in South Africa: physical and socio-economic effects

The country's susceptibility to the climate catastrophe is premised on the date of the South African Country Study, which was conducted in 1999 (Rutherford et al., 1999). The study used data from the global climate models, also known as the general circulation models, which are Genesis, the Climate System Model (CSM) developed by the National Center for Atmospheric Research in the USA, and the Hadley Centre Coupled Model Version 2 (HadCM2) developed by the UK's Meteorological Office (UKMO) (Turpie et al., 2002). Scenarios in HadCM2 advanced two postulations regarding sulphate aerosols during the simulation period: one assumes their presence and steady regression, and the other assuming their complete absence (Turpie et al., 2002). Sulphate aerosols are generated by fossil fuels, particularly the burning of coal, and reflect radiation and, therefore, counteracting warming due to amassing carbon dioxide emissions (Turpie et al., 2002). These scenarios are known as HadCM2S, meaning they include the sulphate effect, and HadCM2N, which exclude the sulphate effect.

The effects of climate change in South Africa lead to an average of 47 human fatalities every year due to extreme weather events (Climate Transparency, 2019). With global warming accelerating, the country's people and several social sectors are rapidly becoming exposed to extreme weather events, such as droughts that often reduce crop duration and lead to poor yields. It could get worse: with 3°C warming, South Africa would experience around 50 days of drought per year if temperatures reached an average higher than 35°C (Climate Transparency, 2019).

Furthermore, one of South Africa's major cities and tourism hub, Cape Town, could lose its beaches because of rising levels of the sea prompted by global warming (Dube et al., 2020). The city's major tourism attractions such as, V&A Waterfront, Cape Point Robben Island, and beaches in False Bay are among those facing the high risk of being inundated by rising seawaters (Dube et al., 2020). The researchers found that rising sea levels would be devastating to the city's tourism economy. Approximately 80% of the city's 2019/2020 Blue Flag beaches faced the threat of submerged by rising sea levels, they found. The city experienced a major drought in 2015/7, leading the World Weather Attribution (WWA) to conclude that climate change has significantly increased the likelihood of the drought by about a factor of three (World Weather Attribution, 2018), meaning that warming was a key driver of the drought.

Scholes and Engelbrecht (2021) argued that there was no doubt, from a scientific point of view, that the climate of the southern African sub-continent was getting warmer, particularly in the interior where warming was happening at approximately twice the world average rate. This has resulted in severe climate impacts because of the region's low socio-economic development state. The atmospheric concentration of GHG in Southern Africa is increasing and the sea level surrounding the sub-continent is rising (Scholes & Engelbrecht, 2021). These developments place the region's people at significant socio-economic hardships. However, tackling climate change through various measures could have some advantages to various sector of the economy in South Africa. The agricultural sector, encompassing agriculture, fishing and forestry, is expected to profit immensely from national and international climate change mitigation and adaptation actions (McNamara, 2010). These benefits could include the promotion of organic farming, biofuels development, biomass-based power generation and improved fire control, among others. In this sector, there are considerable opportunities for supporting labour-intensive production because of semi-skilled the increasingly capital-intensive activities. There will be job opportunities for and unskilled labour (McNamara, 2010). Manufacturing could benefit from the introduction of low-carbon technologies in the development of electric vehicles, thin-film solar PV power, in areas of the platinum group metals as a catalyst for fuel cells, and the capturing of hydrogen during syngas production (McNamara, 2010).

The Alternative Information and Development Centre (AIDC) has found that several thousands of jobs could be created from climate change response initiatives. Jobs in this area could extend from wastewater workers to rangers in national parks. The AIDC (2016) projected that most climate-related would be in renewable energy, electric vehicle manufacturing, public transport, agriculture and construction. Professional jobs for graduate engineers and technicians would also be created. Factory workers, construction workers, electricians, drivers would get employment in the new climate-friendly economy (AIDC, 2016).

Because of its dependence on coal mining for energy and export revenues, South Africa faces significant economic risks in transiting to a carbon neutral economy through abandoning or minimising coal-generated energy (Huxham et al., 2019). However, the country could gain through lower oil prices that would result from lower demand for this fossil fuel. The country could enter new markets for minerals used new technologies, such as manganese and platinum. Jobs could also be created in more resilient industries (Huxham et al., 2019). Meanwhile, Le Page et al. (2019, p. 11) see climate change being “a central pillar” of South Africa’s economic growth, arguing that “the primary goal of any truly modern economy is the cultivation of sustained economic growth based on a healthy environment and society”.

With the energy shortage in South Africa, the country appears to be a fertile terrain for mitigation through the installation of renewable energy infrastructure away from fossil fuels-based energy. The country, the biggest emitter on the continent and responsible for about a percent of world emissions (Saleh, 2022), is gradually developing its renewable energy sector due to rising energy demand, which is overwhelming the existing coal power generating plants. Conventional electricity-generating plants are largely to blame for the high emissions observed in the country (Akinbami et al., 2021). Nonetheless, the latest figures show a gradual growth in renewable energy sources, although coal remains the largest source.

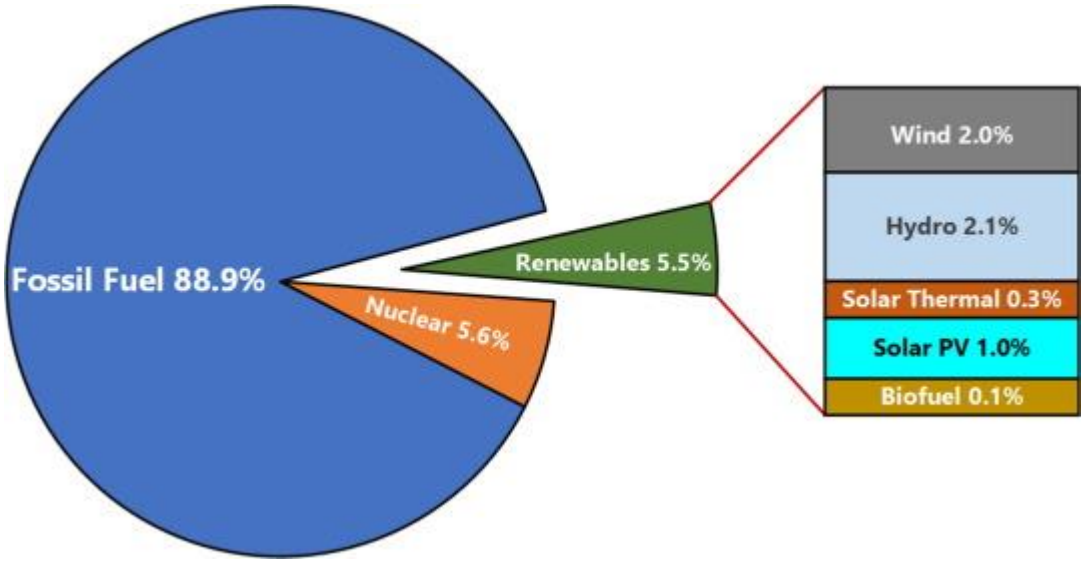


Figure 10: The energy mix in South Africa.

Source: (IEA, 2020).

The cost to move from coal-fired electricity to renewable energy will reach R1.8 trillion by 2035 (Huxham et al., 2019). The Centre for Sustainable Development at the think tank Brookings Institution, put this cost at R3.6 trillion but said there would be several other spin-offs to the economy over-and-above decarbonisation (Omarjee, 2021). The total cost of transition was estimated at R4,4 trillion over 30 years (Omarjee, 2021), although calculations have been fluctuating. Since decarbonisation brings both risks and opportunities, Huxham et al. (2019) argued that South Africa should act proactively to maximise opportunities by adopting renewable energy, which is now cheaper than coal (see 2.12.5).

2.12.1 Social impacts

Climate change has a variety of negative social impacts as it imposes a substantial risk to water resources, health, food security, infrastructure, the economy, and biodiversity, among others. The South African government's 2013 Long-Term Adaptation Scenarios (LTAS) suggest that the effects of warming on the country will mostly be felt primarily on water resources (Department of Environmental Affairs, 2013) as well as food production, health, and the broader economy. Due to the various threats the climate crisis poses to society, Costello et al. (2009) wrote in *The Lancet* medical journal that climate change was this century's greatest threat to health, a major social issue.

Global warming presents several challenges to the region's population as air quality, food security and health would be impacted negatively (Haines et al., 2006). In 2015, air pollution alone is estimated to have led to an increase of 4% in deaths (Cohen et al., 2017). A countrywide analysis of national mortality and temperature data covering 1997-2013 revealed that deaths related to temperature, both cold and hot spells, amounted to 3.4% (Scovronick et al., 2018). The country's aged population is the most vulnerable, because of their reduced thermoregulatory ability, coupled with a more limited resources and mobility to adjust to higher temperatures (Chersich et al., 2018). This data is backed by a study conducted in Johannesburg, Cape Town and Durban that found that a 1°C rise in temperature results in a 1% increase in mortality among the general population, while in those above 65 years of age, the increase is 2% (Watts et al., 2017). Pregnant women face a particular danger from heat exposure, which affects the development of the foetus (National Department of Health, 2018).

Vector-borne diseases are known to thrive in high temperatures. In Limpopo province, high temperatures and changes in rain patterns have been linked to an increase in the deadly malaria disease (Adeola et al., 2017). The changing climate will create fertile ground for the survival of the malaria vector mosquito, known as the a*nopheles arabiensis* (Tonnang et al., 2014; Abiodun et al., 2016). The country's people's health will also be negatively impacted in the occupational space, housing, water and sanitation, among others (Chersich et al., 2018). With the country already facing major health challenges, climate change deserves the health frame, instead of being characterised as a "purely" environmental, technological or economic problem (Chersich et al., 2018, p. 8) so as to enable people to grasp its potential effects.

Researchers in South Africa have detected climate-induced changes in most marine ecosystems, and terrestrial freshwater (Rius et al., 2014; Midgley & Bond, 2015). These climatic variations force changes in genetic, physiological and morphological changes in species as well as their distribution, which affect food production networks and create fertile ground for the transmission of infectious diseases (Scheffers et al., 2016). Table 2 illustrates the various impacts of the changing climate in South Africa.

Projected Change	Services and energy	Human Health	Food security, water and agriculture	Business continuity	Biodiversity
• An increase of 0–1.5°C in daily maximum temperatures for January and 0–1.5°C in daily minimum temperatures for July.	• Increase in requirements for cooling (air conditioning in summer). • Decrease in heating requirements in winter. • Higher rates of refuse decay – more frequent waste collection required. • Greater number of fires – service disruption and damage.	• Increase in heat-related vector and water-borne illnesses. • Possible spread malaria to previously unaffected areas (dependent on maintenance of spraying programmes). • Increase in requirements for cooling (air conditioning in summer). • Decrease in heating requirements in winter. • Heat stress. • Deteriorating air quality due to different dispersion patterns. • Exacerbation of poverty, crime. • Greater number of fires – safety hazard.	• Damage to crops. • Need for better food hygiene (refrigeration). • Land use conflicts between agricultural land and conservation areas used for tourism. • Changes in demand, supply, and quality of water. • Increased demand for water for irrigating green spaces (golf courses, parks). • Loss of certain crops.	• Larger numbers of visitors to coastal areas due to these areas having less extremes in temperatures – pressure on infrastructure and service	• Impacts on species/ ecosystem goods and services which affect tourist attractions. • Increase in the number and extent of invasive species in natural areas. • Altitudinal migration of species. • Extended range of pests and diseases.
• Increased frequency and intensity of short duration heavy rains	• Stress on sewage systems. • Infrastructure heat stress. • Increased cooling energy demand. • Reduction in heating requirements Increase in emergency services.	• Increase in cooling load. Increase in individual and family risk and emergency situations. • Increased load on health care facilities.	• Reduced food production. • Changing disease vectors and possible increase in food poisoning. • Increased water demand and purification requirements. Increase in water borne diseases.	• Fewer visitors due to higher temperatures and drought. Business risk to reduced water availability.	• Stress on green spaces and the critical loss of flood attenuation amongst other services.

Projected Change	Services and energy	Human Health	Food security, water and agriculture	Business continuity	Biodiversity
• Carbon pressures	• Pressure to reduce energy and carbon emissions (could be positive in terms of energy cost savings). • Carbon taxes could affect facility profitability. Carbon pressure on long haul flights could reduce passenger numbers coming to SA (especially from traditional markets of UK and Europe).	• Pressure to use less energy (lower service delivery levels, air conditioning, transport, electricity supply)	• Import of food constrained ("food miles").	• Need for changes in transport modes (away from motor vehicles). • Carbon taxes could discourage people from utilising private vehicles.	• Atmospheric carbon affecting species distributions – woody and invasive species favoured and encroachment into grassland areas, affecting traditional tourist attractions and game viewing

Table 2: An overview of climate change risk factors and prospective impacts.

Source: (Pandy & Rogerson, 2021).

2.12.2 Impacts on agriculture

Agriculture, the main source of food production, is among the sectors facing severe climate devastation. The FAO *(*2019) posited that climate change is lessening the ability of natural resources, to continue producing enough food to meet the world population's nutritional demand. Such resources include soil, water and biodiversity. Thus, food security and climate change are intertwined challenges that need to be addressed concurrently. Warmer temperatures will decrease the harvest of crucial crops, while encouraging the proliferation of pests and weed (Nelson et al., 2009). Rain patterns changes will increase the possibility of production declines (Nelson et al., 2009). Poor rains and increasing temperatures are likely to threaten food security due to reduced crop yields and anticipated livestock losses in South Africa (Mugambiwa & Tirivangasi, 2017). Masiwa (2020) highlighted the following as agricultural sector's main consequences of climate change in the country:

i) Unpredictable weather patterns

The unpredictability of weather patterns will negatively impact farm production. The changes in the distribution of rainfall could either cause droughts or flooding, resulting in the damaging of crops.

ii) Changes in the agricultural economy

Commodity prices could be volatile because it would be not easy for farmers to commit to production volumes.

iii) Forced technological adaptation

The climate crisis is forcing farmers to introduce new technologies in their farming activities to increase efficiencies.

iv) Infrastructure changes on the farm

Farmers are having to make changes to their infrastructure, some having to build additional water reservoirs as contingency plans in case of droughts.

v) Imports of agricultural equipment and technology

Changes in climate dictate new types machinery and input which would require farmers to procure some of them from abroad.

vi) Groundwater and surface water availability

Climate change has negatively affected surface and groundwater availability. Dry spells on land have immensely impacted agriculture because when temperatures rise, soil moisture is lost. That moisture would have been need to support crops during times of little or no rainfall.

v) Soil fertility

Warming causes soil dryness. This affects the fertility of the soil, forcing farmers to make use of more fertilisers to ensure the continued growth of their crops.

Maize production, a staple food in South Africa, will be affected in the entire sub-Saharan Africa where there will be mixed outcomes due to warmer temperatures. While several crops can outstand higher temperatures, increases in excessively

hot days and warm nights coupled with changing rainfall seasons, which will create chaos to planting timetables and crop management, can cause severe damage to agriculture and food production (Johnston, 2019). South Africa's most valued crops, maize and wheat, which are consumed domestically and exported, of which there is not enough to provide for the country's needs, while wine and fresh fruit bring in the foreign currency earnings (Johnston, 2019). All these would be under threat from temperature rises and altering rainfall patterns. While increased CO_2 emissions may favour crop growth, yields would generally decrease under extreme weather conditions (Johnston, 2019; Olabanji et al., 2021). The production of key crops such as dry and soya beans, and sunflower in the Olifants catchment under increased temperatures and decreased precipitation during planting seasons, in scenarios RCPs 4.5 and 8.5, is expected to increase water requirements (Olabanji et al., 2021). A steady decline in crop yield ranging between 19-65%, 11-38%, 16-42%, and 5-30% for maize, soya beans, dry beans, and sunflower, respectively, is also projected under both RCPs climate change scenarios (Olabanji et al., 2021).

There have been calls for funding for adaptation programmes to help in alleviating the effects of global warming. A business-as-usual scenario would "almost certainly guarantee disastrous consequences" for South African agriculture (Nelson et al., 2009, p. 17). Agricultural communities, subsistence or commercial, will require various interventions to equip them with all the necessary tools to fight climate change. Communication to raise awareness, educate and mobilise response, is one such tool.

2.12.3 South Africa's political economy vis-à-vis climate change

Understanding South Africa's climate change issues requires an analysis of one crucial aspect of the political economy of the country. The country treats minerals and energy as the cornerstone of the country's economy, which led Fine and Rustomjee (1996) to coin the term *minerals-energy complex* (MEC). MEC explains that the country's minerals and energy sectors have a massive influence on politics, which is disproportionate to their economic contribution (Fine & Rustomjee, 1996). With strong support from the state, the country intensified its dependency on coal for energy in the 1970s, leading to large investments in new coal mining, coal energy plants, coal-to-liquid fuels factories, and a massive increase in the exportation (Burton, 2011). The post-apartheid government did not

follow a different path when it took over in 1994. It instead adopted MEC policies that prioritised mining and related activities in electricity and liquid fuel supply (Marquard, 2006) production and exports. The post-apartheid government increased its dominance, resulting in a decline in non-MEC manufacturing and consequent poor socio-economic development and increased unemployment (Burton, 2011). The government's continued MEC approach has been illustrated by continued state support for new coal energy plants, state subsidies for privately-owned plants, government money being poured into coal extraction and the state's own participation in coal mining, combined with price regulation for liquid fuels that protect the coal to liquid fuels conversion, thus creating a carbon lock-in (Burton et al., 2018). This development path has led to high GHE, poverty, inequality, and unemployment (Winkler, 2018) and "is the context in which to undertake ambitious climate policy" (Winkler et al., 2020, p. 5). Given the MEC, taking action to reduce GHE from mainly coal activities could be costly for South Africa, in terms of potential earnings, and could add stress to socio-economic difficulties (Winkler et al., 2020). According to Winkler at al. (2020), many with interests in the coal value chain have a vested interest in continuing with the business of coal. This sort of political economy makes it difficult for the country to take bold steps to reduce GHE by curtailing dependence on coal for energy as doing so would create a "very high political sensitivity to employment gains or losses" (Winkler et at., 2020, p. 5). This PhD study is particularly concerned with enquiring as to whether the country's key climate stakeholders have communicated climate change in ways that advance MEC policies or encourage a genuine response to the climate crisis.

2.12.4 Economic impacts

With climate change already being seen as among the propellers of economic inequalities among the countries of the world (Diffenbaugh & Burke, 2019), its impact on economies such as that of South Africa is expected to be huge. The economies of poor tropical countries would be 24% larger if it was not for global warming that affects various spheres of economic activity (Diffenbaugh & Burke, 2019). The world's 0.3°C to 0.6°C increase during the past century (IPCC, 1990) exacerbated warming, which in turn led to crops failing, economic productivity decreasing, and people becoming sick or dying from diseases resulting from increased heat (Diffenbaugh & Burke, 2019). However, this was only the case in poor countries, in the main. Rich countries of the north benefited from global

warming in several ways. Diffenbaugh and Burke (2019) found that over-and-above benefiting directly from using fossil fuels to poor their economies, many wealthy countries most likely benefited from global warming itself (Diffenbaugh & Burke, 2019, p. 9812). Their research calculated temperatures and economic growth between 1961 and 2010, and found that rich countries, mostly in colder climates, registered growth increases during unusually hotter years. During the same period, South Africa's average temperature was around 17°C, which is outside the 13°C economic growth optimum. In this regard, South Africa would have been between 10% and 20% richer, without the hotter temperatures in that period, while fellow Global South countries of India and Nigeria would have been 30% and 29% richer, respectively (King, 2019). Norway, one of the coldest countries on Earth, is 34% richer due to warming as data show that crops tend to be more productive, and people healthier and more productive when temperatures are not too hot or too cold (King, 2019). In this regard, climate change is costing South Africa at least 10% of its GDP (King, 2019).

One of the economic sectors that will feel the harmful impacts of warming is tourism, which is an important driver of economic growth in most countries, including South Africa. The sector relies heavily on climate for its success (Hall et al., 2015). For example, the April 2022 floods in KwaZulu-Natal cost the economy as much as R7 billion (Reliefweb, 2022), with tourism suffering a direct-spend loss of R30m, which translated into a R74m GDP loss and 155 temporary job losses (Dawood, 2022). Output figures provided by the World Travel and Tourism Council (WTTC, 2020) indicated the centrality of tourism to the economy. In South Africa, tourism's contribution to GDP reached 7%, contributing R354.9 billion, 1 483 200 jobs and R129.9 billion (8.6%) of total exports in 2019 (WTTC, 2020).

There are projections that climate change will alter the resource base upon which many forms of tourism are developed and depend on (see Gómez-Martín, 2005; Saarinen et al., 2012; Kilungu et al., 2019). In this sector, the effects of the Earth's warming will be felt in tourism attractions, which are mostly in conservation areas in South Africa (Coldrey & Turpie, 2020), coastal regions (Pandy & Rogerson, 2021) and urban areas (Pandy & Rogerson, 2019). The IPCC (2013) estimated that at current emission levels, global mean surface temperatures will increase by 2°C (likely range of 1.4-2.6°C) by mid-century and 3.7°C (likely range of 2.6-4.8°C) by 2100, compared with 1986-2005 temperatures. Tourism is a contributor to GHG

through travel and general consumptions of various goods. Tourism's global contribution to GHG emissions was estimated to be approximately 8% between 2009 and 2013 (Lenzen et al., 2018) higher than Africa's total of 3.8% (Sy, 2016). In some respects, tourism will possibly be more exposed to climate change than other economic sectors (Dogru et al., 2019).

2.12.5 South Africa's coal dilemma

South Africa's contribution to CO_2 emissions is exacerbated by its reliance on coal for its energy, which accounted for 81.8% of total electricity-generating sources in the first half of 2021 (Calitz & Wright, 2021). As a coal producer, South Africa boasts the fifth largest recoverable coal reserves globally, which are estimated at 66.7 billion tons (Department of Mineral Resources, 2016). It is also estimated that the country has enough reserves to produce coal for more than 50 years into the future (Ratshomo & Nembahe, 2019). Apart from being heavily dependent on coal for its energy, the country exports the commodity and earns much-needed foreign currency. In 2016, South Africa exported 24% of its total production (Ratshomo & Nembahe, 2019) and 64.87 million tonnes of coal were exported in 2021 (Li, 2022).

Although coal was discovered in South Africa over 100 years ago, it was only around 1923 that mining of the commodity began. Since then, coal has been used in space heating and cooking and replaced hydropower as the main source of energy (Mathu & Chinomona, 2013). Coal is credited with having expedited the industrial and agricultural development of South Africa (see Mathu & Chinomona, 2013, p. 347). The Minerals Council of South Africa (2020), the mining industry's employers' organisation that supports and promotes the country's mining sector, has pointed out that the coal sector employed 92 230 workers in 2019, who took home R27.9 billion in annual wages and represented approximately 19% of total workforce in mining. Some 258.9 million tonnes of coal were mined in 2019, which sold for R139.3 billion (Minerals Council of South Africa, 2020). The industry generated a net investment of R4.5 billion in 2010, declining by an average of 15%, per year, to the R2.5 billion realised in 2018. In 2019, the sector boosted the country's economy by procuring goods to the tune of R61 billion from other sectors. As such the sector is reputed for making a massive contribution to the creation and maintaining of jobs in diverse industries (Minerals Council of South Africa, 2020).

However, with all its contributions to the country's economy, coal is also South Africa's biggest contribution to pollution and GHG emissions, adding an average of 80 million tons of CO_2 emissions to the atmosphere every year (Ritchie & Roser, 2017). Coal is further blamed for impoverishing nearby mining communities as a result of pollution that causes various types of diseases. South Africa's power utility, Eskom, estimated that 333 people were likely to die every year from coal from emissions from coal power stations and that the health cost would reach R17.6 billion from the mortalities (Gosling, 2018). Now defunct news website *New Frame* journalist, James Puttick, told the story of the abandoned Imbabala and Goldview mines, in Mpumalanga Province, that left communities impoverished without adequate rehabilitation funds after the mine ceased production:

> Impoverished communities in Mpumalanga know all too well that life near the coal mines, whether they're active or abandoned, means danger, pollution, illness and even death … While the mining companies have moved on to greener pastures, the Wesselton (outside Ermelo) community has been left exposed to the multiple hazards of polluted rivers, toxic mine tailings and a landscape dotted with blackened pits and unstable shafts. Livestock are poisoned, people get sick, and many residents have lost their lives, among them children playing in the abandoned shafts (Puttick, 2020).

Despite its GHG-emitting problem, energy from coal has become more expensive than that generated from renewable sources (Steyn, 2018), therefore it is risks going out of favour as a key source of energy. Costing comparisons reveal that coal prices have risen 300% in the past 20 years. According to Steyn (2018), international renewable auctions were already achieving prices well below $20/MWh. Therefore, Steyn (2018) is of the view that South Africa's energy utility, Eskom, could save money by procuring renewable energy to displace energy from most of the existing coal-fired stations. Indeed, Eskom and Sasol, another major user of coal, are making moves to transition from the commodity. Eskom, who generates 80% of the country's energy by operating 15 coal-fired power stations, has also announced plans to transition from coal (Reuters, 2021c). Sasol announced in late 2021 that cease new investments in coal reserves and would triple its 2030 GHG emission reduction targets from 10% to 30% (Stoddard, 2021).

Coal has also been ditched by investors who are under pressure from environmentalists amid climate concerns and the fear that it is a sunset commodity.

In what has now become a constant occurrence globally, local and foreign investors have pulled out of the 630 MW Thabametsi coal power plant project in Limpopo (Toyana & Heiberg, 2020). The country's largest four banks, namely Absa, First National Bank, Standard Bank and Nedbank, withdrew investment from the project after they were targeted by environmental activists (Toyana & Heiberg, 2020).

Although coal may be the biggest culprit when it comes to South Africa's GHG emissions, there are other pollutants that require attention in the country's mitigation efforts. Direct and indirect energy-related CO_2 emissions from buildings account for 22% (Climate Transparency, 2019), transport emissions come to 14%, with road transport alone contributing 90% of this sector's emissions, according to the International Institute for Sustainable Development (Ahjum et al., 2020).

2.12.6 Renewable energy in South Africa

Renewable energy, also known as alternative energy, is regarded as key in the effort to reduce GHG, because it helps in reducing CO_2 emission, thus tackle climate change, fight environmental degradation and guarantee energy security (Sanedi, 2020). Renewable energy offers several advantages as it is generated from non-exhaustive sources and, most importantly, guarantees no CO_2 emissions (Sanedi, 2020). It can be used in the grid as a power generation or source of stability for the electricity network; as a supplementary source of energy in non-grid environments, and in biofuels, as biodiesel or bioethanol. Renewable energy is slowly growing in the country, with figures from the first half of 2021 showing a contribution of 11%, made up of solar PV, wind, hydro, concentrated solar power and others, while the total contribution of zero-carbon energy sources, comprising renewables and nuclear, amounted to 14.3% (Calitz & Wright, 2021).

Although South Africa is endowed with wind and solar energy and enormous biomass potential, there are several challenges that need to be overcome to make renewables the primary source of energy and replace coal. These, according to Akinbami et al. (2021), include technical knowledge, financial considerations, policy, and environmental challenges.

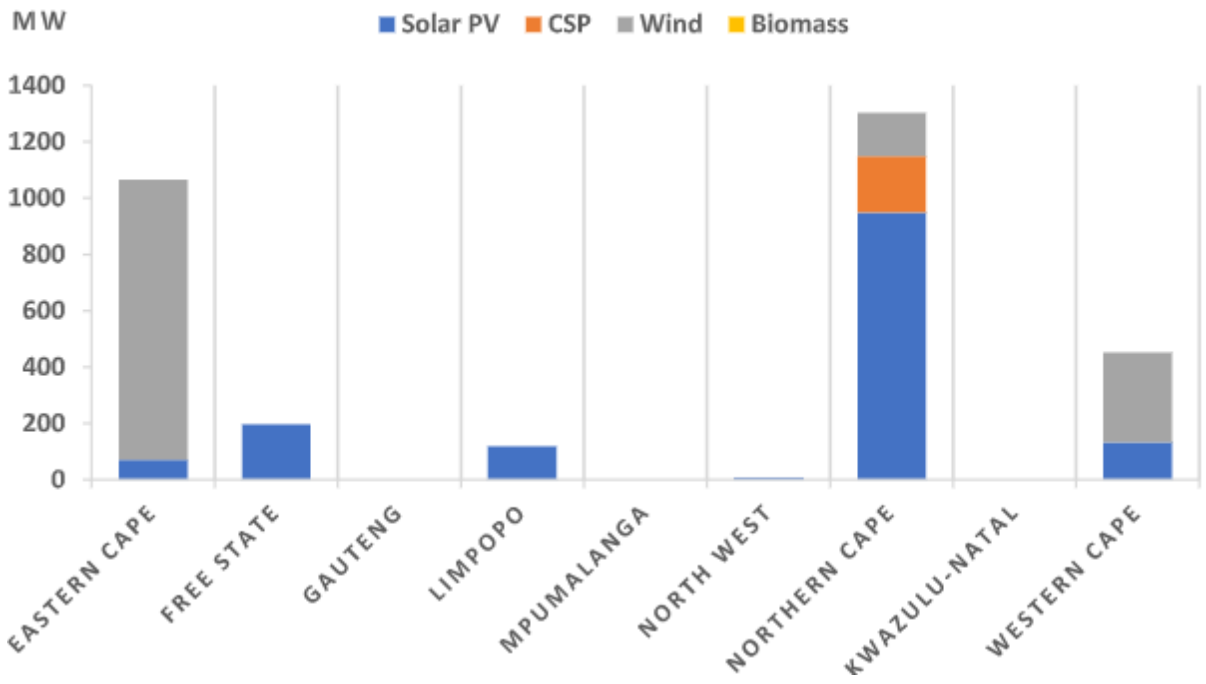


Figure 11: Overview of renewable energy sources by province.

Source: (Akinbami et al., 2021).

Renewable energy is becoming a viable option to coal-generated energy (Ratshomo & Nembahe, 2019), and could become an investment magnet for the country, given the abundance of wind and sun. The country is considered a prime destination for renewable energy investment (Ratshomo & Nembahe, 2019). The Independent Power Producers Procurement Programme (2019) ranked the country in 12th position of renewable energy generation most attractive investment destinations. According to Ratshomo and Nembahe (2019), South Africa has already reached 57% towards the 2020 target and 22% towards the 2030 target in the implementation of renewable energy projects.

2.12.7 Mitigation and adaptation policies

In South Africa, mitigation actions are planned in terms of the Nationally Appropriate Mitigation Actions (NAMAs) (McSweeney & Timperley, 2018), which is a plan introduced by the UNFCCC to guide developing countries. The NAMAs are made up of policies directed for transformational change within an economic sector or across sectors within a country. The country's energy plan is the cornerstone of mitigation against global warming and is to see South Africa shift away significantly from the coal-generated electricity to gas and renewables

(McSweeney & Timperley, 2018). While coal will continue to play a role for decades to come. New coal power stations are planned for building after 2030 and four-fifths of all coal energy capacity will be closed by 2050 (McSweeney & Timperley, 2018). The cabinet has also approved by the Integrated Resources Plan on 22 August 2018 to be the country's electricity infrastructure development blueprint (Department of Energy, 2018). The plan places renewable energy from wind and solar at the forefront of South Africa's future energy mix (Govender & Dempster, 2019).

Adaptation action in South Africa seems to have been given little attention. The devastation caused by the 2022 floods in KwaZulu Natal, for example, was blamed on a lack of adaptation measures. Inadequate climate adaptation measures and obsolete infrastructure aided the flooding (Engelbrecht et al., 2022). Having conducted a literature review of some 820 academic publications, Chersich and Wright (2019) found that there were very few studies on adaptation. While several policies had been developed at all levels of government, their attention to health, for instance, was slight. The policies also demonstrated little concern for the specific needs of exposed groups (Chersich & Wright, 2019). Their analysis found that there was little evidence of the country's readiness for extreme weather events, or the ability of the health system to respond to outcomes of the said events.

The government has instituted the National Climate Change Adaptation Strategy (NCCAS), which charts the country's vision for adaptation and resilience to the climate crisis, and outlines areas of priority for attaining the vision (Department of the Environment, Forestry and Fisheries, 2019a). The vision draws on South Africa's National Climate Change Response Policy, the NDP, the National Strategy for Sustainable Development, the adaptation commitments included in its NDCs, sector adaptation plans, provincial adaptation plans and municipality adaptation plans (Department of Environmental Affairs, 2011). In 2013, the administration established the LTAS project with the aim of developing adaptation scenarios for a range of possible future climate conditions and development pathways to facilitate the integration of climate resilience in development planning in the future (Ziervogel et al., 2014). However, some of these plans appear to end up on the paper they are written on as there is little to no evidence of the implementation of the said plans.

2.13 Summary

The literature that was reviewed for this PhD thesis, discussed the climate change science and sought to outline its various aspects. Most important, the review discussed the crucial aspect that climate change is more than a physical science, but also a field of social sciences research. This is crucial for this PhD study in that it is located in the social sciences arena. The literature makes it abundantly clear that climate change is real and that most sectors of society throughout the world are hard at work trying to address it. South Africa is discussed as expressing good intentions to respond to the climate crisis, albeit with controversies surrounding disagreements at cabinet level. These disagreements are of serious concern because they could be responsible for the sluggish implementation of various policies to address the crisis. The sometimes contradictory messages from members of the cabinet constitute miscommunication and are not to efforts to address the climate crisis.

CHAPTER III: COMMUNICATION AND CLIMATE CHANGE COMMUNICATION SCIENCES

3.1 Introduction to communication science

Although climate change communication should be studied separately from communication studies (Moser, 2016), it is nonetheless necessary to analyse the broad field of communication when discussing the subject because it uses processes similar to communication science. Communication is often studied under the mass communication field, which was defined by Berger and Chaffee (1988) as a science about understanding the production, processing and effects of symbol, and signal systems by developing testable theories which contain lawful generalisations that explain phenomena associated with production, processing, and communication effects. However, McQuail (2010, p. 22) argued that while this definition is regarded as mainstream, it is biased in favour of the quantitative study of communicative behaviour and its causes and effects, making it inadequate for dealing with the nature of "symbol systems and signification", which constitutes the process by which meaning was given and taken in diverse cultural and social contexts. Accordingly, it is impossible to find a single definition of communication science that many scholars agree with (McQuail, 2010). This is due fundamentally to the fact that there has never been an agreed definition of the central concept of communication (McQuail, 2010). Van Ruler (2018) also argued that scholars have never agreed on what communication, or to communicate, actually means.

Earlier scholars, such as Dance (1970), made an effort to define communication by analysing 95 definitions from other scholars and established that they differed immensely. Dance (1970) concluded that communication must be theorised as a family of associated concepts rather than a unique concept to avoid "dissension, academic sniping and theoretical divisiveness" (p. 210). More recently, Finnegan Jr and Viswanath (2018) advanced their own definition that suggests that communication is the production and exchange of information and meaning, using signals and symbols. The communication process, they added, involved encoding and conveying messages, receiving, and decoding them, and synthesising information and meaning. In the context of climate change communication, communication might simply mean providing communities with information about global warming, its impacts, as well as measures to stem them and adapt to the crisis. This exercise should be a process where communities are not mere empty

drums waiting to be filled with information, but people who should be engaged in a way that makes them part of the process. Such communication should also aim to empower society to identify and accrue benefits from the various efforts to address the climate crisis.

3.2 Origins of communication and purpose

From ancient times, humans have been forced to be creative with communication and keep it consistent to maintain a common understanding (Novak, 2019). In a study of the origins of communication, Tomasello (2008) argued that co-operative communication by humans first emerged in the natural gestures of pointing and miming. Conventional communication, first gestural and then vocal, only evolved after humans already possessed these natural gestures and their shared intentionality infrastructure along with skills of cultural learning for creating and passing along jointly understood communicative conventions. Tomasello (2008) argued that human communication was grounded in the fundamentally co-operative and shared intentions of humans. There is a connection between the fundamentally co-operative structure of human communication and the particularly co-operative structure of human social interaction as opposed to other primates. Human co-operative communication rests on a psychological infrastructure of shared intentionality, which evolved originally for collaboration and culture, more generally (Tomasello, 2008). This theory suggests that the basic purposes of the infrastructure are helping and sharing – meaning that humans communicate to request help from one another, inform others of helpful activities, and share attitudes as a means of bonding within the cultural group.

In climate change communication, scholars strongly argue for employing interaction between all stakeholders that goes beyond the one-way and the two-way communication lenses, as is here ably outlined. Van Ruler's omnidirectional diachronic lens emphasises the internal and external arenas of meaning presentation, negotiation, construction, and reconstruction. This focus seems to respond to the sort of interaction that is needed in climate change communication.

3.3 Communication theory

Communication theory refers to the body of concepts that constitute our understanding of the communication process (Littlejohn, 1983). Communication entered scholarship following technological advancements and literacy after World

War I, during which several scholars developed an interest in studying the discipline (Littlejohn & Foss, 2011). The study of communication as a scholarly subject has its roots in the USA where there was desire to enhance the then emerging technology to improve people's lives by disseminating information that would help achieve these objectives (Littlejohn & Foss, 2011). Researchers found communication to be one of the means to improve relations among people, had an impact on decision-making by those in authority, and affected people's lives positively (Littlejohn & Foss, 2011). In this regard, communication is acknowledged as one of the fundamental elements underpinning human life: without it, it would be impracticable for humans and institutions to achieve some of their goals.

Gerbner (1985) outlined three main fields of communication research as follows:

- *Semiotics* is the study of signs and symbols on how they combine to convey meaning in diverse social contexts. The field is mainly concerned with researching the way in which verbal, non-verbal, visual, and oral signs and symbols combine to create messages.
- *Media effects* study the behaviour of individuals and their interaction subsequent to their exposure to messages. This field emphasises measuring, explaining, and predicting communication effects on knowledge, perceptions, beliefs, attitudes, and public opinion. Scientific methods from the fields of psychology and social psychology strongly influence media effects in the context of Gerbner's fields of communication.
- *Message production* studies the large-scale organisation of communication through institutions and systems, such as mass media, governments, political organisations, and advocacy groups, among others. It explores their history, regulation, and policy-making impact, from a communication point of view. This field is influenced strongly by scientific methods from sociology, and by the methods of history, public affairs and political science.

The various perspectives of communication theory would add much value if they were discussed from the point of view of the achievements of any communication process. Climate change communication appears wounded in that it has so far failed to get people to respond to messages positively and aptly about the climate crisis. This is an area of concern that warrants massive research to understand

why people do not change their behaviour in spite of massive climate change communication, at least in western countries.

3.4 Science communication

Climate change being primarily a physical science subject, is often communicated within the ambit of science communication. Indeed, it has been argued that poor science communication is the cause for a lack of understanding of science, including climate change, within society. This, in turn, accounts for the fact that consensus among scientists about climate change is often not sufficient to win over people (Kappel & Holmen, 2019). Such consensus appears to be taking place in a conversation among scientists and not involving other members of society. Therefore, studying climate change communication necessitates a cursory overview of science communication since it has been argued that science communication is perhaps the only instrument that enables most people to learn about events and other developments that affect their lives and the lives of others (climate change included) (Treise & Weigold, 2002). Science communication not only informs people about what is happening in scientific spheres, it also contextualises scientific activities in a broader perspective. Thus, it provides the public with information that is essential to form opinions about public policies and the costs and benefits of government spending on science (Treise & Weigold, 2002). An additional benefit of science knowledge, according to Nelkin (1995, p. 2 in Treise & Weigold, 2002), is to aid "the individual's ability to make rational personal choices". For Shortland and Gregory (1991), an informed public may refuse to associate responsible science with irresponsible science. Science communication informs, educates, shares achievement, and raises awareness of research findings. Society needs science as a driver for social, economic, and political success, while science lives off the resources, talents and freedom that the society makes available (Jucan & Jucan, 2014). These are among the key arguments for the relationship between science communication and climate change communication.

Nevertheless, in spite of the said need to communicate science, there is observable abstinence of science communication with no serious evaluation of communication programmes, and studies of trust in science remaining methodologically weak and seldom related directly to specific communication programmes. Weingart et al. (2019) blamed, among other factors, vested interests

that engage in communication programmes for pure public relations gains. Universities that compete for public funding, students, and positive general attention to enhance their legitimacy, engage in communication focused on and limited to press releases about new research discoveries. This type of communication has often been mere public relations exercises as it is explained by the “dramatic” growth of communication professionals at universities (Weingart et al., 2019, p. 5). These authors believe the consequence of this communication approach is that the focus of research institutions, universities and individual researchers is increasingly shifting from information and knowledge transfer to reputation control and image-building. On the other hand, closer relations between science and industry have called into question the presumed impartiality of science and the openness of scientific communication (Jucan & Jucan, 2014).

The advent of social media platforms presents another challenge to science communication. Facebook and Twitter, in the main, facilitate direct communication between scientists and the public without the traditional journalistic mediation. Therefore, these platforms are earning applause from universities, and scientists alike, for their promise to expand their reach and capture public attention at a much larger scale (Weingart et al., 2019). However, the social media platforms are notorious for spreading false information, such as in the case of anti-vaccination groups who use these mediums to spread their ill-conceived views. The scholars charged that political and economic interests have also used these platforms for propaganda purposes, leading to a waning of trust in social media as a tool for science communication. Needless to state, it will be crucial that all stakeholders in science improve their communication as the country, and indeed the world, are facing various challenges of a scientific nature such as climate change and Covid-19. It is now clear that science communication should not be intended for the affluent and policymakers only, but it should also reach ordinary communities since they are also stakeholders of the various scientific developments. Arguments of ordinary people not understanding science, therefore there is little purpose in communicating it to them, are precisely the challenge that needs to overcome. Those involved in science are challenged to make it understandable to all in society.

3.5 The evolvement of climate change communication

Climate change communication evolved from a scenario in which gloal warming and the consequent climate change science was not in doubt, albeit with uncertainties about the proportion of its anthropogenic nature. However, communicating the results of the science to the public has been a challenge (Tickell, 2002) that has accelerated the need to communicate the science in better ways and to more people. In the 1980s, the early years of climate change discourse, awareness of the issue was limited to scientists, in the main, with public awareness being relatively limited (McBean & Hengeveld, 2000). Policymakers were oblivious to the dangers of climate change until the first clear warnings about its risks emerged in October 1985 at a meeting of international experts in Villach, Austria. Here, policymakers were warned that various important economic and social decisions regarding long-term projects were based on assumptions of previous climate data. These were no longer good assumptions because the data they were based on was no longer reliable as a result of the changing climate (McBean & Hengeveld, 2000). This event was followed by several engagements involving scientists and policymakers that led to the UN's IPCC being established in 1988. However, not everyone was on board in terms of agreeing with the science of climate change in these early days, something that complicated communication of the climate crisis.

After the releasing of the IPCC's Second Assessment Report in 1995, several scholars took to pen and paper, writing essays and opinion pieces in newspapers expressing varied points of views, some of which were critical of IPCC processes (McBean & Hengeveld, 2000). One such criticism was penned in the American *Wall Street Journal* by former president of the US National Academy of Science, Dr Seitz, who charged that the final IPCC text in AR2 was edited to remove sceptics' views that human activities were having a major impact on both global warming and climate change (Seitz, 1996). Furthermore, Seitz (1996) disputed the notion of anthropogenic climate change, arguing that claims of human activities causing global warming deceive policymakers and the public into believing that there is scientific evidence to that effect.

As the debate between consensus and sceptics gathered pace and scientists remained reluctant to communicate climate change, the media enjoyed giving time and space to controversial views of contrarians, leading to confusion among

members of the public. McBean and Hengeveld (2000) argued that the ineffectiveness and reluctance of the science community to effectively communicate climate change research outside its circles has given prominence to the voices of those critical of scientific findings including those that are regularly issued by the IPCC. There were also some fossil fuels interests, who employed often unqualified scientists as well as tailor-made think-tanks to create deliberately misleading information about climate change as a tactic to create confusion and sabotage climate change communication (Davidson, 2008; Jacques et al., 2008; Moser, 2010). The mass media would be used to channel such misleading messages and lobbyists would be employed to intentionally create the impression of inadequate scientific understanding of global warming among policymakers, in particular. Consequently, basic understanding of the climate problem remained shallow and susceptible to recurrent revision of the data (Moser, 2010). This state of affairs led to the birth of climate change communication as a professional and scholarly subject.

The birth of climate change communication scholarship was not from the typical field of communication studies, but from people such as activists, social scientists and communication professionals who were involved in communicating climate change and wished to ensure that their work is supported by empirical evidence (Moser, 2010). The evolvement of climate change communication into a scholarly research subject has made it possible for the discipline to stop relying on relevant, but untested studies from other related fields of research (Moser, 2016). Researchers have since developed several key methods for communicating climate change. The more common approaches to climate change communication research entail surveys, interviews, or focus groups (Lee et al., 2015). Within this context, researchers concentrate on studying the role of values, beliefs, world views, identity and meaning making in climate change communication (Crompton, 2011; Persson et al., 2015).

One of the key findings of these ongoing studies is that climate communication can resonate with different audiences if approached from the point of view of value frames (CRED, 2014). This is important because it has been argued that a mere survey quantifying climate change communication would fail to unearth whether the messages being conveyed are helpful in driving understanding and response. In this regard, Severson and Coleman (2015) argued that one of the effects of

issue framing on climate policy is that frames that conservatives are responsive to, such as religious morality and economic efficiency, fail to change support for climate policy among people who do not share these beliefs. On the other hand, frames that accentuate science, secular morality, and economic equity have the potential for increased public support for climate change policies (Severson & Coleman, 2015). These tend to highlight immediate as well as long-term benefits to which people promptly warm up to.

Climate change communication researchers have introduced a varied pool of communication tools for specific use in climate change communication, instead of borrowing from other disciplines. One such tool is imagery, about which Gruber and Dickerson (2012) believe played a crucial role in conjunction with the text to create a persuasive effect. Research has found that powerful images can assist in achieving public understanding of climate change, given the complexity of the climate crisis (Nicholson-Cole, 2005). While textual material is understood in a logical, linear, manner, visuals can entice an emotional response and can also make the material more salient and memorable. Following a study to test audience reaction to the use of images in climate change communication, Corner et al. (2015) identified seven principles for visual climate change communication: i) show real people and not staged photo opportunities; ii) show fresh visuals; iii) show climate causes at scale; iv) show emotionally powerful images; v) show images of local impacts of climate change; vi) be careful of pictures of activists protests to avoid reinforcing that climate change is for activists; vii) understand the sort of images that will attract attention of the intended audience. The increasingly image-focused digital landscape suggests that images of climate change have a pivotal role in building public engagement. A better understanding of how these images are used and understood by the public, is key for communicating climate change in a way that will engage and capture the attention of audiences (Wang et al., 2018).

3.6 Effective communication of climate change

While climate change has been regarded as a physical science issue, there is growing consensus about its broad ranging impacts, and the much-needed mitigation strategies suggest that it is of immense significance to all people in society, cutting across interests, sectors, and nations. Thus, there is recognition that the traditional fact-centred way of communicating information about climate

change is not necessarily the best strategy for engaging cross-sections of society (Badullovich et al., 2020). This has necessitated the employing of the ‘effective communication’ theory which is about ensuring that messages being communicated get across to audiences in the way they are intended. The theory involves capturing the audience's attention, ensuring the recipients of the message understand the idea the message is trying to convey, and encourage the audience to act on the information by means of applying its instructions or providing feedback. In this regard, frames have been used to highlight the importance of certain attributes of an issue over others, thus shaping the ways in which that issue should be understood (see 4.7).

Moser (2016. p. 5) highlighted effective communication when outlining “key” elements of the communication process. According to Moser, effective communication requires detailed understanding of the communicators’ target audience. In this regard, researchers have to spend a considerable amount of time to better understand different audience types and segments within and across national, sectoral, and age samples (Moser, 2016). Here, the role of values, beliefs, worldviews, identity and meaning-making are most important for researchers and communicators alike (Kahan et al., 2012; Gioli et al., 2014; Persson et al., 2015). Moser (2016) says among the advantages of this approach is that researchers and communicators hear, perceive, make sense of and judge incoming information through the filters of culturally transmitted values. Secondly, the values people hold affect not only their perceptions and interpretations of the climate and their acceptability of climate science, but also the acceptability of anticipated or proposed behavioural changes, technological solutions or climate policies (Moser, 2016). This approach leads to climate communication either meeting acceptance or resistance, thus being made more resonant for different audiences because it has been approached through value frames (Holmes et al., 2012; Dietz, 2013). Moser (2016) pointed out some key elements of effective communication that have evolved over the years of communicating climate change:

- Communication channels and forms: This reflects the crucial importance of channels and forms for the communication process because of the paramount importance of the media in conveying, translating, interpreting and giving meaning

and importance – or not – to the complex scientific and policy aspects of climate change.

- Communicating mitigation and adaptation: Research into ways to move people from awareness of climate change to response and behaviour change.
- Mass mobilisation: Framing climate change in ways that can motivate people to take action to address the crisis.
- Dialogic forms of communication: a shift from the deficit-model driven unidirectional communication to dialogic communication (see Chapter 4.1).
- Long-term and deeper engagement: Devising of ways to communicate climate change for a long haul.

Into the future, new topics and needs will emerge in the quest to achieve effective communication. These will include the needs and ways of communicating different types of climate mitigation/energy solutions, such as renewables, carbon capture and storage and nuclear energy, among others (Gabrys & Yusoff, 2011; Yusoff & Gabrys, 2011), adaptation options in different sectors (Davies & Sarpong, 2013), as well as the spectre of the of geoengineering (Porter & Hulme, 2013; Blue, 2016). African scholars, in particular, will be challenged to come up with ways to implement effective communication in an African context that will meet the needs of the continent's people. It has been argued that climate change communication on the continent, including media coverage and scholarship, has been dominated by the western view of climate change thus failing to resonate with African audiences (see Oyedele, 2015; Elia, 2019; Mahl et al., 2020).

3.7 The intricacies of climate change communication

Climate change and related subjects, such as global warming, are a difficult subject to understand due to the intricacies of the science that underpins them, the uncertainty of climate science projections, and the diverse technologies and policies needed to deal with the issue (McCaffrey & Buhr, 2008; Pidgeon & Fischhoff, 2011). These factors make the task of communicating on the climate crisis very difficult. Complicating matters is that communicating climate change often involves conveying messages that pose challenges. Rayner and Minns (2015) characterised climate change communication as communicating unwelcome climate messages, which few people wanted to hear. Furthermore, the field of climate science is evolving as quickly as scientists bring out new evidence.

Sometimes, this create the impressions that climate scientists are confused and are emitting contradictory messages. Observed sea ice melt and changes in ice sheets, for example, are occurring faster than various models had forecast (McCaffrey & Buhr, 2008). Thus, staying current with the latest scientific projections is difficult for scientists and near impossible for educators and the general public. Monroe et al. (2015) identified four challenges of communicating climate change: i) climate change is complex, uncertain and variable; ii) people, who receive climate change messages, learn and remember selectively; iii) audiences pay attention to people who share their experiences and iv) audiences are diverse.

The uncertainty of climate change projections and its effects, thought to be distant to some, have been among the challenges of communicating the crisis to society (WARC, 2019). This led psychology professor at the University of Texas in the USA, Art Markman, to argue that unlike the chlorofluorocarbons (CFCs) in aerosols that are visible, GHG are invisible, meaning that people do not have anything tangible to relate to (WARC, 2019). In addition, the psychological distance that people have regarding the effects of climate change, makes people view the issue abstractly and conclude that the problem is happening far away from them (WARC, 2019).

Considerable literature on climate change communication points to four fundamental beliefs as key factors in predicting the level of concern and action individuals would take to address climate change (Krosnick et al., 2006). They are: i) certainty that global warming is taking place; ii) certainty that it will have negative effects to life in general; iii) acceptance that the problem is anthropogenic; and iv) as humans are behind the problem, they can take the responsibility to reduce the threat (Krosnick et al., 2006). The two former assertions suggest an outcome of expectations regarding a threatening outcome, while the latter two assess the efficacy of collective action for minimising the threat posed by global warming (Roser-Renouf et al., 2014). Agreement on these beliefs is calculated to have a relationship with the perception of scientific consensus, increased level of concern for public action, and heightened level of policy support and climate activism (Roser-Renouf et al., 2014; Van der Linden et al., 2015). Cook et al. (2017) found that misinformation about the scientific consensus of climate change had a polarising effect on attitudes toward the climate crisis. Misinformation decreases

climate change acceptance among people who support unregulated markets and increased acceptance among people who are against the free markets system. Schmid-Petri and Bürger (2022) made similar findings about the importance of pre-existing beliefs and worldviews in influencing attitudes towards climate change. On the other hand, people who support unregulated markets, agree with populist attitudes – and describe themselves as politically right-wing – are particularly sceptical of climate change. These findings and arguments might not be the same for every country. The referenced research was conducted in Germany. In South Africa, for instance, the right-wing does not necessarily hold populist attitudes, at least in the domestic context and might not fit the category here discussed. In fact, when it comes to climate change, it is populist left-wing formations that hold sceptical view with regards to action to address climate change. Trade unions, the opposition Economic Freedom Fights, are among these left-wing groupings that have been militating against the transition from coal to renewable energy, for instance

Weber and Stern (2011) argued that several important aspects of climate change, particularly about its consequences, are less well established and are uncertain, something that complicates communication. Estimates of the impacts of climate change have various degrees of uncertainties, which involve climate sensitivity, such as the amount of warming resulting from a particular level of GHG emissions (Weber & Stern, 2011). However, Rabinovich and Morton (2012) paradoxically argued that uncertainty in scientific matters can serve as an advantage to communicators. The researchers posited that communicating a scientific message with a high degree of uncertainty would come across more persuasive to people who regarded science as an ongoing debate, and not an absolute truth that left no room for ambiguity. Instead of uncertainty undermining the effectiveness of science communication, it has the potential to improve message effects when it fits the audience's understanding of what science is (Rabinovich & Morton, 2012). This argument informs the perspective that a lack of understanding should not be a limiting factor to taking action against climate change (Weber & Stern, 2011), but rather inform the framing of the communicated messages (Kahan et al., 2012). They also found that public divisions over climate change do not arise from the public's lack of understanding of science, but rather from a distinctive conflict of interest. The conflict of interests arises from the personal interest individuals have in forming their beliefs while, at the same time, having collective beliefs.

Subsequently, there is the issue that Sterman (2008, p. 532) referred to as the "mental models and mass balance" in appreciating how challenging it will be to stabilise and reduce anthropogenic CO_2 emissions into the atmosphere. Writing in *Science* magazine under the title: *Risk Communication on Climate: Mental Models and Mass Balance*, Sterman (2008, p. 532) noted that the strong climate scientific consensus stands in stark contrast to widespread confusion and complacency among the public. Effective risk communication about climate change was grounded in a deep understanding of the mental models of citizens and policymakers.

Climate sceptics are decreasing in number, yet action to cut emissions is not forthcoming, at least in the envisaged numbers. It seems the climate change discourse has evolved from denial to delay, meaning that although most agree with the scientific consensus, some do not support action. It all seems that those canvassing for delay – or no action at all – do so in defence of the same interests that sceptics have been defending, mainly money. The 'delaynists' have found themselves unable to dispute the consensus view on scientific grounds and are now raising economic and social issues as reasons to retard climate change action. In a sense, this could be the same group changing tactics, but hoping to achieve the same aims, which are to protect their interests by continuing with their polluting enterprise (see 2.5.1). Viewed differently, this is not as simple as a mere defence of interests. In Markman's (2018) view, action in response to climate change is the most difficult trade-off to make in that it is about trading short-term and long-term benefits. Humans tend to value short-term benefits, adds the author. Action against climate change has largely long-term benefits. However, there are several actions that could have short-term benefits, such as renewable energy, which is clean, and easier to install and maintain, and is now cheaper than energy from fossil fuels. These are some of the aspects that climate change communication has to convey to encourage action. Indeed, the mood on climate action in South Africa appears to have been shifting since the country was promised money to finance a just transition from coal to a carbon free economy (see Wadula, 2021). Media that had been sceptical about climate action, such as the *Business Day* newspaper, have since adopted the opportunity frame to characterise climate change as an opportunity for investment. Its reporting seems to be moving from cautioning against moving fast to address climate change to encouraging a move to

renewable energy, for instance, as an opportunity for investment and sustainable development. For an example, the publication recently reported on a virtual discussion of business people, who had traditionally viewed the transition to carbon neutrality as a threat to the economy and said a just transition of the liquid fuels value chain to a low and carbon neutral value chain presented economic opportunities for South Africa (Business Day TV, 2022). This suggests that resistance to action is often melted by the presentation of immediate benefits to people as individuals or collectives, rather than messages such as 'protecting the environment for our children's children'.

3.7.1 Obstacles for better communication and media reporting

Communicating science has often been regarded as being a difficult task - communicating climate change even more difficult (see 3.4 and 3.6). There have been several obstacles to communicating climate change as well as media coverage of the issue. Torok et al. (2021) have cited the complexities of the science and the language of climate change, people's misunderstanding of risk management, and the amount of deliberate misinformation on the subject as being among the obstacles. On the other hand, the language used in IPCC reports has tended to be ambiguous, sometimes conveying different meanings to different readers, thus amounting to a communication obstacle. For instance, the IPCC has used the word "likely" to communicate confidence in predictions, indicating that there are at least a 2-in-3 chances of some climate change development taking place. This sort of language has shown to convey high levels of imprecision that lead to readers' judgements being different from the IPCC's (Budescu et al., 2009). The IPCC reports also tend to be conservative to the point of confusion (Budescu et al., 2009). A study by Barkemeyer et al. (2016) found that IPCC reports were getting harder to read. Even worse, and despite the IPCC's good efforts, the text of the *Summaries for Policymakers,* which is released with IPCC reports, has attracted a very low readership, amid claims of dense paragraphs and complicated jargon for the average reader (Torok et al., 2021). These scholars have charged that information from the IPCC has failed to cater for different audiences, such as young people, managers and planners, as it is aimed mostly at politicians and scientists.

‘Fake news’ has also entered the information arena in recent years, resulting in a situation where consumers of climate change news get confusing information and leading to climate news fatigue (Torok et al., 2021). Politicisation and obstructionism (see 2.5.1) have made it harder to communicate climate change. In the past few years, information on the more urgent Covid-19 has tended to have turned away the attention of communicators and audiences alike. Overcoming the communication obstacles, will require communicators to aim for consistent messages, draw on credible information, focus on what is known rather than the uncertainties, offer tangible solutions, use clear language that avoids despair, connect locally, and tell a story (Torok et al., 2021).

3.7.2 Communicating risk

Explaining the risks associated with climate change has been considered an immensely influential way of raising concern and spurring action to fight climate change (Roser-Renouf et al., 2014). Highlighting the risks of global warming could generate a sense of urgency, which would, in turn, encourage people to take action. Emphasising the risk of managing the uncertainty of climate change has emerged as one such frame (Gober et al., 2010). Climate change, in the risk frame, is shown to modify the profile of risks from the many events associated with the climate, typically increasing such risks, including catastrophic ones (Weber & Stern, 2011). The responses to climate change were presented as options for risk management, not as self-evident responses to a predictable future. In the risk management frame, everyone understands that they face catastrophic risks from, for example, life-threatening diseases, automobile accidents, house fires, and even climate-related disasters, and everyone understands the need for strategies for handling these (Weber & Stern, 2011).

For O’Connor et al. (2002), knowledge and risk perception are the most influential factors in getting people to support the reduction of GHG emissions, especially for those holding the ego-environmentalism worldview. However, the framing of the said risks should not be exaggerated because of concerns that there is a gap between climate professionals and the public in determining the appropriate level of risk to be attributed to climate change. Slimak and Dietz (2006) expanded this notion by arguing that scientists are most concerned about long-term ecological

risks, while the general public are mostly concerned about imminent catastrophic effects of climate change.

The feeling of being psychologically distant from the impacts of the climate crisis can potentially limit its saliency as a political issue (Leiserowitz, 2006). Thus, climate change communication researchers emphasise the need to create messages that place climate change as an issue relevant to individuals (Kahan et al., 2012) and is immediate. In addition, it would assist public understanding of climate change if location-specific information of intervention efforts based on scientific predictions of future events, was to be afforded to communities (Weber, 2006). On the other hand, crafting information on interventions incorporating cultural elements specific to target communities would greatly assist the communication drive (Kahan et al., 2012; Moser, 2016).

Experiential factors such as values, effect and imagery can contribute to shaping risk perception and climate change beliefs in that they represent a person's positive or negative feelings towards an issue (Leiserowitz, 2006). Often, the value commitments that individuals hold, inform their perspectives regarding concern for climate change. Following this theory, it has been argued that people who hold altruistic values (Slimak & Dietz, 2006) and strong ecological values (Kellstedt et al., 2008) are more susceptible to be concerned about climate change and have a higher perception of its risks than those who do not hold these values. In addition, Botzen et al. (2021) observed that individuals are likely to make choices by focusing on either the low risk of a disaster occurring or its potential consequences, instead of making a rational assessment of the full risk distribution. Many people use threshold models to decide whether to take protective measures in advance of a potential catastrophe. For instance, many change-related risks, such as natural disasters, have a low probability, leading some people to place them below their threshold level of concern (Botzen et al., 2021). Among politicians, climate change is known to invoke that 'not in my term of office' (NIMTOF) bias where politicians often fail to undertake measures to limit risks that are unlikely to happen in their term of office. This because taking such measures would not bring about sufficient rewards from voters since the said risky events would not occur when they are in office (Kunreuther & Useem, 2010).

Individual responsibility and the perception that individuals can do something about climate change are regarded as key determinants of whether an individual will take

the issue seriously (Lorenzoni & Pidgeon, 2006). When authorities and scientists assign no role to individuals in addressing climate change, they leave individuals thinking that dealing with the issue is the task of governments and corporate entities, and not theirs. Sadly, in some instances, individuals think that authorities, rather their own actions, are responsible for adaptation efforts and establishing an appropriate political atmosphere for climate change policies. Kellstedt et al. (2008) found that the responsibility to address climate change was higher among older individuals. This possibly explains that older people subconsciously accept the responsibility for the damages towards the planet and thus feeling responsible for correcting their past mistakes (Kellstedt et al., 2008). It could also be accepted that older people are more conscious of risk compared to younger people.

Personal exposure to climate events is considered a major influence in contributing to belief and taking action. In spite of the fact that climate change is often considered a geographically-distant issue, when people have experienced some of its effects and have personal accounts of their experiences, beliefs and concerns change to positivity for responding (Myers et al., 2012; Rudman et al. 2013). Several studies have shown that people who have personally witnessed suspected or real impacts of climate change are more prone to believing the existence of climate change (Krosnick et al., 2006; Myers et al., 2012) and its risks. According to Krosnick et al. (2006), personal experience of climate change effects can either help influence an individual to believe that climate change exists, or it can strengthen an existing belief that what they have witnessed is something else not related to climate. However, Gärtner and Schoen (2021) found that it could not be taken for granted that personally experiencing extreme weather phenomena makes a difference in perceptions of climate change and related policy preferences. The link between people's personal experiences with local weather conditions and their beliefs about climate change and attitudes towards related policies might not be as simple as it would seem (Gärtner & Schoen, 2021). Instead, long-standing political preferences often attenuate the responsiveness of citizens' attitudes towards climate change and related policies to local weather phenomena. However, whether unusual climate events influence people's attitudes towards climate change, or not, waiting for millions of people to have personal experiences of devastating consequences associated with climate

change might be too late for taking the actions necessary to mitigate the crisis (Weber, 2006).

On the other hand, researchers have found that there is a belief that groups of people, rather than individuals, are more suited to take effective action to address climate change (Kellstedt et al. 2008; Weber, 2010). People tend to have a higher belief in the collective efficacy than individual worth in addressing climate change (Leiserowitz et al., 2014; Roser-Renouf et al., 2014).

3.8 'Place' in climate change communication

In spite of the fact that climate change is a global matter, several studies have shown that communities display more willingness to deal with it when they realise that it can potentially affect them, or they can harvest the benefits of action to address it. Thus, communication about climate change works best when tailor-made to communities based on their concerns of the implications (positive or negative) of the crisis to them. In this regard, the theory of 'place-based communication' has been put forward by several researchers as ideal to communicate on the climate crisis (e.g., Schweizer et al., 2013; Hu & Chen, 2016; Gislason et al., 2021; Khadka et al., 2021; Royal Town Planning Institute, 2021). The theory emphasises framing messages that resonate with target audiences based on a value system or interests that constitute them into a 'place'. In this characterisation, the concept of 'place' goes beyond geographical jurisdictions to include institutional settings in politics, economics, institutions, or interest groups (Gislason et al., 2021). Climate change communication scholars regard 'place' as an important notion with regards to research and engagement and have put it at the heart of contemporary scholarly discourses in their quest to promote public involvement and sustainable transformative change.

Schweizer et al. (2013) found that communication on the climate crisis tended to resonate with different audiences when: i) it is aligned with cultural values and beliefs; ii) it is meaningful to the target audience; and iii) it empowers audiences to embark on a particular action. The three talk to the notion of 'place' because alignment in cultural values and beliefs is often found in some sort of 'place' as defined by Gislason et al. (2021). Furthermore, meaningfulness to a target audience suggests 'place' because target audiences are often in geographic or institutional settings. Empowering individuals to take action would also happen

more effectively in a ‘place’ setting rather than an open-ended one. Applying the concept of place-based engagement in climate change communication facilitates understanding of the climate change effects and solutions that have practical application to conditions of the people that constitute the ‘place’ (Groulx et al., 2014). In a place-based engagement setting, audiences use knowledge that creates a platform for narratives of change that can anchor adaptation measures in local experiences and values (Kraub & Bremer, 2020).

Schweizer et al. (2013) proposed theoretical threads that can create the foundation for developing a multi-faceted and an all-inclusive framework for place-based climate change engagement, namely: i) place attachment theory; ii) place-based education; iii) free-choice learning; and iv) norm-activation theory. Place attachment theory is a notion that people are emotionally attached to specific geographical locations (Schweizer et al., 2013). Environmental psychology, for instance, describes place attachment as the bonding of people to places (Altman & Low, 1992; in Schweizer et al., 2013). Images in the media showing the impact of climate change on polar bears and melting icebergs, for example, might attract the attention of those who are geographically or psychological close to these objects, but might mean very little to people who are distant from them. For audiences in Africa, images of drought-stricken areas or dying animals in agricultural or conservation settings, might mean a lot more in terms of driving climate understanding and have a bigger potential to encourage a response. Thus, place-based communication may galvanise action by making climate change more personally-relevant to people (Halperin & Walton, 2018).

Focusing on ‘place’ helps direct audiences to the nature of both vulnerability and response to climate change that is connected to them, thus driving awareness of the problem, and creating a strong motivation to address it (Hess et al., 2008). Likewise, O’Neill and Nicholson-Cole (2009) added that images of local impacts of climate change make audiences feel empowered to take action that would make a difference in their own conditions. Including a global context in climate change communication is crucial since the issue is both global and local. However, this should be done carefully to avoid overwhelming audiences to a point where they could feel helpless and feel that the problem is far too big and their individual contribution might have no impact (O’Neill & Nicholson-Cole, 2009). It has further been suggested that many characteristics of climate change make it an impersonal

and distant issue to many people (Lorenzoni et al., 2006). Therefore, as these researchers found, communication approaches anchored on an understanding and appreciation of an audience's values, beliefs, attitudes, local environment and experiences, are more likely to achieve meaningful engagement of individuals with climate change (O'Neill & Nicholson-Cole, 2009). After all, adaptation measures, in particular, are meant to ensure that communities can withstand the disasters that emanate from the climate crisis, in their own conditions and localities. Mitigation measures also need to talk to local conditions since some communities, particularly in Africa, feel that they emit far too less to be involved in any mitigation action (see African Development Bank Group, 2022).

Place-based education is described as the foundation for developing a multi-faceted and all-inclusive framework for place-based climate change engagement (Schweizer et al., 2013). In climate change communication, place-based education, or experiential learning, is defined as communication and engagement practices that link climate change with places and individuals or groups based on their experiences (Schweizer et al., 2013). Khadka et al. (2020) found that the use of place-based education in climate change communication promotes knowledge, awareness, responsibility, hope and behavioural intention of participants. David Kolb, who is largely regarded as the father of experiential learning theory, following his publishing of the *Experiential Learning Theory* book in 1984, argued that experiential learning proceeds from the assumption that ideas are not fixed and unchanging over time, but are formed and reformed through experience. No two thoughts are ever the same since experience always intervenes (Kolb, 1984). Experiential learning theory works in four stages namely, concrete learning, reflective observation, abstract conceptualisation, and active experimentation (Western Governors University, 2020). It is premised on the idea that learning best takes place when learners experience what they are learning. The experiences remain in the learners' minds, helping them to retain information and remember facts about what they have learned (Western Governors University, 2020). In climate change, experiential learning is based on connecting people to the land through applied learning and experiences (Schweizer et al., 2013). Through place-based education, in the context of experiential learning, audiences remember lessons and adopt behaviours when they feel a sense of responsibility and have knowledge of consequences (Schweizer et al., 2013).

The free-choice learning theory, the third in Schweizer et al.'s (2013) theoretical threads, is premised on the assumption that each learner has their own desires and motivations to learn; therefore, different learners will achieve different learning outcomes, which will be as diverse as the cohort itself (Falk, 2005). According to Falk (2005), free-choice learning takes place where a highly structured learning system is absent, usually in institutions such as national parks, aquariums, zoos, and museums that people visit. Free-choice learning differs from formal, non-formal or informal learning as the underlying motivation and interest of the learner to learn is its basis; hence, the preference to use the term free-choice learning (Falk, 2005). Free-choice learning is primarily for personal fulfilment and the interest in learning is motivated by the needs of identity formation and reinforcement (Falk & Dierking, 2019). The theory emphasises a more learner-centred approach that places issues of learner motivation and identity at the centre. It has been suggested as being appropriate and indicated for people to learn about the environment and by extension, global warming.

The norm-activation theory was developed by Schwartz (1977) to explain social behaviours where individuals engage in activities for the benefit of others, such as helping people in needy situations, and general altruistic pro-social gestures (Harland et al., 2007; Octav-Ionut, 2015). Norm-activation theory is often used to explain decision-making in moral situations such as pro-environmental behaviour (Stern et al., 1999). The norm-activation theory holds that self-expectations of performing pro-social behaviours are driven by four variables, namely: i) problem awareness: an individual's knowledge of a person or cause in need; ii) ascription of responsibility: how responsible an individual feels for the need; iii) outcome efficacy: the usefulness of actions to alleviate the need and iv) ability to help: an individual's perception of their ability to help alleviate the need. Applications of the norm-activation theory in the environmental field demonstrate that personal norms are better predictors of pro-environmental behaviour (Schweizer et al., 2013). However, Harland et al. (2007) criticised the norm-activation theory, arguing that the activation of personal norms is not sufficient for pro-social behaviour since personal norms could be neutralised by denying the responsibility to take action to benefit others or by denying the consequences of a person's actions on others.

In summary, place-based climate change engagement in climate communication should focus on objects that link people to climate change (Wang et al., 2018).

Individuals who can identify what they care about and wish to protect themselves, tend to feel more strongly about the issue than those who are physically and psychologically distant. This demonstrates the role of human emotions in occasioning interventions (Wang et al., 2018). Social vulnerability and strengths should be combined in climate change communication, particularly in relation to notions of urgency and capacity to change (Gislason et al., 2021). For effective climate change communication, 'place' should be used as a medium (Schweizer et al., 2013) and should be connected to emotional and social meanings through messages about localised impacts of climate change. In short, think globally; act locally when dealing with climate change (Collier & Liifstedt, 1997; Devine-Wright, 2013).

Place-based climate change communication would find application in South Africa where the impacts of climate change differ between different regions. Some coastal areas, for instance, are likely to face flooding from sea level rises; the interior such as the Karoo face droughts leading to water shortages and poor agricultural yields; the rainy winters in the Western Cape province might deliver less rain, while northern KwaZulu Natal, Mpumalanga and north-eastern Limpopo areas might experience frequent storms as part of cyclones that are projected to frequently impact central Mozambique and southwest Indian Ocean (see Engelbrecht & Monteiro, 2021). In the face of these diverse climate vulnerabilities in different regions, communicating climate change as a common feature might not achieve the necessary result of attracting the attention of all people in the same way, and might not be conducive to encouraging a response. Stakeholders such as the government and the media would do good if they took the notion of 'place' into account in crafting their communication strategies. According to Mahlalela et al. (2020) analysis of mid-century (2040–2060) projections under the RCP8.5 scenario suggested that annual cycle over the Eastern Cape would change to a situation where there would be wetter winters and drier the summers.

3.9 Scientists in climate change communication

The academic and scientific community play an important role in researching various aspects of climate change. They have heroically led in studying and interpreting the climate to a point where they concluded that there were changes in the offing. Their findings are often communicated by other stakeholders such as the media, policymakers, and NGO, among others. However, there has been a

debate on whether scientists have a responsibility to communicate their research findings to the public or leave this task to professional communicators and other stakeholders. Some have argued that climate scientists are singularly qualified to contribute to deliberations on public policy relating to climate change due to their expertise, in particular (Bromley-Trujillo et al., 2014). Pielke (2007) argued that scientists' engagement in public policy deliberations had implications on the way scientific knowledge is integrated into policymaking. However, the role scientists should play in policy processes – which is part of climate change communication – is often complicated and a source of contention within the scientific community itself (e.g., Maibach et al., 2014; Wittemyer et al., 2018). It has been debated whether scientists should be mere objective purveyors of the best available science, or also work as advocates of specific policy proposals (Lackey, 2007). Getson et al. (2021) found that there was consensus within the scientific, professional climate and agroecosystem community that there is a perceived responsibility among scientists to promote action to address climate change. Because of the complexity of the science of climate change and its socio-ecological implications, scientists occupy a consequential, and pivotal position to influence the adoption of mitigation and adaptation strategies (Getson et al., 2021).

Trust in those communicating climate change – be they scientists, government officials or professional communicators – is crucial. Climate scientists, in particular, need the trust of their audiences, often lay people, if the scientific information they share is to be accepted and believed. This would take place in a scenario where significant audience segments, mostly those doubtful or dismissive of climate change, distrust climate scientists (Goodwin & Dahlstrom, 2013). Public trust of climate change scientists might have already been high in some instances, but in the wake of developments such as Climategate, there have been various assessments of the work of scientists. Shortly after Climategate, some commentators suggested that public opinion shifted towards the conclusion that scientists often tried to suppress alternative hypotheses and ideas, withhold data, and try to manipulate some aspects of peer reviews to avoid public dissension (Cicerone, 2010). This view reflects the "fragile" nature of trust between science and society and demonstrates that the perceived misbehaviour of even a handful of scientists can diminish the credibility of science as a whole (Cicerone, 2010, p. 624). Thus, it is necessary to build public trust in institutions such as the scientific community to raise collective efficacy and reassure the feasibility of addressing

climate change (Lorenzoni & Pidgeon, 2006). To this end, Leiserowitz et al. (2013) suggested that finding ways to rebuild trust should become an important priority for the scientific community to avert the risk of a growing marginalisation of science-based information in the policymaking process. With such trust, people will be more willing to support climate mitigation and adaptation initiatives. Paradoxically, it has been suggested that high confidence in scientists can result in opposite reactions towards addressing climate change (Kellstedt et al., 2008). This would occur when individuals who were highly confident in scientists, had a low concern and low sense of responsibility for global warming on the belief that scientists – not individual members of society – would create technical solutions to deal with the problem (Kellstedt et al., 2008).

Goodwin and Dahlstrom (2013) drew two approaches from the social scientific sub-fields for building trust among climate change audiences. The first approach stresses the impact of a scientist's personal characteristics in promoting their audience's trust. They argued that although it is important to accentuate likeability and humour when addressing positive audiences, this approach is unlikely to be persuasive to the very audiences who are most distrustful of climate science (Goodwin & Dahlstrom, 2013). Secondly, drawing from the humanistic sub-field of rhetorical studies, focus should be on earning trust from doubtful and dismissive audiences by applying a general strategy of vulnerability acceptance (Goodwin & Dahlstrom, 2013). In a survey in the US, Krishna (2021) found that climate change deniers displayed significantly lower levels of trust in the scientific community than those who believed that climate change is a reality. Thus, it can be concluded that climate change deniers also distrust scientists or have lower trust in scientists than those who believe in the climate change consensus (Krishna, 2021). Climate change disinformation efforts often concentrate on scientists who conduct climate change research, where attempts are made to delegitimise their findings about anthropogenic climate change, in particular. With the debate about the anthropogenic nature of climate change dying down, recent attacks have concentrated on attempts to malign scientists by casting their motivations as monetary and self-serving (Qui, 2018). Those against climate science also mount their campaigns by deliberately conflating limitations associated with scientific research with errors that disqualify scientific findings (Ladle et al., 2005; Qui, 2018).

There is also the issue of whether climate change scientists should also be climate activists. In 2019, mainly British scientists signed the 'Scientists' Declaration of Support for Non-Violent Direct Action Against Government Inaction Over the Climate and Ecological Emergency', declaring that the scientific community had tried all conventional methods to draw attention to the crisis. The declaration also contended that continued governmental inaction over the climate and ecological crisis justified peaceful and non-violent protest and direct action, even if this went beyond the bounds of the current laws (Sakas, 2019). Glavovic et al. (2022) posited that in the face of a lack of the required action to respond to the climate crisis, scientists had called for a moratorium on further research until governments took the necessary action. However, an editorial in the international scientific journal, *Nature,* in November 2021, took a different view, suggesting that the answer to the inaction against climate change should simply be more research until those in authority responded. Nonetheless, Glavovic et al. (2022) argued that this choice not only ignores the complex relationship between science and policy, but it also runs counter to the logic of scientists training that enjoins them to reflect and act on the evidence. The second option for scientists is to combine continued research with advocacy (Glavovic et al., 2022) as was witnessed during the Scientist Rebellion movement when scientists joined climate protesters during COP26 (Thompson, 2021).

These debates point to a clear need for accelerated climate change communication that should involve scientists. The suggestion to combine continued research and advocacy appears to be a viable option instead of a discontinuation of research in protest. However, climate scientists are not communicators or activists, they don't have the skills let alone the time to concentrate on communication and advocacy of climate change. Their full-time job is to research global warming in all its facets. Communication and advocacy are full-time occupations that should be treated as such. They cannot be treated as part-time occaptions of scientists. Thus, although scientists should be available to communicate climate change, it is unrealistic to expect them to take this as one of their main tasks.

3.10 Government role in climate change communication

Meeting CO_2 emissions targets to reverse global warming will require individuals to engage meaningfully with climate change so that they can undertake decarbonisation behaviours (Lorenzoni et al., 2007). As leaders of society, governments have a prime responsibility to communicate climate change information in order to motivate their citizens to mitigate and adapt to the crisis (Bingham, 2007; Ferranti et al., 2021). Climate change communication is about conveying information and raising awareness, with the ultimate purpose being to change beliefs and motivate for action (Moser & Dilling, 2007). Motivating for action is a particularly important task for governments because without the actions of individuals in reducing emissions in their day-to-day activities, countries will not be able to achieve the required reductions in GHG emissions (Ferranti et al., 2021). The role of government in communicating science, such as climate change, was emphasised by Nerlich (2016) who opined that science communication can only flourish when it is embedded in a supportive political environment. Governments in different countries adopt diverse approaches in their climate change communication. A study comparing climate change communication in the UK and Hong Kong, for example, found that the former prioritised adaptation and risk assessment programmes in its climate polices, whereas the latter had more "effectively" embedded climate change education in the school curricula and had a more centralised and consistently branded campaign with a focus on self-responsibility and behavioural change (Ferranti, 2021, p. 287). In the USA, most climate change communication in recent times has come from local governments, at city level, because of President Trump's administration climate change apathy (Boussalis et al., 2018). Trump's approach to climate change, which included the USA's withdrawing from the Paris Climate Agreement, prompted mayors of various cities to create the Mayors National Climate Action Agenda 2017 to reaffirm their commitment to address climate change (Boussalis et al., 2018). The apathy to dealing with climate change has since changed following the coming into power of President Biden on 20 January 2021. Biden returned the USA to the Paris Agreement and made climate change a priority for his administration.

In South Africa, there is no specific government policy for climate change communication, apart from commitment statements made in diverse documents and speeches by the president and cabinet ministers. Even though the National

Climate Change Response White Paper, published in 2011 (Department of Environmental Affairs, 2011) committed the government to a climate change communication "strategy" very little has been seen in this regard. The document said the government would follow a "nuanced" approach to communication (p. 39) in recognition of the fact that there should be two different communication strategies. One aimed at urban and wealthy communities who have the largest carbon footprints but are less susceptible to climate disasters. The other aimed at rural and poor individuals and communities who emit less GHG, but are most vulnerable (Department of Environmental Affairs, 2011). In this regard, government committed to empowering all residents with information about the potentially catastrophic impacts of climate change and resilience actions (Department of Environmental Affairs, 2011). Government will ensure that all relevant climate change information systems implement effective communication strategies to guarantee that information reaches the target audiences efficiently and effectively. Novel ways of communication will be explored to reach people who are illiterate and/or have no access to telephonic or other forms of electronic communication, in particular (Department of Environmental Affairs, 2011). However, speaking at COP24 in Katowice, Poland, seven years later in 2018, Department of Environmental Affairs chief director of international climate change, Maesela Kekana, conceded that the country needed more aggressive awareness campaigns, at a local level. According to Kekana, although South Africans may have experienced the effects of climate change, they were probably not aware of the concept itself (ENCA, 2018). The government has, to some extent, implemented various awareness campaigns to educate the public on crucial matters. For instance, the state put together a massive communication campaign for the Covid-19 pandemic (GCIS, 2020). In the same vein, the National Health Insurance, which has not yet been implemented, warranted a massive government communication strategy and resources in the form of a budget (WHO, 2017). Equally, government has undertaken several communication campaigns for HIV and AIDS awareness (The New Humanitarian, 2006; Peltzer et al., 2012). None such campaign can be traced for climate change. Sithole (2021) observed that government's oomph in fighting the Covid-19 pandemic was lacking in climate change.

Government commitments to communicate climate change can also be found in documents such as the First, Second and Third National Communication Under

the United Nations Framework on Climate Change, which the government submits to the UNFCCC, detailing its plans to deal with climate change. The Third National Communication, in particular, stated that government was implementing several initiatives at different levels of government to contribute to public awareness and climate change action programmes (UNFCCC, 2021). Examples of the said initiatives are listed as:

- The distribution of SARVA to local government throughout the country. SARVA is an initiative of the Department of Science and Technology and is intended to be a central depository of environmental and climate data for South Africa (CSAG, 2021).
- The establishment of centres in universities to facilitate access to climate change regarding risk and vulnerability.
- The Department of Energy is implementing the Energy and Environment Partnership to promote renewable energy, energy efficiency and clean technology investments.
- Most provincial government departments are undertaking public awareness and outreach programmes regarding climate change.
- The provincial environmental affairs departments run community outreach programmes that support radio programming and other types of information sharing on climate change.

It appears, however, that government's climate communication falls short of the required as evidenced by research findings (see Chingwete et al., 2018; Roberts & Struwig, 2021). Another potential government neglect of climate change communication is the fact that several terms relating to climate change are not available in indigenous African languages (BBC, 2010). This might suggest that any government communication on climate change is not accessible to speakers of indigenous languages. It also means that non-English or Afrikaans speakers in South Africa might not have understood whatever has been communicated about climate change. According to Modise (2021), the SA Weather Service (SAWS) has been working on a project to deal with this issue. Government would do well by accelerating the awareness of climate change since the country now experiences several impacts of the crisis and more are focused to happen in the future.

3.11 Corporate climate change communication

Several corporate management theorists and practitioners now hold that the well-being and future of any business entity is critically dependent on how it is perceived by its key stakeholders, such as investors, customers, employees and members of the community where it undertakes business (Cornelissen, 2007). Public activism demanding greater corporate responsibility and accountability, globalisation and recent accounting scandals in major corporate entities, have further strengthened this belief, thus bringing the communication practice to the centre of corporate activities (Cornelissen, 2007). Bararia (2018) argued that the reputation of a business entity has the potential to make or break its future. Corporate communication should maintain an excellent reputation to ensure a company's continuous future growth. Companies should make sure they have a promising future and remain reliable to the general public, stakeholders, media and clients (Bararia, 2018). The role of corporate communication has forever changed, with new expectations and rules of engagement (O'Leary & Samson, 2021).

One such new expectation is for companies to communicate on their activities in relation to the environment and global warming. The need for corporate entities to communicate on their climate change activities is informed by the fact that business entities have emerged as some of the largest contributors to CO_2 emissions due to their roles as producers and consumers of energy (Thaker, 2019). Just about 90 of the world's largest corporations such as Chevron, ExxonMobil, BP (UK), Aramco (Saudi Arabia), BHP Billiton (Australia) and Coal India have created nearly two-thirds of GHG emissions since industrialisation (Goldenberg, 2013). Some individual corporations in the Global 500 Companies, such as Rio Tinto, emit more GHG than countries such as New Zealand (Patenaude, 2011). Two leading energy corporates in South Africa, Eskom and Sasol, are also the country's leading polluters, responsible for 42% and 11% of the country's emissions, respectively (Burkhardt, 2019; Mathews, 2020). The Kriel area, in Mpumalanga province, which has a high concentration of coal-fired power stations, ranks as the second-worst SO_2 emission hotspot in the world (Myllyvirta, 2019). A 2016 study by UK-based air quality and health expert, Dr Mike Holland, on the health impacts and associated economic costs of current emissions of just one type of pollutant from Eskom's coal-fired power stations found that 2 239 deaths occurred every year resulting from: lung cancer (157); ischaemic heart disease (1110); chronic

obstructive pulmonary disease (73); strokes (719); and lower respiratory infection (180). In spite of all the damage corporates inflict on the environment and the health of individuals, they resist communicating on the risks of their activities to protect their profits.

Some corporate entities have been criticised for bluffing with the intent of having society believe that they are doing something good about climate change, yet they continue to pollute the atmosphere. Faced with the demand to reduce GHG emissions, some corporate entities have been accused of sometimes communicating misleading information about the environment, or greenwashing. There are fears that this might increase as the demand for companies to do business in a sustainable way increases (River, 2021). Greenwashing is where a company uses various communication mechanisms to inform the public that its activities are environmentally friendly when, in fact, they are not. In other words, greenwashing is the act of making false or misleading claims about the environmental friendliness of a product, service or technology. According to Miller (2016), several studies focusing on corporate climate change communication have found that some energy entities, in the main, engaged in greenwashing. For example, in France, global oil giant Total Energy's slogan 'the responsible energy major' was ridiculed by environmental pressure groups such as 350.org, who coined a counter slogan 'Total-ly irresponsible: An illusion of climate strategy' (Dahl & Fløttum, 2019).

Although the role of corporate entities in addressing climate change is widely recognised as an important component of efforts to reverse the crisis, business climate change communication has been found wanting and has received very little research attention from scholars. Only a few studies have focused specifically on the science communication aspects of corporate communication related to climate change (Dahl & Fløttum, 2019). Some research has 'bluffed' on the issue of climate change, which has been criticised as distorting government policies to deal with the issue and retarding scientific progress (Thaker, 2019). Empirical studies have shown that industry underwritten research is likely to investigate and communicate results that are favourable to the sponsors' institutional and business goals (Thaker, 2019).

On the other hand, corporate entities have been criticised for their reluctance to be more transparent with their environmental performance. In South Africa, for

example, Sasol rejected proposals by some of its shareholders that would compel the company to publish its environmental performance details in its annual reports, saying there was no law that compelled companies to do so (MacDonald, 2020). While Sasol voluntarily publishes climate change reports detailing the company's disclosures on climate risk, critics such as Emma Schuster, who is responsible for investment researcher at Just Share, and the Raith Foundation are not convinced this is enough (MacDonald, 2020). Eskom also undertakes voluntary publication of its climate change performance. Voluntary publishing has been criticised as lacking in firm and legally binding commitment to climate change fighting action (MacDonald, 2020).

The releasing of the IPCC's AR4, which categorically linked global warming to climate change and accentuated the fact that it was anthropogenic (IPCC, 2007), generated massive concern within the corporate sector, particularly the fossil fuels industry. The sector went into overdrive, seeking to forestall state interventions to curb emissions (Greenberg et al., 2011). Their strategy for achieving this was to enlist the services of third-party advocacy groups (Miller, 2007) to propagate messages creating doubt on the climate science conclusions about the origins of global warming (Moser, 2010). This process also involved the establishment of grassroots movements to help push private interests to provide avenues through which businesses could influence policymakers and sway political campaigns against efforts to deal with climate change, in defence of corporate profits (Greenberg et al., 2011). One of the most controversial public relations communication techniques to emerge during this period, was the use of artificial grassroots organisations, or 'astroturf' (Greenberg et al., 2011; Sourcewatch, 2013). In astroturfing, apparently grassroots-based community groups are conceived, created and/or funded by corporations, industry trade associations, political interests or public relations firms to run campaigns in opposition to climate change action (Sourcewatch, 2013). Astroturfing has been used by corporations and governments around the world for well over a century (Miller, 2007). Critics of astroturfing argue that it is an obvious deception which, among others, corrupts the policymaking process (Greenberg et al., 2011). Lock and Seale (2017) criticised astroturfing as it damaged organisations' trustful relationships with their publics.

Nonetheless, there seems to be a change in the approach to climate change action among some of South Africa's corporates. The country's largest polluting

corporate, power utility Eskom, has since been emitting positive communication with regards to action against climate change. CEO, André de Ruyter, is reported to have said that South Africa could no longer ignore its carbon footprint (Van Diemen, 2021b). This undoubtedly represents a major shift, not only in approach, but in how the corporation communicate on climate change. Both Eskom and Sasol, the two largest emitters in South Africa, have now communicated targets for cutting emissions through embarking on renewable energy projects and transition from coal. The two leading polluters in the country would do well by accelerating not only their transition to carbon neutrality, but their communication on their GHG emissions activities. This would save lives since communities who are victims of the pollution would be empowered with knowledge to respond.

3.12 NGO climate change communication

Concern for the environment has been part of human life from as early as Roman times, but the contemporary environmental movement was given rise from concerns in the late nineteenth century about the protection of the countryside in Europe and the wilderness in the US, as well as health problems caused by pollution since the Industrial Revolution (Elliott, 2022). The environmental movement grew from the perspective that government, rather than the free market system, should be charged with protecting the environment (Elliott, 2022). This was in contrast with the dominant political philosophy of most of the world during the twentieth century, which held that all social problems, including environmental degradation, should be solved through the free market system. NGOs have been leading in the fight against global warming since the late 1980s when this environmental crisis became a public affairs issue (Doyle, 2009). Climate activism has played an influential role in climate politics, especially at the global level, working across countries to mobilise different governments to co-operate with tackling climate change (Doyle, 2009). With regards climate change communication, NGOs have acted as mediators between scientific expertise and the public (Ladle et al., 2005). NGOs are known to be at the forefront of campaigning for action to address climate change.

NGOs have used public relations strategies to gain media coverage and attract public attention to the climate crisis (Schäfer, 2012). Digital technologies advancements have offered NGOs cost-effective communication tools to reach a

wide range of audiences (Korda & Itani, 2013). Vu et al. (2021) found that of the three aspects of climate change, *impact*, *action*, and *efficacy*, *action* was used most frequently, while *efficacy* was the least common in NGO climate change communication through social media platforms.

In South Africa, NGOs started their involvement in climate change matters in the 1980s (Partelow et al., 2020), even though there had been active environmental NGOs operating in the country from the 1960s (Steyn, 2002). The country saw an upsurge in environmental NGO activities from 1965, but several of them were ineffective and failed to rally support for their causes as they were slow to react to the new demands of the global environmental movement (Steyn, 2002). During the apartheid era, environmental activism operated effectively as a conservation strategy but neglected social needs (Beinart & Coates, 1995; Mittelman, 1998). Environmental NGOs were viewed as participants in the construction of climate change news in the media (Kwenda, 2013). Their voice in the media tends to be louder than most stakeholders as they appear to have positioned themselves as the champions of action against climate change. They constantly pressurise governments and corporate entities, in particular, to act against climate change.

3.13 Conclusion

This section discussed communication and climate change communications as areas of research. Most importantly, it discussed the challenges of communicating climate change, looking at how the stakeholders under review in this PhD thesis have communicated global warming. The overview reveals the frustration climate scientists have had in putting across the climate crisis message to the public. It also discussed the corporate sector apathy in communicating climate change, something that is of great concern because business activities are mostly responsible for emitting GHG. The South African government was found to communicate inadequately on climate change, contrary to suggestions that governments should lead in these efforts since they are responsible for policies and resources to address climate change. The reviewed literature tends to paint a rosy picture of NGO climate change communication, praising them from acting as mediators between scientists and the general public in conveying information of global warming.

Most importantly, the literature analysed the concept of 'place-based communication' and pointed out that it was ideal in communicating climate change in that it highlighted issues of concern to local communities, thus standing a chance of achieving success in encouraging behaviour change. Place-based communication should be the cornerstone of South Africa's awareness campaigns because of the diverse impacts of climate change and the need for tailor-made solutions. A one-size-fits-all approach would not achieve the ultimate goal of communicating the crisis, which is behaviour change. Different geographical communities face different impacts, thus require diverse communication messages that fit their 'place'. There are also different communities of interest such as trade unions in coal mining who are adamant that coal mining should not be discontinued because this would jeopardise their jobs. The coal mineworkers require a communication approach that responds to their concerns. Coastal communities require communication of an adaptation nature since they need to be made aware of the need to move to higher ground in the face of rising seas. Farmers, particularly subsistence farmers, need awareness that talks to changing seasons as a result of climate change, for instance. In short, government not only needs to improve its communication of climate change, but it needs to do so taking into account the various complexities of the climate crisis in the country.

CHAPTER IV: OVERVIEW OF CLIMATE CHANGE IN THE MEDIA

4.1 Climate change communication science

Before offering an overview of climate change in the media, it is imperative to d the umbrella under which this field of research falls under, which is climate change communication science (see Ballantyne et al., 2016). Simply put, climate change communication is explained as the discipline of science that explores a broad variety of issues that affect and are affected by the ways in which climate change is communicated (Chadwick, 2017). The science has been active in scholarly and professional spheres for about four decades, having emerged in the 1980s when the bulk of research was on debates about the existence, or otherwise, of anthropogenic climate change (Moser, 2010; Nerlich et al., 2010; Moser, 2016). With most governments and policymakers agreeing on the reality of anthropogenic climate change, the discipline has since shifted from convincing people about the reality of climate change to encouraging the adoption of measures to address the scourge (Nerlich et al., 2010). However, despite this shift, GHE continue to increase globally and keep various communities in the very position of being susceptible to the harmful outcomes of climate change (Nerlich et al., 2010). This persistence has led to questions about the adequacy of climate communication strategies on the one hand, and the ability of society to undertake measures to respond thereof, on the other. Psychological distance, according to Singh et al. (2017), could be one factor that might be influencing risk perceptions and policy preferences. The perception of a psychological distance between climate change impacts and an individual creates an individual's opinion of how climate change is removed from them (Singh et al., 2017). In this regard, the science has to go beyond merely informing about climate change and its associated catastrophic outcomes. Rather, it should encourage individuals and society to take action. The present scenario, by some accounts, is that up to 98% of news stories on climate change are negative (De Meyer et al., 2021). This implied that most communicators of climate change believed that raising people's, awareness, concern and fear of climate change were necessary steps for changing behaviour and encouraging action (De Meyer et al., 2021). Given the fact that this approach does not seem to have delivered the desired goals, communication about climate change needs to evolve from issuing warnings about impending disaster to being a horizon light that reveals opportunities in climate change mitigation and adaptation. These

opportunities start from a clean environment, which result in better health prospects, to sustainable economic and social development. In short, the communication should inspire hope rather than a sense of helplessness. Liu et al. (2021) concur, arguing that actions to tackle climate change could create co-benefits with the attainment of sustainable development goals with regards to food security, air pollution, land use, water scarcity, and sustainable energy. On the other hand, the communication needs to carry a promise of immediate tangible benefits that respond to individuals' present needs, rather than promises of distant future gains.

The difficulty of effectively communicating climate change is, firstly, that climate change is mostly invisible (Ungar, 1992) – what is visible are changes in daily or monthly weather, for instance, which need not necessarily be connected to climate change or long-lasting changes in weather. Secondly, science cannot predict or project with accuracy how climate change will manifest itself in different communities so as to offer more precise messages. Thus, although uncertainty about anthropogenic climate change seems to have dissipated, the various complexities around the climate, make it difficult to communicate the subject (Nerlich et al., 2010). Such complexities include the consequences of mitigation measures, some of which might result in job losses from the closing down of economic sectors that produce polluting fossil fuels, for example. Human behaviour towards the environment might have to change in ways that would force massive sacrifice and a change in lifestyles. The complexities of communicating climate change mean that communicators are faced with having to navigate between encouraging action and dealing with the possible fall out from such action. The communication has to take into account the fact that that climate change is not just a problem of the environment, but a developmental issue, because its negative effects severely affected poorer countries whose economies were largely based on natural resources (Oyero et al., 2018). Climate change also leads to unemployment, crime, insecurity, etc. (Jegede et al., 2016; Olanrewaju & Joshua, 2017), thus its communication needs to be tailored in ways that take into account that tackling the crisis could lead to some of these problems.

On the other hand, there are communication complexities over and above those related to climate change itself. Hulme (2007, p. 16) argued that the task of communicating climate change went beyond raising awareness of the physical

basis of climate change, or “lower case” climate change, and included communicating a series of issues that are related to climate change, or “upper case” climate change. These were constantly evolving cultural discourses (Hulme, 2007). Nerlich et al. (2010) suggest that the climate change communication subject has a two-fold complexity: i) the intricacies of climate change itself; and ii) the complexity of the communication that is involved. The discipline has similar features with other communication fields, mostly risk communication (Morgan et al., 2001), health communication (Schiavo, 2007; Makoul et al., 2009), and science communication (Maibach & Priest, 2009; Nisbet & Kotcher, 2009). It also departs from various disciplinary traditions in social and cognitive psychology. In this regard, it studies attitudes towards risk, strategies that can be employed to cause behaviour change, predispositions, and mental barriers. Furthermore, climate change communication refers to social studies of science and communication studies that explore the connections between media, scientists, policymakers, and other stakeholders (Nerlich et al., 2010). Thus, a single theoretical approach cannot describe climate change communication efficiently, hence the requirement for a multi-pronged approach that builds on theoretical inter-dependency (Evans et al., 2018).

Since the 1980s, when climate change was accepted as an issue of major public concern, it has been recognised as an essential issue to be communicated to the public through various channels (Junsheng et al., 2019). The said channels include the media, which has become a crucial tool for information, education, and public awareness of climate change matters (Hunt & Watkiss, 2011). The intersection of mass media, as the principal channel of information, climate change science and policymaking, is a dynamic platform in the arena of climate change communication studies (Nerlich et al., 2010). Happer and Philo (2016) opined that public media contributed to moulding public awareness, which helped in bringing about behaviour change on matters such as the climate crisis. Mass media reporting may influence the ways in which translations between science and policy shape public discernment of climate change, making it important to take into account the role of the media in climate change science and policy, and media framing of the climate crisis (Nisbet, 2009b). The range of climate change communication extends from the provision of information and awareness-raising to concern and response, with the ultimate goal being to secure behaviour change (Nerlich et al., 2010). This

scope has raised fundamental questions about whether mere awareness of an issue can invoke action. Several scholars have argued that awareness alone is not enough to induce action (Tiller & Schott, 2013; Kramer et al., 2015; Trolliet et al., 2017).

Literature on science communication from the 1980s reveals a scientific community and policymakers who support the theory known as the 'public understanding of science model' or the 'knowledge deficit model' that views the public as only requiring education from scientists and other experts to be able to respond to scientific challenges (The Royal Society, 1985). In line with this theory, the knowledge and consensus on science among the public will increase should the public and scientists engage effectively (Anderson, 2009). Simply put, the model suggests that audiences in a communication process will be keen and capable to handle information if it is made available to them, therefore, all that is needed is more awareness and education to inspire public engagement in campaigns (Gross, 1994; Simis & Madden, 2016).

However, in subsequent years, the model was challenged by social scientists who dismissed its supposition that merely affording ordinary people information about scientific matter would automatically result in them accepting scientific and technological developments, driving the conjunction between knowledge and attitudes of ordinary people and scientists (Nerlich et al., 2010). The now regarded as outdated model, (Nisbet & Scheufele, 2009; Dudo & Besley, 2016), has attracted much criticism for conveying the assumption that individuals are passive audiences waiting to be given information to act upon. The knowledge deficit model has been accused of employing the normative ideology of science to advance the theory that communication is simply about transferring knowledge alone, and it rules out political concerns as irrelevant, making the model "asymmetrical" (Gross, 1994, p. 6). Furthermore, the model has been charged with portraying communication as a one-way stream from science to individuals. Gross (1994) explains that the model suggests that science practitioners should not try to convince members of the public as they assume it already holds a positive view of the value of science. Communicators, in terms of the model, should not attempt to build trust with the publics, because they assume that the public already have their trust. This means the model assumes a passive public, requiring a rhetoric that

acts to accommodate the facts and methods of science to the individuals' scant experience and cognitive abilities (Gross, 1994).

While researchers supporting the knowledge deficit model argue that it helps in rationalising the value of knowledge in informing people's attitude towards science (Sturgis & Allum, 2004), there is a contrary view suggesting that possessing information does not necessarily translate into a concern for global warming, for instance (Kellstedt et al., 2008). Most climate change communication researchers, therefore, tend to favour theoretical models that involve dialogue and engagement with audiences in the communication process (Ballantyne et al., 2016), as opposed to a top-down or one-way supply of information approach. Ballantyne et al. (2016) argued for a theoretical model that does not view climate change communication as a mere tool for transmitting messages to the populace. They considered what they termed the "conversational interaction model", which presupposes that the constitutive powers of communication embrace co-construction involving the messenger and the audience, with both parties being essential components of the communication process. In other words, the conversational interaction model advances a participatory process that explores problems, solutions, and related issues, where communicators work in tandem with audiences.

In the same context, another perspective in communicating climate change was advanced by Nerlich et al. (2010) and Howarth et al. (2020), who opined that climate communicators should consider making the issue of climate change likeable, interesting and with a meaning people find appealing, over-and-above encouraging rational public engagement with the problem. This means that climate change communicators ought to aim to achieve consequential engagement in the three aspects of communication, namely: understanding, emotion, and behaviour. Howarth et al. (2020) also suggested that science, such as climate change, follows some golden principles, also known as the Mertonian norms (see Merton, 1942): i) communalism: scientific data comes from social collaboration among scientists, thus it is usually owned by the entire scientific community; ii) universalism: scientific evidence is objective and is not dependent on the personal or social attributes of who discovered it; iii) disinterestedness: science is impartial and should not be undertaken for personal advancement and is answerable to scientific equals; and iv) organised scepticism: science is, by nature, questioned consistently and routinely, and is verified with a temporary judgment suspension. With the above as

the starting point, Howarth et al. (2020) argue that climate science communicators would be able to craft their strategies with an open mind. This means that communicating the climate crisis needn't be prescriptive of the solutions, but simply inform, educate, and expose communities to the benefits of adopting positive behaviour and finding solutions that work for them. This way, individuals would be able to find their own solutions to the climate crisis as they affect them in their own circumstances.

The argument for localised climate solutions has since been at the centre of the debates on the approaches to address the climate crisis in Africa. For instance, the African Development Bank Group (2022) has argued that climate change mitigation is not viewed as the immediate action that communities in Africa should concern themselves with, because the continent is a minor CO_2 emitter. According to 2019 estimates, the continent emitted a mere 3.8% of world emissions, while single countries such as China emitted 23%, the USA, 19% and the European Union, 13% (Carbon Disclosure Project, 2022). Because of Africa's low emissions, it has been argued that adaptation should be the focus of the continent's efforts to deal with climate change since Africans are more exposed to the wrath of global warming and the resultant climate change. This suggests that mitigating climate change, as a solution to the climate crisis, is not an action that should be of equal concern to Africans and westerners, for instance, because the former's emissions are negligible compared to their western counterparts. The solution Africans seek is to withstand the effects of climate change. Therefore, to resonate with the African people, communication about the climate crisis should take this paradigm into account instead of focussing on mitigation. As already stated in this thesis, approximately 90% of world climate funding goes into mitigation efforts (see African Development Bank Group, 2022)

4.2 Climate change communication research

The main mechanism to curtail the amount of GHE to levels before 1990, which will prevent temperatures from rising by 1.5°C by 2050, is decarbonisation (IPCC, 2013). Such reduction is supposed to be undertaken by individuals and communities, in all formations. Thus, such efforts will need to be underpinned by an information drive that capacitates people with relevant knowledge and information on what to do. Once again, climate change communication is the ideal tool that would capacitate communities to develop sustainable practices to help

mitigate and adapt to the changing climate (Evans et al., 2018). These arguments place research on climate change communication at the apogee of activities to address the crisis by making it a *sine qua non* for developmental, mitigation and adaptation policies, and societal change in behaviour in a sustainable way (Evans et al., 2018).

Climate change communication research evolved from two distinct interests:

- Those who wanted to preserve the prevailing state of affairs of using fossil fuels to protect their economic interests, have lobbied politicians, and have invested time and resources to get the attention of the mass media. Their goal was to create the notion of insufficient understanding of climate change, ongoing dearth of scientific consensus, and genuine counter explanations for the increasing evidence of global climate warming (Davidson, 2008; Jacques et al., 2008).
- Those who believe the growing evidence of climate change and the seriousness of its effects have embarked on a mission of raising the awareness of individuals, bolstering understanding and campaigning for changes in policies (Moser, 2010).

As afore stated, climate change communication research deals substantively with interdisciplinary scientific communication, international diplomacy, the scientist and policymaker interface, media coverage and public understanding of climate change (Russill & Nyssa, 2009). With regards to public understanding, research usually aims to establish public awareness and inherent risks in particular geographical settings (Lorenzoni & Pidgeon, 2006) or gauge the level of public knowledge and attitude towards the climate crisis (Poortinga et al., 2011). This sub-field of climate change communication scholarly research further encompasses studies seeking to explore the factors that influence the ways in which the public comprehends and responds to climate change (Zia & Todd, 2010; Corner et al., 2014). The mass media sub-field focuses on media content in the reporting on climate change and conducts content analyses in the theoretical frameworks of discourse analysis, framing, social theory, or a combination of these concepts (Ballantyne et al., 2016). According to Woldemichael (2020), the media is at the centre of fighting climate change because of its ability to communicate with people all over the world. This PhD study is largely situated in this sub-field. The study goes beyond merely exploring media coverage to probing communication by other

stakeholders using the media. This is important, because the media largely acts as a conduit of communication from other sectors, over-and-above communicating its own messages. The analysis therein allows for probing the stances of both the media and other stakeholders that communicate through it. Simply looking at media coverage might result in an exercise that deals with the piper but not the caller of the tunes.

The third main sub-field of climate change communication research relates to strategic communication, which concentrates on the methods of communicating climate change (Ballantyne et al., 2016). In this category, research often explores ways to enable change in the public opinion or behaviour using communication methods (Roser-Renouf & Maibach, 2018). This sub-field further deals with investigating strategies to conduct climate change communication and overcome barriers in the communication process (Uggla, 2008). Because the main aim of strategic communication is to encourage positive public responses to climate change messages, the elements of communication planning are usually presented as ways of addressing communication obstacles that are peculiar to climate change communication (Lorenzoni et al., 2007).

The fourth main sub-field is communication scholarship research. According to (Ballantyne et al., 2016), this sub-field is linked to the third branch, strategic communication, although it deals more with studying communication outcomes. This sub-field is concerned with applying quantitative research methods to measure public knowledge or attitude to climate change (Ballantyne et al., 2016). However, it has been recognised that the application of quantitative methods, alone, might not be able to adequately gauge public attitude, and qualitative research would need to come into play. Other scholars, particularly African have attacked quantitative methods of studying public understanding (see Oyedele, 2015 and Mahl et al., 2020). Whitmarsh et al. (2013) earlier suggested a more theoretical category, which entails reviewing climate change communication literature and analysing theoretical frameworks used in researching climate change communication.

Perhaps the missing sub-field in two lists is that of communicating the opportunities that climate change brings about. Contemporary climate change communication scholars have been critical of the approach where scientists, policymakers and communication practitioners communicate the climate crisis using its catastrophic

effects as the key component of communication. Communication approaches that are reliant on instilling fear and the authority of science alone, instead of wide-ranging explanations that include solutions, tend to leave individuals feeling swamped and detached, and not hopeful and encouraged to take action (Bonanno et al., 2021). It has been argued that for climate communication to be successful, communication should involve the head (awareness), heart (hope from agency and efficacy), and hands (intentions to take part in societal action) (Bonanno et al., 2021). In addition, Nagel (2021, p. 17) proposed an "opportunity-oriented communication" for climate change, which suggests a replacement of the commonly used "fear appeal". This would entail an approach of framing climate mitigation that relates to individual's values with the expectation of developing long-lasting engagement with action that is sustainable (Nagel, 2021). As is argued in the discussion section of this thesis, communicating economic and sustainable development opportunities of addressing the climate debacle, might have the potential to attract people, including sceptics, to seeing the fight against climate change as being about life rather than death.

4.2.1 Mapping of climate change communication scholarship

Research in climate change communication is conducted in the already stated sub-fields in various parts of the world. However, most such research takes place in Northern Hemisphere countries, such as the USA, UK, Canada, and some western European countries (Chadwick, 2017). Australia, in the Australasia region also conducts considerable research (Chadwick, 2017). Different countries have different approaches to scholarship on the subject. In some countries, the scholarship tends to be driven at the national level. Media reporting of climate change in Britain, for example, is led by national newspapers, rather than the local media (Anderson, 2019), leading to a scenario where research is also approached at national level. The two approaches of national and local research could have their pros and cons. Research driven at national level has the potential of constructing climate change as a national rather than a local issue and paint climate issues in different parts of the countries with one brush. Anderson (2019) suggested as much when discussing the national-centred approach. Locally driven research would be in line with the place-based communication approach, which has been regarded as being potentially more effective in that it addresses climate issues that speak to local communities (Schweizer et al., 2013).

Africa is possibly the continent most lagging behind in climate communication research (Smith, 2013; Oyedele, 2015; Suliman, 2018). While academics in South Africa and Nigeria, in the main, have conducted some research in this field (e.g., Cramer, 2008; Tagbo, 2010; Smith, 2013; Oyedele, 2015; Oyero et al., 2018; Suliman, 2018), work from other nations on the continent is very limited. Kenyan, Tanzanian and Ugandan researchers have also published some works (Nassanga, 2013; Kalonge, 2020; Elia, 2019, 2021). As already stated, there has been an outcry that not only climate change is inadequately communicated in Africa, scholarship on climate change communication is also less than sufficient, taking into account the vulnerability Africa faces from global warming (see Tagbo, 2010; Oyedele, 2015). Hereunder follows a global overview of climate change communication research in different countries and regions. Only a few countries and regions were selected to give a snapshot of the status of scholarship on the subject.

4.2.1.1 Germany's 'climate catastrophe' catapulted scholarship

In Germany, climate change communication scholarship started in the 1980s and has since been expanding (Schäfer, 2016). Climate change was dubbed a "climate catastrophe" and climate change communication has received widespread public attention. The scholarship in that country mainly entails media and document analysis as well as qualitative interviews in which researchers analyse the interplay between scientists, political decision-makers and the mass media (Schäfer, 2016). Germany's progressive stance regarding climate change seems to be a secure platform for climate change communication scholarship to evolve. Such progressiveness is evidenced by the country setting an example of a commitment to move away from polluting policies by setting itself extremely tight targets for reducing emissions (Klein, 2012). The country has set the target of cutting emissions by 65 percent below the 1990 levels by the end of the present decade and achieve carbon neutrality by 2045 (Black et al., 2021).

Climate change communication in Germany is underpinned by three contextual factors. Firstly, the structure and culture of the country create conditions for open debate about important matters such as the climate crisis, which is due to Germany's political "opportunity structures" (Schäfer, 2016, p. 2). The said political opportunity structures create the space for stakeholders with different viewpoints to discuss issues such as climate change openly (Schäfer, 2016). Other scholars

have concurred, adding that the country's "democratic-corporatist" media system (Hallin & Manchini, 2004, p. 143), which favours consensus over contestation, has further contributed to the contextual factors that built a formidable climate change research scholarship in the country (Schäfer, 2016). Before the July 2021 flooding that was reported to have been up to nine times more likely exacerbated by the climate crisis (Carrington, 2021), Germany had only experienced socio-economic outcomes of climate change, in the main, and relatively fewer weather disasters (Schäfer, 2016; Watts, 2021). However, public interest on climate change has been constant in the country, driven by the fact that despite advances to becoming a low-carbon economy, Germany's energy mix continues to rely heavily on fossil fuel energy sources. The most common signs of climate change in Germany include extreme weather patterns, health risks, rising sea levels and biodiversity losses. Thirdly, the country has a strong environmental legacy, which places climate change as a key subject of the country's environmental activism. This fuels communication on the subject and subsequent scholarship.

According Roose (2012, cited in Schäfer, 2016) an extensive belief in the reality and anthropogenic causes of global warming, a robust German environmentalism tradition and an open yet consensus-driven media architecture favouring organisational stakeholders over civil-society representatives, Germany has the makings for strong, but not excessively controversial public deliberations and media reporting of climate change. Accordingly, scholars such as Grundmann (2007) believed that climate change communication scholarship in Germany, although having many gaps, illustrated a considerable consensus among government, scientists, NGOs, and fossil fuel interests, who all agree on the reality of anthropogenic climate change and the need to respond. There is further consensus among key players that the country should be a leading player in global efforts to mitigate climate change. The country does not have an apparent "climate denial machine" (Dunlap & McCright, 2011, p. 147), such as a strong communication machinery supporting sceptical views (Grundmann, 2007). Nevertheless, Forchtner et al. (2018) noted a far-right climate change scepticism that communicated criticism of scientists and the media, accusing them of distorting climate change and being alarmist. They also blame climate policies for supposedly being money-making scams. Their scepticism is about both the evidence and the processes of climate change (Van Rensburg, 2015). German journalist, Pötter (2020), described the website *Klimafragen.org* as one of the

sceptics' key media, which regularly attempts to advance views of denialists. According to Pötter (2020), the website publishers are all from well-known climate-sceptic institutions and conservative political circles. However, Schäfer (2016) and Pötter (2020) concur that the German public mostly tends to brush off sceptics' views and internalise the message of climate change and are always determined to do something to mitigate it. Pötter (2020) wrote that deniers of anthropogenic climate change did not enjoy much public support in Germany, adding that for several years, there has been a stable 80% of the population who are convinced of climate change, support a switch to greener energy, and back tougher climate goals. Clearly, climate change communication research in Germany is facilitated by many factors, some of which are characteristic of the German society.

4.2.1.2 Climategate gave rise to scholarship in the Netherlands

In the Netherlands, the concept of climate change communication was first witnessed in the media in 1957 in the context of the International Geophysical Year (Dewulf et al., 2017) from 1 July 1957 to 31 December 1958 (see Nasa, 2005). However, it was only in the later years of the 1970s that the subject became prominent in the public discourse as part of the energy crisis, which originated from the disagreements regarding nuclear energy (Dewulf et al., 2017). In earlier years of climate change communication scholarship in the country, De Boer (2007) studied climate change framing in the Netherlands and concluded that it was framed to articulate its association with river-based problems and rain. This might be problematic for communicating the risks of climate change since they potentially produce many more over-and-above rain and river-based problems (De Boer, 2007).

The combination of COP15, which was held in Denmark, and Climategate, both in late 2009, contributed to a turning point in the country's climate change communication and gave rise to voices in online communication, and climate change sceptic voices gained prominence (Dewulf et al., 2017). Climate change media reporting has often been boosted by the coverage of international climate change conferences, thus attracting scholarship for climate change communication (Christensen & Wormbs, 2017; Gurwitt et al., 2017). The underlying presumption of the scholarship is that higher levels of media reporting during such events has a great potential to influence public opinion and might encourage action in response to the climate crisis (Wonneberger et al., 2020). Much research in the

Netherlands is dedicated to public responses to climate change communication (Christensen & Wormbs, 2017; Gurwitt et al., 2017). However, scholarly research focusing on climate change communication is still regarded as being scarce in the country, which is said to be quite strange given the Netherlands' tradition of participating in domestic and international climate change deliberations. While the subject often features in studies on the country's environmental policy as well as in research of the interface between science and policy, or in international comparative research, in-depth studies of climate change communication are rare, which makes the field a fragmented subject (Dewulf et al., 2017). In this regard, various Dutch scholars have explored different aspects of climate change communication. Mees et al. (2018), for instance, studied the efficacy of communication tools in dealing with barriers to local government level adaptation to climate change. These scholars considered the effectiveness of communicative tools for increasing the awareness of climate impacts and stimulating adaptive action by municipalities. Their study found that the main barriers faced by municipalities are a lack of urgency and knowledge of risks and measures as well as limited capacity (Mees et al., 2018).

4.2.1.3 UK scholarships underpinned by media coverage

In Britain, climate change communication research began in the 1980s and concentrated on studying media reporting of climate change (Anderson, 2019). The first steep rise in media reporting in countrywide daily newspapers took place in the late 1980s as climate change and related issues became politicised (Anderson, 1997, 2014, 2019; Carvalho & Burgess, 2005). A meta-analysis covering 133 studies of international media coverage concluded that a sizeable amount of academic research on climate change communication devoted to studying climate change media reporting, with the UK scoring the highest in Europe (Schäfer & Schlichting, 2014). Some two-thirds of all examined news articles in print media, revealed the UK's dominance in the coverage of the subject (Anderson, 2019). However, broadcast media has since increased its coverage of climate change and is committing to doing more. Up to 12 of the UK's broadcasters, covering 70% of the market, signed a pledge at COP26 to broadcast content that educates audiences about the climate crisis (Yossman, 2021). The pledge was hailed as a sign of commitment to help the British society deal with the climate crisis, which led British Broadcasting Corporation (BBC) director-general, Tim

Davie, to declare that the pledge was the media industry's firm commitment to accelerate the engage and informing of audiences on the climate challenges (Yossman, 2021). In earlier years, Anderson (1991) and Hansen (1993) focused their climate change communication research on national print media coverage of environmental issues and the strategies employed by civil society environmental organisations to influence the media reporting of the climate emergency.

Research in this field in Britain has a strong interdisciplinary character that cuts across human geography, sociology, media studies, and political science (Anderson, 2019). Some few studies in the early 1990s concentrated on researching media coverage of environmental matters, among them the effects of GHE on global warming (e.g., Anderson, 1991; Cottle, 1993). Most of this initial research was on the effects of news values in determining the quantities of coverage afforded to divergent environmental matters and disparities of access among people and groups who provided information to the news outlets. In later years, academic institutions and NGOs took on the challenge to research various facets of climate change communication, including public understanding and media coverage.

In 2004, climate activists George Marshall and Richard Sexton joined hands to establish the first charity in the country to concentrate on public engagement with climate change, which first became known as the Climate Outreach Information Network (COIN) and later named the Climate Outreach (Climate Outreach, 2020). The charity undertakes research and programmes, and external relations and operations – all in the realm of climate change communication research. The UK boasts special climate change communication science education in the form of the 20-year-old Tyndall Centre for Climate Change Research, among others. The training centre offers a course on science of climate change communication, which has the following aims, according to Tyndall Centre for Climate Change Research (2021):

- Introducing the political and social context of communicating climate change, as well as providing specific tips and guidance for researchers, where the science of communicating climate change is introduced.
- Building confidence among climate change researchers to engage the public effectively.

Studying various facets of climate change communication is now a common occurrence in the UK where various researchers regularly undertake work to primarily establish the levels of knowledge and understanding of climate change. One such study, for instance, found high levels of pessimism and disempowerment among the youth (Hibberd & Nguyen, 2013). The study found that there was a lack of relevance, resources, and rituals, calling these a "set of triple-R reasons" that explain youth disengagement and inaction in climate change (Hibberd & Nguyen, 2013, p. 27). The media and other forms of communication were found to be hindering rather than helping the youth to be actively involved and engaged due to the absence of positive and relevant messages on the changing climate, where the focus is often on the extreme and controversial (Hibberd & Nguyen, 2013).

In another study, Howarth et al. (2019) urged the UK to institute policies that focus on improving resilience to hot weather. Such policies ought to be aligned with broader sustainability challenges and include communication, social insights, and behaviour in an effective manner (Howarth et al., 2019). As the world becomes exposed to ever rising temperatures, so the social responses to risks of hot weather need to be prioritised, argued Howarth et al. (2019). Most studies regarding media reporting of climate change have targeted the mainstream press, which prompted Anderson (2019) to suggest that future research should go beyond the mainstream press and target a broader range of media, including television news. TV news has become the most important and trusted source of information on climate change in the country, because of perceptions of it being accurate and influential, especially among individuals older than 55 years (Gavin, 2017). Research should also cover other forms of media, such as online news (Anderson, 2019), since two-thirds of people in the 18-28 age group mainly use this medium for information (Newman et al., 2016). While the UK has made a major contribution in shaping European response to climate change, including climate change communication scholarship, its future role is unclear as a result of Brexit, where the UK ceased its membership of the EU in 2021.

4.2.1.4 Climate change communication in the Asia-Pacific region

Climate change communication in the Asia-Pacific region ranges from government-driven campaigns for emission reduction to mass media coverage of international events on climate change issues (Aoyagi, 2017). Corporate interests hijack climate communication in Australia (Holmes & Star, 2018), while there is low interest on

the subject in India (Thaker, 2017). In Japan, the lack of interest by social scientists to research climate change communication has limited the amount of communication with the general public (Aoyagi, 2017). This has created a scenario where there is no debate on the effects of the climate crisis, the kinds of energy required to mitigate it, the vulnerability of different sectors of the Japanese society, as well as ethical and justice issues (Aoyagi, 2017).

China has started research relatively late (Li & Dan, 2017). In China, the year 2007 became known as the first year of climate change communication research in the world's second largest polluter (Li & Dan, 2017). Here, climate change communication research includes analyses of scientific reports and studies conducted by the government, academia, NGOs, and business enterprises, among others (Li & Dan, 2017). Climate change communication in China has taken a new turn since the country decided on carbon targets, with the aim to take the country to zero emissions by 2060. Scholarship on the subject is has since experienced growth (Binbin, 2021). Liu and Zhao (2017) studied climate change debates in China's premiere microblogging website, Weibo, surrounding the Paris Agreement during COP21, in 2015, and found that state media bloggers and international figures dominated the discussions, while Chinese NGOs and public intellectuals were mostly absent. On the other hand, few Weibo users discussed topics such as climate science, climate change impacts on China, or China's low-carbon policy measures. Therefore, climate change was regarded as a global threat which had little connection to China's national context (Liu & Zhao, 2017). A study of media coverage of climate change comparing the US and China, found two divergent approaches in the two leading CO_2 emitters. The divergence reveals two distinct societies, capitalist and democratic US, on the one hand, and communist and authoritarian China, on the other. The US media highlighted political conflict and the catastrophic consequences of climate change, whereas the Chinese media had no mention of political conflict, but highlighted public accountability and governance, as well as economic development and competitiveness concerning climate change (Su & Hu, 2021).

In spite of India being a major CO_2 emitter – the world's third largest – and one of the most climate-vulnerable countries, there have been very few studies focusing on climate change communication in the country (Thaker, 2017). As a result, the majority of Indians are unaware of the terms 'climate change' and 'global warming',

yet many people have reported experiencing changes in their local weather patterns, which are largely consistent with climate change (Thaker, 2017).

Australia has a rather challenging atmosphere when it comes to climate change communication scholarship. Their journey began with much promise in the late 1980s with the media and politicians raising awareness of climate change (Holmes & Star, 2018). However, by the mid-1990s, the political and media consensus on climate change took a new turn when political elites and corporate interests hijacked the narrative of climate change, which was termed the 'national interest', at the time (Holmes & Star, 2018). One of the country's major news organisations, Murdoch's News Corp Australia, was accused of leading misinformation on climate change and defending fossil fuels interests (Walton, 2020). Even when the country was engulfed by unprecedented bush fires in early 2020, which were blamed on climate change, News Corp preferred to accuse unidentified arsonists, thereby avoiding dealing with the reality of the existence of climate change and possible cause of the inferno (Walton, 2020). The political economy of the fossil fuels industry, politics, and the mainstream media "nexus" complicate climate change communication in Australia (Holmes & Star, 2018, p. 151). The economy, which is highly regarded by most Australians, is strongly dependent on extracting and exporting minerals, particularly coal (Holmes & Star, 2018), making the country the world's largest exporter of this polluting commodity. Thus, the country is becoming a leading CO_2 emitter with emissions greater than the domestic pollution of Germany, Canada, Turkey, and the UK combined (Kelly, 2020). The economic importance of coal ensures a strong bond between political elites and fossil fuels companies. To make matters worse, coal companies are the largest donors to major political parties at the federal level and in the state of Queensland (Holmes & Star, 2018). Public concern for climate change can only be sustained by research on how to "fracture the media–fossil fuels industry-political elite roadblock that currently polarises the issue" (Holmes & Star, 2018, p. 166). This outcry appears to reveal how climate change communication scholarship is frustrated by politics and money down under.

Climate change communication in New Zealand occurs through multiple channels, including public communication by experts, formal and informal science-policy dialogues, publication of popular books, documentaries, and media reports (Salmon et al., 2017). Communication also happens through various activities,

such as those that utilise social media, art, community events and festivals, and co-production processes related to adaptation and mitigation choices. According to Rutherford (2021), the country had passed the Education and Training Act of 2020, which among others, legislated climate change and environmental education that includes Māori principles. Although research into the communication of climate change is in its infancy in the country, data on public attitudes toward climate change over the past decade indicate that most New Zealanders believe climate change is occurring, is anthropogenic, and is a serious concern (Salmon et al., 2017). According to Chetty et al. (2015) and Salmon et al., (2017), most mainstream news reports in the country were largely consistent with the scientific consensus and IPCC reports and did not give much coverage to sceptical or catastrophic viewpoints.

In general, climate change communication research in the Asia-Pacific region entails studying media coverage of climate change. There is minimal research on how other sectors such as government, corporates and civil society communicate the climate crisis (Thaker, 2017).

4.2.1.5 North and South America at the forefront of climate communication research

Judging from the amount of literature emanating from the US, it is clear that, in many respects, America is at the forefront of climate change communication scholarship. Several studies have been conducted by various institutions in academia, the scientific community, NGOs, etc. The media in the US and Canada, take different approaches in their reporting about climate change. The Canadian media coverage of climate change has been more than the global average (Callison & Tindall, 2017), and it has primarily focused on policy-making at the national level, with a secondary focus on energy and economics of the climate crisis. Canada has had consistently positive public attitudes and media coverage of climate change, although this has not necessarily resulted in policy or action (Callison & Tindall, 2017). In the US, climate change communication has been characterised by a diversity of voices, including some media that almost specialise in reflecting sceptics' narratives of climate change. However, a recent study of public understanding of climate change found that Americans who think global warming is happening outnumber those who think it is not happening by a ratio of more than six to one (Leiserowitz et al., 2021). Nevertheless, Elkus (2021)

suggested that America had a climate change communication problem, rather than a problem with taking action to address the crisis.

In the case of Mexico, interest in climate change had often been demonstrated in political, economic, and environmental spheres (Urbina-Soria & Landeros-Mugica, 2021). Most academic and social research focuses on knowledge, beliefs, perceptions, and social representation of climate change, except for a few that dealt with the communication process of climate change (Urbina-Soria & Landeros-Mugica, 2021). Most research findings have expressed the need for the country's publications to report on campaigns and workshops which are aimed at increasing the knowledge of climate change.

In South America, concern about climate change has not yet become an effective pressure on the political classes, particularly because the subject remains relatively marginal in electoral campaigns (Franco, 2016). Scholars from the regions have largely researched media coverage and public understanding of climate change in Argentina, Brazil and Chile, among other countries. López et al. (2020) found that local digital media published articles about regionally important climate change topics, while national media focused on international issues. Researchers have also found that news about climate change appeared mainly when climate change disasters occurred, generally to discuss impacts on important social sectors in the regions, such as agriculture and economics (López et al., 2020). In addition, there has been no reciprocity mechanisms among climate change stakeholders, such as journalists, academics, and policymakers (López et al., 2020). The region's Spanish-speaking media largely used politicians as the principal sources of climate change stories and almost half of the news items came from news wire services (Arcila-Calderón et al., 2015). Consequently, media coverage did not respond to local needs, a major finding in several studies in the region (Dotson et al., 2012; Mercado, 2012; Dayrell & Urry, 2015).

4.2.1.6 Climate change communication scholarship is poor in Africa

Climate change communication scholarship in Africa has mostly focused on western and industrialised countries and is generally minimal. It has largely been quantitative in nature, using standardised methods that have certain limitations regarding the detail of their characterisations (Mahl et al., 2020). This charge has been supported by other researchers such as Suliman (2018), who found that

climate change communication is generally understudied on the African continent. Having studied research in 67 national and international journals covering the continent on subjects of climate communication, climate change and agriculture, Oyedele (2015, p. 239) found that most studies relied on "probability sampling and first-level statistical analysis, with only two of the 67 studies being theory driven". Furthermore, Oyedele's research found trends showing that the existing research approach, design, and methods were "purely" elitist and quantitative, something that was regarded as being "grossly inappropriate given the socio-cultural, economic and demographic variables of most audiences on the continent" (p. 240).

Nigerian scholars have conducted studies on climate change communication in their country, particularly within the sub-field of public understanding of the climate crisis. These studies have included an assessment of public perceptions of local and global impacts of the threat posed by climate change in the Ibadan metropolis of Nigeria by Adelekan and Gbadegesin (2005). More specifically, their research assessed the level of knowledge of different climate matters by residents of the city. Studying media coverage of climate change in Nigeria and Ghana, Nwabueze and Egbra (2016) found that most publications lifted their stories from foreign media and institutions such as NGOs. Their research concluded that African media has a significant amount of work to do in informing the public about climate change and its "adverse and deleterious" effects (p. 123). They suggested that instead of relying on international media and other platforms for their climate change stories, the continent's journalists should "wake from their slumber" and afford the public information on climate change issues so that there can be success in the campaign against the scourge (Nwabueze & Egbra, 2016, p. 123). The specific issue of media coverage of climate change is discussed in some detail hereunder.

Climate change communication scholarship in the realm of public understanding of climate change, have been studied from time to time, in several countries on the continent. In 2010, the BBC undertook one such research project, titled *Africa Talks Climate* (BBC, 2010). The research involved more than 1 000 citizens from the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Nigeria, Senegal, South Africa, Sudan, Tanzania, and Uganda. Interviews were conducted with nearly 200 opinion leaders, including policymakers, religious and community leaders, businesspeople, media, and NGO representatives (BBC, 2010). A telling finding of this study was poor public understanding of climate change among the continent's

people, clearly blamed on a lack of communication on the crisis. Although his is an old study, some of its findings have been confirmed by later studies such as Chingwete et al., (2018). This PhD study analysed 39 articles in several journals published after 2015 and found that while there was an increase in the volume of studies, various issues of concern raised in earlier studies persisted. A literature review of media-based communication of the climate crisis in Africa by Okoliko and De Wit (2020, p. 63) found that there was growth and diversity in research in the field, but they also found a “pale picture” of what communication efforts were underway to get Africans to engage with climate change issues via the media.

Some of the public understanding of climate change surveys have been conducted by NGOs and independent research institutions such as Afrobarometer. This is a leading research institution established in 1999 by a merger of three research projects, led by Afrobarometer co-founders, Dr Michael Bratton, Dr Robert Mattes and Dr E Gyimah-Boadi (Afrobarometer, 2021). Their latest comprehensive study on the subject was published in 2018 (see Chingwete et al., 2018).

An interesting take on climate change communication on the continent came from Chari (2016), who argued that climate change remained misunderstood by the African people due to socio-cultural, economic, and structural factors. Chari (2016) found that communication of the climate change science on the continent could be better served by integrating indigenous communication systems that embrace existing local knowledge. Making the case for the usage of African knowledge systems, Chari (2016) maintained that indigenous communication media had distinct characteristics that resonated with the lived experiences of the majority of the African people and would thus be more effective in communicating complex issues such as climate change to Africans. This argument might not be entirely valid because many of the continent’s people also use the same media such as newspapers, radio, television, and digital platforms, as used in other jurisdictions with different cultures. This media has been used in other societal information and education campaigns, such as for instance, to fight the Covid-19 pandemic and HIV and Aids. No case has been made that this mainstream has been inadequate in these campaigns. Therefore, the sam systems should also be useful for communicating climate change. Other scholars have pointed to many factors, such as the lack of climate skills in key communication institutions instead of the non-application of African knowledge systems. For instance, Ogwezi and Umukoro

(2020) explored public understanding of climate from a media coverage point of view and found that community and global efforts at mitigating climate change have been greatly influenced by the media's portrayal of climate change in Nigeria and other sub-Saharan African countries. Despite this, it has been generally acknowledged that journalists, especially in the developing world, were not sufficiently equipped to process and effectively communicate climate change information in a manner that would galvanise popular participation in climate change mitigation efforts (Ogwezi & Umukoro, 2020). This points to a lack of skills on the subject, among journalists, instead of the absence of indigenous communication knowledge as argued by Chari (2016).

In Southern Africa, media coverage has been the keystone of climate change communication research. Shimhanda and Vivian (2021) investigated media coverage of climate change in South Africa and Namibia and found that climate events such as international conferences and adverse weather influenced reporting on climate change. Publications in the two countries relied, to some extent, on stories from international media networks (Shimhanda & Vivian, 2021). They criticised this, saying it suggested that climate change problems in Southern Africa were primarily a replication of international news.

In conclusion, most literature on climate change communication research in different African countries, generally, raises similar issues: i) poor media coverage; ii) reliance of the media on foreign news agencies for their reporting; iii) media coverage influenced by extreme weather events and international climate change conferences, instead of daily experiences of local communities; iv) a general lack of public awareness, where more than half of the population in some countries, such as South Africa, are simply not aware of the concept 'climate change'; and v) a lack of skills among journalists to report on the climate crisis. There is also criticism that climate change communication scholarship on the continent focusses on climate events taking place in western countries and reported by the western media. This is regarded as an obstacle to the fight against climate change on a continent most exposed to the wrath of global warming. As already discussed in Chapter II, Africa is already facing major climate challenges, which are expected to become worse in years to come. Scholarship in climate change communication can play a meaningful role in identifying communication gaps that society would

need to fill so as to raise the levels of public awareness and response to the climate *crisis.*

4.2.1.7 Climate change communication scholarship in South Africa

Climate change communication scholarship in South Africa is largely focused on studying media coverage of climate change (e.g., Cramer, 2008; Shanahan, 2009; Tagbo, 2010; Smith, 2013; Johannessen, 2013; Shimhanda & Vivian, 2021). However, public understanding of climate change and public policy have also been investigated in several studies (e.g., BBC, 2010; Chingwete, et al., 2018; Mahl et al., 2020; Roberts & Struwig, 2021). Averchenkova et al. (2019) investigated climate policy in the country. As earlier stated, the study of climate change policy is part of the broader field of climate change communication (see Ballantyne et al., 2016).

In South Africa, a further sub-field of climate change communication research was explored by Evans et al. (2018), who examined the subject from the perspectives of communication effects and conceptual analysis. These authors explored theoretical perspectives, that they argued, would work towards climate change communication in the Global South. They analysed various communication approaches used in communicating climate change and identified their strengths and weaknesses. Evans et al. (2018) proposed an integrated and structural participatory approach premised on the participation and empowerment of people. The authors argued for what they termed the 'glocal' approach – meaning approaching climate change communication from both the global and local perspectives. This, they added, could advance a two-way exchange of knowledge and information between those in authority, communities, and other stakeholders.

It is clear that both climate change communication and scholarship remain inadequate in South Africa. This is of great concern given the fact that the country is the continent's largest polluter (Reuters, 2021c) and already experiences serious climate change impacts in the form of droughts, rising sea levels and floods (Engelbrecht & Monteiro, 2021) and deaths associated with poor air quality as a result of the massive reliance on coal for energy (Reuters, 2021d).

This literature analysis has revealed that most climate change communication scholarship in various countries and regions of the world concentrates on researching public understanding of climate change and media coverage. Other

sub-fields of climate change communication, such as communication strategy, policy and diplomacy are largely studied from other fields outside communication. The concentration in studying media coverage is understandable in that media coverage has been considered crucial in climate change communication research since it is the main source of information about climate change. For instance, Newman (2020) surveyed data from online sources of climate change information from 40 countries, both developed and developing, and found that in 2020, news media were the most widely used source of information on climate change, therefore, very useful in climate change communication scholarship.

The issue of the African media relying on foreign media for their reporting is no trivial matter of mere academic concern because such coverage may have a negative impact in public understanding of the climate crisis on the continent. Naturally, the western media concentrate on their climate stories and giving little attention to climate stories of Africa. For instance, when America's Cable News Network (CNN) compiled its top 10 list of 2021's climate change events, none from Africa made the cut. If this list was to be relied upon in learning where the effects of climate change were more severe, the continent's people would have been left with the impression that climate change is not a serious issue on their continent, and therefore is not one they should preoccupy themselves with. The CNN list, according to Ramirez et al. (2021), was made up of:

10. Historic rain at Greenland's summit: Rain fell for the first time at the typically snowy summit of Greenland.

9. Texas deep freeze: An unusual winter storm swept across the central United States, disrupting electricity generation, and leaving some 4 million people without power.

8. Fatal floods across three continents: Destructive flash flooding ravaged parts of Western Europe (Germany and Belgium), China's Henan province and the state of Tennessee in the US, killing scores of people and destroying property.

7. US re-joins the Paris Agreement: The US re-joined the Paris Agreement following its withdrawal by President Donald Trump.

6. UN report: A 'code red': The UN's IPCC released AR 6.

5. A critical summit in Glasgow: COP 26 took place in Glasgow.

4. Hurricane Ida: Category 4 Hurricane Ida destroyed homes, uprooted trees and cut off power to more than a million customers in Mississippi and the already storm-ravaged state of Louisiana.

3. December tornado outbreak: A series of tornadoes tore through the Midwestern and South-eastern US, uprooting trees, levelling homes and killed dozens of people.

2. Pacific Northwest heat wave: An unprecedented heat wave in late June 2021 led to the death of hundreds of people in the Pacific Northwest and British Columbia, in the US.

1. Drought, wildfires and water shortages: Fires were experienced in California and two of America's largest water reservoirs, Lake Mead and Lake Powell, went dry, following a drought.

The list missed several climate change-inspired events in Africa, such as a crippling drought in the Grand Sud region of Madagascar, which has had a disastrous impact on agriculture, placing 28 000 people in food insecurity and 1.3 million requiring urgent assistance (World Food Programme, 2021). The list did not include a climate change-inspired drought that is ravaging northern Kenya's Wajir county, with 2,4 million people struggling to get food (Pietromarchi, 2021). The flooding in South Sudan, which displaced over 800 000 people (McGrath, 2021), also did not make the CNN list. These and other omissions make the case for the continent's media to increase their reporting of climate events in their own countries, instead of relying on foreign news services to boost communication on the crisis in Africa. Scholarship on climate change communication on the continent needs to highlight these communication gaps as means to encourage the relevant stakeholders to improve their communication on the crisis.

4.3 The media in climate change communication

Climate change is communicated through various channels, including the media, government systems, and public relations activities from NGOs and international organisations, among others. The media is the leading vehicle through which climate change is communicated. The media's role in communicating the crisis is

accentuated by the fact that public perceptions of climate change tend to be intertwined with media presentations of the crisis (Mahl et al., 2020). Thus, researchers have usually gauged public perception of climate change by studying media reports on the issue. While people pay far more attention to information from television news compared to other media (Newman et al., 2020), the media, in general, is by far the main source of climate information for most people. It has been speculated that perhaps the power of the moving image stirs audience emotions. In developing nations and rural areas, however, radio is the main medium for communicating climate change information to the public (Luganda, 2005; Abdulai et al., 2021). Nearly half (47%) of the Reuters study's respondents praised the news media for doing a good job of providing accurate information about climate change. However, by contrast, climate sceptics responded that the media was not doing a good job in their reporting on climate change (46%), but even among them, 16% thought the media was doing a great job (Newman et al., 2020). In this regard, even among those that are critical of the way in which the media reports on climate change, there is acknowledgement that it is the main source of information on the climate crisis.

During recent decades, the mass media reporting on science – such as climate change – has proven to be a major contributor to shaping and affecting science policy discourse, public understanding, and action (Boykoff & Roberts, 2007). The mass media's representation of science has broadly affected translations between science and policy, and has shaped perceptions of various issues concerning the environment, technology, and risk (Weingart et al., 2000). Mass media coverage of scientific subjects is crucial in several ways, such as in stem cells, genetically modified organisms, cloning, the environmental or health implications of chemicals, or climate change (Weingart et al., 2000; Boykoff & Rajan, 2007). Media coverage of any scientific subject helps to shape public perception, thus affecting how science is translated into policy, particularly in areas such as the environment, new technologies and risks (Boykoff & Rajan, 2007). The media creates a version of events that is seen as reality, thus shaping public consciousness (Gitlin, 1980). In Southern Africa, Evans and Musvipwa (2016) described the media as a primary source of public information in communicating the climate crisis, therefore, making its role in this regard, one of extreme importance in helping the region in addressing global warming. The institution plays an essential role in influencing local perceptions, attitudes, and policymaking on the issue (Evans & Musvipwa, 2016).

The media assumes the normative role of producing and transforming attitudes towards climate change adaptation and mitigation (Corbett & Durfee, 2004). In climate change discourse, the media is the theatre where various climate change struggles play out. The institution mediates between the different groups of actors by framing climate change issues for politicians and members of the public, thus helping them to understand the changing world (Johannessen, 2013).

Media coverage of climate change worldwide has been "ebbing and flowing" amidst competing interests in political, economic, environmental, social, and cultural spheres (MeCCO, 2018, p. 2). In a study of worldwide media coverage of climate change, MeCCO (2018, p. 2) found that October 2018 "was the high watermark for coverage of climate change or global warming". The increase in media coverage can mainly be attributed to the attention afforded to the release of the IPCC Special Report in 2018 that suggested the world should work towards achieving a global warming increase of 1.5°C by 2100 (MeCCO, 2018). The releasing of AR6 received immense coverage in newspapers in several countries (CarbonBrief, 2021), but there was an outcry about poor coverage in South Africa. Friedman (2021) decried that while releasing the report was a major news event internationally and it was covered to a saturation point around the globe, in South Africa it was not reported in any meaningful way. The mainstream media almost entirely ignored the releasing of the report, leaving it to online networks such as the *Daily Maverick*, who carried an article on the day of the releasing event (see Van Diemen, 2021a).

In spite of an October 2018 increase, the world aggregate of newspaper coverage declined by 26% in this year compared with 2017, although there was a country-level coverage increase in countries such as the UK (up 22%), New Zealand (up 22%) and USA (up 20%) in 2018 (MeCCO, 2018). The MeCCO survey further found that coverage was at about the same levels in the two years in Australia (up 1%), Canada (down 2%), Germany (down 1%), India (up 2%) and Spain (down 1%). The study concluded that there was a decrease in coverage in media outside the above-mentioned countries (MeCCO, 2018). By comparison, coverage in Central American and South American sources was down 23%, which might be a case of limited capacity to cover climate change due to a lack of resources for media in developing countries (MeCCO, 2018).

The crucial role of the media in climate change coverage has placed it in a position where interests in politics, economics and other sectors have been trying to influence its reporting in an effort to affect the public's understanding and perception (in their favour) (Boykoff & Rajan, 2007). With scientists becoming alert to this fact, the intersection of mass media, science and policy is becoming a lively terrain of communication where all sides claim high stakes (Boykoff & Rajan, 2007). This issue is at the centre of this PhD study where the exercise seeks to understand if climate change communication in South Africa has been influenced by politics and money instead of the need to achieve behaviour change among the country's citizens. Establishing this helps in determining how such influencing has shaped public understanding, perceptions, and action against global warming.

4.4 Historical overview of media coverage of climate change

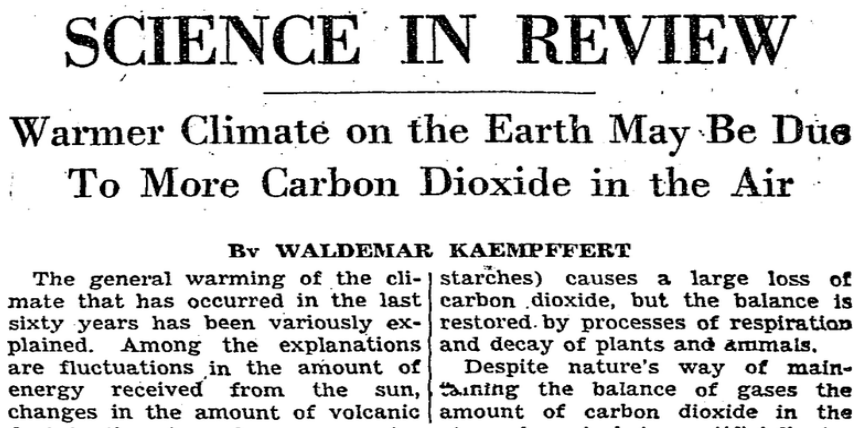
Media coverage of climate change can be traced to writings about the connections between weather and climate as far back in the nineteenth century (Boykoff, 2011). Such coverage was spearheaded by western newspapers from the eighteenth to mid-twentieth centuries, focusing primarily on links between weather, food production and climate (Boykoff, 2011). The media has used various terms to describe climate change throughout the years, always following the language used by scientists to describe what has finally become known as 'climate change'. From about the 1950s, climate change was known as 'global warming'. The term was meant to describe a long-term rise in the Earth's average atmospheric temperature (Dictionary.com, 2019). But this term was found to be confusing as some people understood it to mean that the Earth would simply increasingly get warmer, without leading to a change in climate. Thus, the term 'climate change' was introduced gradually by scientists, leading the media to use it as the best way to describe the climatic changes that would result from the warming (Dictionary.com, 2019).

Scientific reports revealing that the burning of fossil fuels was causing global warming constituted some of the early media reporting on the subject at the beginning of the twentieth century. As earlier stated, one such report appeared in New Zealand newspapers, *Rodney and Otamatea Times* and *Waitemata and Kaipara Gazette* (see 2.6.1)

The media reporting on the Earth's warming continued and intensified over the early decades of the twentieth century, with a 1932 article in *The New York Times*

stating that “the earth must be inevitably changing its aspect and its climate. How the change is slowly taking place and what the result will be, has been considered …” (Boykoff & Roberts, 2007, p. 4). While the above media reports suggested anthropogenic climate change, which was acknowledged by scientists in the nineteenth century (Rajan, 2006), it was only in the 1950s that the media became more categoric in drawing clear links between human activity and the change in climate. The US-based *Saturday Evening Post,* for example, published a story in 1950 titled *Is the World Getting Warmer?* which explored links between atmospheric temperature change, caused by human activities, and agricultural shifts as well as sea level rises (Abarbanel & McClusky, 1950, cited by Boykoff & Rajan, 2007, p. 207). In later years, the media ramped-up its reporting on anthropogenic climate change. One such ground-breaking article was penned on October 28, 1956 by *The New York Times* journalist, Waldemar Kaempffert:

> Today more carbon dioxide is being generated by man’s technological processes than by volcanoes, geysers and hot springs. Every century man is increasing the carbon dioxide content of the atmosphere by 30 percent – that is, at the rate of 1.1°C in a century. It may be a chance coincidence that the average temperature of the world since 1900 has risen by about this rate. But the possibility that man had a hand in the rise cannot be ignored.



SCIENCE IN REVIEW

Warmer Climate on the Earth May Be Due To More Carbon Dioxide in the Air

By WALDEMAR KAEMPFFERT

The general warming of the climate that has occurred in the last sixty years has been variously explained. Among the explanations are fluctuations in the amount of energy received from the sun, changes in the amount of volcanic

starches) causes a large loss of carbon dioxide, but the balance is restored by processes of respiration and decay of plants and animals.

Despite nature's way of maintaining the balance of gases the amount of carbon dioxide in the

Figure 12: An article in the New York Times reporting on the causes of global warming. Source: (Kaempffert, 1956).

The issue of human-inspired or anthropogenic climate change seemed to have gained momentum in the media when legendary *Christian Science Monitor* journalist, Robert Cowen, wrote an article in 1957 that discussed the role of industrial activity, cars, and fire in GHE (Cowen, 1957):

> Industrial activity is flooding the air with carbon dioxide gas. This gas acts like the glass in a greenhouse. It is changing the earth's heat balance. It could bring anything form an ice age to a tropical epoch … Every time you start a car, light a fire, or turn on a furnace you're joining the greatest weather 'experiment' men have ever launched. You are adding your bit to the tons of carbon dioxide sent constantly into the air as coal, oil and wood are burned at unprecedented rates.

Climate change media reporting, however, went relatively quiet in several parts of the world thereafter, only to resurface and surge in later years in different countries (Boykoff & Roberts, 2007). The world saw the first major media interest in climate change in Kyoto when 3 500 journalists from over 400 media entities, representing 160 countries, descended on the city to cover the discussions that led to the Kyoto Protocol (Leggett, 2001). Some scholars have argued that it is no longer whether the media reports on climate change subjects or not, but how the media frames the subject. Framing is of the utmost importance: positive framing allows audiences to better construct climate change in their minds and decide on whether to take action. On the other hand, negative framing can have the effect of misinforming and disinforming the audience, consequently leading them to reject the notion of climate change or refrain from taking action.

4.5 Divergence in international media coverage of climate change

Climate change media coverage differs between countries and is informed by each country's individual experiences of the climate crisis. In many instances, when a country has been directly exposed to the effects of climate change and it has adopted measures to curtail global warming, the media's position on climate change is influenced by such developments (Barkemeyer et al., 2017). In addition to specific country-scale experiences of climate change that inform media coverage, events such as the releasing of IPCC reports and COPs, among others, generate massive media reporting in the media in different countries (Boykoff, 2010; Holt & Barkemeyer, 2012, MeCCO, 2018). The same analysis was earlier shared by Boykoff and Roberts (2007), who identified three main drivers of contemporary climate change media reporting:

- Ecological/meteorological events such as droughts and hurricanes.
- Important political figures such as heads of state featuring in climate change discussions.

- Scientific gatherings, international meteorological and climatological gatherings by international organisations such as the IPCC.

On the other hand, they argued, media reporting of climate change happens in the broader context of regulatory frameworks, political constraints, and economic drivers. Cultural, regional, and national contexts further contribute to differences in the way in which interactions between media coverage, science and policy formulation take place (Boykoff & Roberts, 2007). In a study comparing the media coverage of climate change in various countries, Barkemeyer et al. (2017) found that regulatory quality within countries can be positively linked to media attention to climate change. Their findings support the views earlier advanced by Longhofer and Schofer (2010), that the existence and able functioning of environmental institutions and a well-oiled policy regime, are important preconditions for increased media coverage of climate change. The level of economic development of a country does not appear to inform levels of climate change media coverage in the same way that carbon intensity and integration into the world economy also do not play an integral role (Barkemeyer et al., 2017). This finding closely explains the situation in South Africa, which is a carbon-intense country (Du Plooy & Jooste, 2011) and has an economy that is integrated into the world economy (Mboweni, 2000) yet the levels of media coverage of climate change are low. However, socio-economic factors do play a role in media reporting on climate change. In their study of 41 countries and 113 leading newspapers in those countries, Barkemeyer et al. (2017) observed several contextual factors that affect the relative levels of media coverage – either positively or negatively. One is unemployment, which was found to drive media attention to climate change in a country. Broadly speaking, the extent of climate reporting in the mass media is often informed by competing public concerns. On the other hand, factors that often influence a slump in coverage included economic recessions and political “inertia”, which make it difficult to sustain the newsworthiness of climate change stories (Anderson, 2019, p. 2).

According to Anderson (2019), the developments that propelled media interest in climate change in the late 1980s included:

- The record high temperatures in the USA during the summer of 1988 and the ensuing drought became a major news story when scientist James Hansen testified to the US Congress that he was 99% confident that a long-

term trend towards global warming was occurring (see Hansen, 1988). The media took up the issue with intensive reporting.

- In view of growing evidence of rising public interest in environmental issues, British Prime Minister, Margaret Thatcher, delivered the 'green' speech to The Royal Society in September 1988. The speech pushed the issue of global warming further up the public agenda and the media follow suit (see Margaret Thatcher Foundation, 1988).

Because of the above as well as observable impacts of global warming in various parts of the world, the media increase its coverage, using climate scientists as the major news sources (Anderson, 2019). In the UK, however, Thatcher's speech increased the usage of politicians as the sources most quoted in climate change news, sharing the stage with scientists (Carvalho & Burgess, 2005). A period of apathy to climate change media reporting followed between 1991 and 1996 when public interest on the subject waned, although there was a coverage burst after the 1995 release of the IPCC report (Carvalho & Burgess, 2005; Anderson, 2019). This was also the year in which COP1 was held in Berlin. Conferences are known to increase media reporting of climate change.

The coming into force of the Kyoto Protocol in 2005 and the holding of the G8 (Group of 8 countries made up of Canada, France, Germany, Italy, Japan, Russia, the USA and the UK) summit in the same year, saw a rise in media climate change coverage. There was a decline during the 2008 global financial crisis when media and public attention concentrated on economic issues. Apart from a sudden rise in media reporting in 2009 with Climategate and COP15, there was a noticeable decline in coverage from 2008 to 2014 (Anderson, 2019). Throughout the years of media coverage of climate change in the UK, views of denialists received higher salience in the mainstream media than in many other similar countries (Anderson, 2019). Although reporting on a different period, Boykoff and Rajan (2007) chose the US as the country where negative reporting against views of anthropogenic climate change was more prominent than the UK. Their research found that in the USA, media coverage of climate change was also influenced by denialist interests who opposed the view that the anthropogenic release of CO_2 and other GHGs into the atmosphere was causing a rise in overall global temperatures.

In Germany, the socio-political history of climate change favoured science, thereby enabling scientists to set the issue on public and policy agendas successfully with

1) politicians and the media emphasising the climate change threat; 2) corporations abstaining from interventions into the debate and 3) sceptical voices remaining marginalised (Schäfer, 2016). Left and right-wing news outlets in Germany had some consensus on the reality of climate change and did not differ substantially on the need to elevate the issue to the political level or "climate politics" (Schäfer, 2016, p. 3). Differences that existed in the German media were in terms of the specific measures that were presented as being preferable to mitigate climate change. Left leaning media outlets were more in favour of subsidising renewable energy and phasing out nuclear and fossil-based energy sources, while their right-leaning counterparts held non-committal positions (Schäfer, 2016).

In Chile, the media followed more or less the pattern of western countries. Conservative newspapers tended to promote denialists' views, while the more liberal media presented more diverse frames, largely in support of the anthropogenic origins of climate change (Dotson et al., 2012). In Argentina, the media covered climate change as an international issue, largely highlighting what it regarded as a clash between various conflicting positions on international climate change negotiations (Mercado, 2012). In India, media coverage portrayed climate change as real and caused by humans (Thaker, 2017). The media reported on the severe impacts of climate change, but largely externalised the problem, although the highlighting of domestic responsibility seemed to gradually increase (Thaker, 2017). In Australia, the primary sources of information about climate change were visual media sources such as documentaries, TV news programmes, newspapers, and the internet (Ashworth et al., 2011). The devastating wildfires of 2020 forcefully brought the issue of climate change into the public agenda, leading the media to go into overdrive in reporting about the climate crisis.

As already remarked, media coverage of climate change in African countries is relatively low, with Nwabueze and Egbra (2016) finding that the media in Nigeria and Ghana do not provide significant coverage on climate change issues. Having reviewed 844 newspaper editions in the two countries, there were only 37 stories on climate change from a total of 2 000 articles (Nwabueze & Egbra, 2016). These researchers lamented the fact that the coverage of climate change issues in Nigerian and Ghanaian media was "disproportionate to the level of threat climate change posed to the two countries and the African continent, as a whole" (Nwabueze & Egbra, 2016, p. 121).

In East Africa, a study on media coverage of climate change in Uganda by Nassanga (2013) found that stories on the subject were not given priority by either field journalists or editors. Media professionals in that country found climate change to be a new concept, which made it difficult to understand the issues that are involved in climate change (Nassanga, 2013). In Tanzania, the media relies on climate change experts and daily events, such as community meetings and other social gatherings to obtain information about climate change (Siyao & Sife, 2021). According to their study, journalists make minimal use of other potential sources of information, such as libraries, printed materials, and internet websites, something that might affect the quality and quantity of climate change information published in the Tanzanian media. Elia (2019) studied media coverage of climate change in Tanzania and found that 49% of journalists reporting on the topic had not had any relevant training. Training on media reporting on climate change was provided by foreign agencies, which resulted in reporting that was toned towards the western view of climate change and reflected very little on the experiences of local communities. The study found that 77% of media houses lacked editorial policies on the coverage of climate change. Most of the reporting was on measures to adapt to the impacts of the phenomenon (49.3%), followed by weather and climate trends (33.8%), while renewable energy and the link between climate and poverty were the least covered topics (Elia, 2019). In a further study, Elia (2021) found that climate change reporting in Tanzania was made difficult by editors who rejected climate change news, as well as journalists who lacked a grasp of scientific terms used in climate change communication. The Kenyan media relied largely on foreign news agencies for its news reporting on the subject of climate change (Environment and Natural Resources, 2016). The Ministry also found that the majority of data cited in news articles was obtained from international scientific reports (31%), the country's meteorological department (23%) and academic journals (11%). The local media also registered an increase in climate change coverage during international climate change events, as was the case during the Paris Agreement talks in November 2015 (Environment and Natural Resources, 2016). An earlier study by Atieno and Njoroge (2014, p. 7) found that climate change received low coverage in the country's media, with increased reporting being noticed when scientific findings were released, leading the local media was "quick to flash out alarmist news". This led Atieno and Njoroge (2014) to question whether climate change was adequately represented in the country's mainstream media, or the media was merely reporting on sensational stories that attracted

scores of readers in an effort to maximise sales. Kenyan media coverage of climate change is made difficult by a lack of journalistic capacity, conflicting priorities in newsrooms and inadequate funding to train and support journalists (Kalonge, 2020).

Studies comparing media coverage in Africa and other parts of the world often reveal poorer reporting in Africa. For instance, Hase et al. (2021) reached this conclusion after a study of media coverage in 10 countries that included South African and Namibian newspapers, between 2006 and 2018. The countries polled were Australia, Canada, Germany, India, Namibia, New Zealand, South Africa, Thailand, the UK, and the USA. Articles in two newspapers in each country were tallied, resulting in a corpus N=71 674. Namibian newspapers were found to have reported the least on climate change, with *Allgemeine Zeitung* and *The Namibian* only presenting 129 and 177 stories, respectively. In South Africa, 288 stories were found in the *Sunday Times* and 1 075 in *The Star*. Newspapers in fellow Global South countries, India and Thailand, presented more articles. India's *Hindu* and *Times of India* had 4 625 and 3 921, respectively. In Thailand, the *Bangkok Post* and *The Nation* presented 1 181 and 1 511 climate news stories, respectively. The six Global North countries had much larger numbers of news stories, generally higher than Global South Countries. Hase et al. (2021) also found that countries in the Global North covered climate change more frequently and focused more on climate science, while the media in countries from the Global South focused on challenges and implications of climate change for society, particularly its impacts on lives and livelihoods. The situation with regards to media reporting might be improving, at least in quantity, as this study has found. Two of the publications whose climate change articles were analysed during this PhD study, namely the *Mail & Guardian* and *Business Day*, provide regular reporting on climate change.

4.6 Media framing of climate change

The concept of 'framing' appeared for the first time in the 1950s (Goffman, 1974; Denzin & Keller, 1981). However, Gregory Bateson is credited with having expanded on the theory in a 1972 book titled *Steps to an ecology of mind: Collected essays in anthropology, psychology, evolution and epistemology*. The scholar argued that frame is a meta-communicative and every meta-communicative message is known as a psychological frame (Bateson, 1972). Subsequently, Gaye Tuchman, a cultural sociologist, brought the concept to the field of news,

discussing it in the book titled *Making news: A study in the construction of reality.* The discussion focused on framing the issue of social perspective news, especially social reality construction. Tuchman (1978) is regarded as having laid the conceptual basis of the 'frame' in the assumption that news is a window on the world. The 1990s and the 2000s saw many scholars studying media framing. They include Iyengar (1990), Entman (1993), Pan and Kosicki (1993), Cappella and Jamieson (1997), Scheufele (1999), Tankard Jr (2001), De Vreese (2005), Nisbet (2009a), and Nisbet (2009b), among others. Most of the works on framing agree that the value of news in the media is in framing in that it directs audiences to the importance of the information therein.

The concept of framing "offers a way to describe the power of a communication text" (Entman, 1993, p. 51). Simply put, framing involves the selection and salience of information, whereupon to frame is to select some aspects of a perceived reality and make them more salient in a communication message, thus promoting a particular understanding of the message (Entman, 1993). Nisbet (2009a) added another aspect to framing, saying the theory is used to focus an audience's attention on a certain feature of a particular subject with a view to inspiring a specific understanding, while discouraging other possible interpretations of the same issue. Frames are "interpretative storylines" which decide the subject and objects that responsible for some activity, and the response thereof (Nisbet, 2009, p. 15). Framing is regarded as being a critical activity in the construction of social reality which helps shape the perspectives through which audiences in a communication exercise perceive the world (Hallahan, 1999). For instance, Iyengar (1990) argued that the understanding of poverty depends on how it is framed. In operationalising the concept, Iyengar (1990) offers the following explanation: First, the thematic frame which refers to news that contains information in a general trend, such as poverty levels. Second, the episodic frame which deals with news trends that focus on aspects of individual experiences or more specific perspectives. In this instance, poverty is highlighted in the context of individual experiences, such as the living conditions of a certain individual under economic standards (Iyengar, 1990). Thus, it can be concluded that the media are powerful agents that translate information across the science–policy interface, framing it for audiences (O'Neill et al., 2015). Yet, frames are never neutral because they define an issue, identify causes, make moral judgements and shape proposed solutions based on the protagonists' interpretation of the issues at stake.

Based on a review of literature, seven different types of framing have been identified. They entail the framing of news, issues, situations, attributes, choices, actions, and responsibility. Hallahan (1999) outlines the seven framing models as follows:

1. News: Media reports use familiar, culturally resonating themes to relay information about events. Sources vie for their preferred framing to be featured through frame enterprise and frame sponsorship.
2. Issues: Social problems and disputes can be explained in alternative terms by different parties who vie for their preferred definition of a problem or situation to prevail.
3. Situations: Relationships between individuals in situations found in everyday living and literature. Framing of situations provides a structure for examining communication. It applies to discourse analysis, negotiation, and other interactions.
4. Attributes: Characteristics of objects and people are accentuated, whereas others are ignored, thus biasing processing of information in terms of focal attributes.
5. Choices: Posing alternative decisions in either negative (loss) or positive (gain) terms can bias choices in situations involving uncertainty. Prospect theory suggests people will take greater risks to avoid losses than to obtain gains.
6. Actions: In persuasive contexts, the probability that a person will act to attain a desired goal is influenced by whether alternatives are stated in positive or negative terms.
7. Responsibility: Individuals tend to attribute cause of events to either internal or external factors, based on levels of stability and control. People portray their role in events consistent with their self-image in ways that maximise benefits and minimise culpability. People attribute causes to personal actions rather than systemic problems in society.

When it comes to climate change, several scholars have argued that the value of media coverage of climate change is in the framing of various events and issues. Günay et al. (2021), for instance, argued that because of the media's agenda-setting power, the news media is an important source of information about scientific issues, people and events. Anderson (2011) added that although the relationship between media coverage and public attitudes varied, media coverage of climate change shaped the possibilities of public engagement with the issue. Individuals

might easily establish a connection between climate change and its consequences, but might not know what to do with it, unless the media framed it accordingly (Günay et al., 2021). Climate change has been framed in different ways in different parts of the world. For instance, Günay et al. (2021) found that adaptation framing was prevalent in Nigerian newspapers, whereas Turkish newspapers evenly framed adaptation and mitigation.

The framing of climate change by the media (and by extension in mass communication) plays a critical role in influencing the public perception of urgency and disposition to respond (Myers et al., 2012). Historically, climate change has been framed in fearful terms (Boykoff, 2008; Hulme, 2008), with frequent reference to impending desertification, melting glaciers, rising sea levels, and increasingly frequent and severe hurricanes. Consequently, climate change policies are framed as means to avoid such potential damages related to disasters (Gifford & Comeau, 2011). This type of framing has been deemed effective in raising public awareness of the gravity of the consequences of climate change and promoting support for proposed policies (Bertolotti et al., 2021). However, critics of this framing have suggested that a better method would be framing that shifts the focus of communication from environmental to economic consequences of those policies (Bertolotti & Catellani, 2015). This alternative framing would present climate-friendly environmental policies as an investment leading to economic gain, rather than as a sacrifice to prevent future losses. It has been predicted that this framing approach might be convincing to those with concern for the environment as well as those without but have concern for the economy. In this way, those who believe that climate change is real would happily welcome economic benefits from addressing it, in addition to the environmental gains, whereas climate sceptics would see the promise of future economic gain as a reward for the required effort (Bertolotti et al., 2021). This PhD thesis advances the argument for climate change communication that is framed on the opportunities of addressing the climate crisis rather than emphasising the threats posed by global warming. This approach could help to respond to South Africa's dilemma where there is almost no scepticism about climate change, but there is reluctance to act in fear of economic losses, among other social hardships.

In an attempt to influence beliefs, perceptions, and actions towards addressing the problem, climate change has been framed in many different ways. However,

consensus among scholars has long been established that any frames should be aligned with the overall aim of the intended communication and be relevant to the targeted audience from the point of view of what is of interest or concern to them (Nisbet, 2009a; Weber, 2010). This assertion is conducive to creating common ground between the climate change communicator and their audience (Nisbet, 2009a). This will, in turn, facilitate the audience's understanding of the subject and shape their behaviour to be receptive to action. Weber and Stern (2011) argued for the usage of conceptual frames that match the audience's level of knowledge of the subject. This conceptual framing calls on the communicator not to change what their audience has already identified as more concerning to them, but instead focus on stressing the perceived risk (Weber & Stern, 2011). Furthermore, framing could be used not only to foster understanding of climate change, but also to simplify policy and decision-making processes (Weber, 2010). The consequences of doing nothing about climate change, or the inaction frame, is used successfully, particularly in political circles, where the audience's attention is taken away from the specifics of the science and focused on what might happen if nothing is done (Weber, 2010). Applying the inaction frame allows perceived uncertainties about the science not to be seen as barriers to establishing climate change policies (Weber, 2010).

Since the impacts of climate change also include indirect consequences, such as health, migration, resource scarcity and conflict, it has been suggested that it was imperative to move the discourse beyond the environmental, scientific and securitisation framings to ones that are more humanistic (Nanthini & Nair, 2021). This framing would take into account the vulnerabilities of climate change that are being generated through dynamic social, political, economic, institutional, cultural and technological conditions and their historical legacies (O'Brien et al., 2010). For instance, the public health frame encourages better public engagement and response to climate change, than does the environment frame (Maibach et al., 2010; Myers et al., 2012). Using the public health frame and exposing audiences to the advantages that a climate change friendly lifestyle will have on their health, tends to get audiences to react with some feeling of hope (Myers et al., 2012). In their study, participants to the public health frame responded with hope to the issue of redesigning cities to make it easier and safer to travel by foot, bicycle, or public transport, because this would reduce the number of cars on the road, reduce traffic

accidents and help people to be more physically active, while, at the same time, reducing CO_2 emissions (Myers et al., 2012).

4.6.1 Basics of media framing of climate change within countries

As earlier stated, the media in different countries adopts frames in accordance with various factors such as the political environment, economics, and climate change-inspired events. The framing further differs between rich and poor nations, with richer countries framing climate change as a political issue and poorer countries usually framing the phenomenon as an international issue to be addressed by the world at large (Johnson, 2019). An analysis of the literature on framing in developing countries shows that the responsibility for causing climate change and taking climate action, particularly differentiates media framing in the developing world from media framing in the developed world. Valkenburg et al. (1999) suggested that journalists usually adopted generic frames of *conflict*, *human interest*, *responsibility for causing and taking action on climate change* and *economic consequences*. For example, French and Dutch newspapers mostly use the *consequences frame* in their news coverage of climate change (Günay et al., 2021). The *responsibility* frame attributes blame for the problem and the solution. The *conflict* frame refers to conflict and disagreement among parties, while the *economic consequences* frame refers to the economic costs and benefits of an issue (Günay et al., 2021). The *human-interest* frame considers the personal, emotional aspects of a climate change. The *morality frame* offers a moral judgment, usually by quoting others giving a moral perspective. The *generic* frames enable cross-country comparisons (Dirikx & Gelders, 2010). O'Neill et al. (2015) studied the framing of climate change in UK and US media after the releasing of the IPCC's AR5 and found that the coverage was contested and politicised, employing the *settled science, uncertain science, Political or ideological struggle and role of science* frames. The table below illustrates how these frames were used and what their descriptions.

Frame	Description
Settled science	Emphasis on the science of climate change and the broad expert consensus. Considerable evidence of the need for action. Science has settled the issue, uncertainty or scepticism quashed, it's time for action.
Political or ideological struggle	A conflict over the workings of the world; over solutions or strategy to address climate change; a battle for power between nations, personalities or interests.
Role of science	Explores the role science plays in society. May debate transparency, funding or public awareness, especially in relation to institutions, such as the IPCC.
Uncertain science	Focus on uncertainty with regards to climate science, impacts or solutions. May question anthropogenic nature of climate change or discuss natural variability. Advocates no action suggesting it will be difficult to do so.
Disaster	Predicted impacts are dire. Impacts are numerous and threaten all aspects of life. Impacts will get worse; we are not well prepared.
Security	A threat to human security. Could be energy, water or food security, or a threat to the nation state through migration, for example.
Morality and ethics	An explicit and urgent moral, religious, or ethical call. ME1: for action. Strong mitigation, and protection of the most vulnerable. ME2: for no action. Likely to discuss scientific uncertainty.
Opportunity	Climate change poses opportunities. Either O1: as a way to re-imagine how we live; for example, to further human development, to invest in co-benefits. O2: there will be beneficial impacts so no intervention is needed. Likely to mention uncertainty
Economic	Discusses growth, prosperity, investments, markets. Provides economic costs. Economics implies either E1: taking action now. Details potential economic actions (for example, divestment) or E2: action is hugely expensive (or too costly in context of other priorities). Likely to mention uncertainty.
Health	Climate change poses a danger to human health, for example, malnutrition, air quality. Urgent action required.

Table 3: Overview of frames used in the coverage of AR 5 by the UK and US media.

Source: O'Neill et al. (2015).

Generally, the media in the Global North tend to frame climate change as a local issue and along the need to adopt mitigation measures. In the Global South, the tendency is to frame global warming along its impacts and the need for adaptation (e.g., African Development Bank Group, 2022).

The IPCC's AR 6, which was published on 9 August 2021, led the international media to pick on the "unequivocal" connection between human activity and climate change as well as the likelihood that the 1.5°C target set in the Paris Agreement will not be met. CarbonBrief (2021) surveyed a series of international publications and found that there was consensus in most of the media on the IPCC's findings, with a small number of right-wing publications that were dismissive of AR 6. These included *The Wall Street Journal*, that wrote in an editorial that the AR 6 gave no good reason for people to sacrifice their lives, or their standards of living, to those who promoted the notion of 'climate change' (CarbonBrief, 2021). The mainstream media was accused of ignoring the story (Friedman, 2021), but online media such as the *Daily Maverick* (Van Diemen, 2021a) and *Independent Online* (Naidoo, 2021) also sounded the alarm of intensified warming, but also went on the report's assertion that disaster could still be averted if action was taken urgently (see IPCC, 2021).

4.6.1.1 Illustration of framing at COP21

As already stated, the media generates its own frames based on its understanding of the issues it covers, inputs from participants, and ideological inclinations of the media concerned. To illustrate this point, an analysis of the UK, US and Chinese media coverage of COP21 is hereunder presented. The analysis reveals 10 different frames the media from different countries used to characterise the climate negotiations at the same event. (Pan et al., 2019), as shown in Table 4.

	Frame	**Counter-frame**
Starting point: Climate change	F1 – Apocalypse	F2 – Waiting list
		F3 – Fiction
Process: Solving climate change	F4 – Zero-sum game F5 – Empty promise	F6 – Fairness seeking F7 – In it together F8 – Sustainability
	F9 – Vanguard	F10 – Laggard

Table 4: Overview of media frames on COP21 climate change negotiations.

Source: (Pan et al., 2019).

The *apocalypse* frame defines climate change as scientifically founded, anthropogenic and very urgent, which if not dealt with speedily could result in a series of catastrophic consequences (Pan et al., 2019). It calls for immediate action in all related areas to "tightly" control anthropogenic carbon emissions for the sake

of human safety (Pan et al., 2019, p. 524). The media uses phrases such as ‘catastrophe’, ‘unabated’ and ‘wreak havoc’ to stress the potential consequences of climate change (Pan et al., 2019, p. 524).

The second and third frames, *waiting list* and *fiction*, respectively, present the opposite of the first frame, *apocalypse* (Pan et al., 2019). While conceding that climate change is a problem, the *waiting list* frame argues that it is not a priority to be dealt with urgently. This was illustrated by various media reports in the US in which Republican politicians criticised the former President Barak Obama’s climate policy by arguing that government should concentrate on the issues that people care most about. One such report fitting this frame stated (Herszenhorn, 2015, para. 6):

> While the president is at this climate conference, the American people have that as a very, very low priority. They are focused on jobs, the economy and terrorism.

The *waiting list* frame is further employed by developing countries who regard the fight against poverty as more of a priority than climate change. This argument is illustrated by a statement to this effect by India’s finance minister, Jaitley (2015) in an article of the Indian newspaper, *The New Indian Express*:

> India is a developing nation, and we must first acknowledge her needs; the eradication of poverty must remain our priority. This is why India’s climate change commitments have been designed to address environmental concerns.

The third frame, *fiction,* takes the denial approach by rejecting scientific consensus and criticising climate change as a fabrication by “evil-minded” politicians, scientists and others (Pan et al., 2019, p. 525). Then frontrunner in US presidential election, Trump, was quoted by *The New York Times* portraying climate change as a mere fabrication by America’s enemies (Kaplan, 2015). Trump (2012) tweeted that:

> … the concept of global warming was created by and for the Chinese in order to make US manufacturing non-competitive.

The fourth frame is the *zero-sum game* frame that regards climate negotiations as a platform where “one’s gain is the others’ lose” (Pan et al., 2019, p. 525). In this frame, climate control is presented as a matter of sacrifice where there will be

losses. It regards negotiations as a competitive process in which each country competes to protect its own interests. The frame's proposition is that in a situation where own interests are at stake, each country should protect its own interests against other "greedy" countries (Pan et al., 2019, p. 525). *New York Times* journalist, Gillis (2015, para. 19) used the metaphor of a "carbon pie" to describe the competitive nature of climate change negotiations represented by this frame:

> The problem is that about two-thirds of the pie has already been eaten by a handful of rich countries, plus China … The big emitting countries insist on laying claim to most of the rest of the pie.

The fifth frame, the *zero-sum game,* was applied in Republican senators' criticism of President Obama, accusing him of making undertakings that would supposedly strengthen foreign economies at the expense of American workers (Davenport, 2015). In this frame, COP21 was viewed as a forum where stakeholders would say the right things, but without committing to the fight against climate change. Thus, this frame could also be seen as the *empty promise* frame. The frame was evident in discussions about NDCs and the binding enforcement mechanism of the Paris Agreement (Gosden, 2015). As part of this frame, the British media complained that their country risked being left out on its own pursuing far-reaching measures to address climate change, while other countries may fail to deliver on their promises (Gosden, 2015, p. 2).

The following three frames, *fairness seeking, in it together* and *sustainability*, act as counters to the last two frames by problematising the z*ero-sum game* and e*mpty promise* frames (Pan et al., 2019). The *fairness seeking* frame describes the scenario in which all stakeholders come to realise a just, fair and balanced solution to climate change. The frame is identifiable in the demand by small island countries for loss and compensation and the commitments of developed countries regarding moral obligation. Fairness-related reasonings respond to ascriptions of blame within the z*ero-sum game* frame (Pan et al., 2019).

The *in it together* frame pushes the case that climate change is a worldwide matter whose causes and aftermaths went beyond national borders (Pan et al., 2019). Thus, the frame advances the argument that because climate change transcends national borders, its control is a collective aim that needs all parties to overcome prejudice and distrust by taking shared responsibilities and actions (Pan et al., 2019). As framing devices, it uses phrases such as "human civilisation", "global

community of nations" and "a collective responsibility". *China Daily* journalist, Fu (2015), used the *in it together* frame, writing that dealing with global warming was a chance the negotiating parties at COP21 had to demonstrate solidarity in their willingness and ability to protect the global village. A successful and meaningful outcome would help boost global confidence that the world's leaders can compromise and work together to realise solutions to the world's common difficulties (Fu, 2015).

The eighth frame, *sustainability,* rejects the idea that addressing climate change means loss and sacrifice. This frame argues that since climate change deals require action in the present for a better future, sustainability in this context is about abandoning fossil fuels and pursuing sustainable options (Pan et al., 2019). In the *sustainability* frame, climate change is viewed as an opportunity for long-term development as its solutions catapult technological innovation and renewable energy, thereby contributing to the move from a high-carbon economy to a more sustainable one.

The *vanguard* and *laggard* frames are depicted by the delegations playing negative or positive roles during the COP21 negotiations. Newspapers in the researched countries of China, UK and US had different takes on the performance of different delegations. The British newspaper, *The Telegraph,* for example, wrote about expectations that its then prime minister, David Cameron, would demonstrate that the Paris Agreement should also support adaptation projects in developing countries and that the UK had led by example, by spending 50% of its climate finance to improve climate resilience (Riley-Smith, 2015). In advancing the *vanguard* frame, the publication wrote a preview on the eve of COP21 in which it suggested that the British prime minister would tell the gathering that a deal in Paris should include demonstrable support to some of the poorest nations (Riley-Smith, 2015). Furthermore, the Chinese *People's Daily* employed the *vanguard* frame to praised its country's delegation, saying it had made a massive contribution to the adoption of the Paris Agreement (People's Daily Online, 2016). It wrote:

> As a responsible major developing country, China has, by following a principle of common but differentiated responsibilities, equity and respective capability, taken practical measures to deal with climate change, participate in global climate governance, and accelerate the implementation of the Paris Agreement.

Also applying the *vanguard* frame, Davis (2015) praised the US and President Obama, writing "*Obama, Once a Guest, Is Now a Leader in World Talks"* and went on to cite Obama's statement that the Paris Agreement was a product of American leadership:

> We've transformed the United States into the global leader in fighting climate change.

The *laggard* frame can further be identified where the media blamed some parties for obstructing the negotiations or failing to take responsibility in addressing climate change (Pan et al., 2019). The British leading newspaper, *The Guardian*, blamed Saudi Arabia and India for rejecting a text referencing a UN study on limiting global warming (Taylor, 2015):

> One impasse in the talks so far is about whether the document should mention that the latest science says the world should be aiming to limit global warming at 1.5 degrees, with Saudi Arabia and India flatly refusing attempts to even "reference" a UN study saying a 1.5 degrees target was safer than 2 degrees.

This overview has demonstrated how framing is by is influenced by various factors. This could be anything from national pride, as seen from the media from the three countries, that clearly favoured the positions of their governments at COP21. National interest also came into play where delegations such as India and Saudi Arabia took positions in protection of their national economic interests. Undoubtedly, news framers engage in the exercise to drive agenda-setting on subjects such as climate change.

4.7 Framing in the US media

In the early days of reporting on climate change in the US (i.e., the late 1980s), the media introduced several frames with the main ones being the *economic* and *environmental consequences* and how technology and investment might help ease the problem (Nisbet, 2009b). However, in subsequent years, Republican party consultant, Frank Luntz, drafted a strategy memorandum that he subsequently presented to members of Congress and lobbyists. The memorandum suggested that the issue of climate change should be framed as scientifically uncertain, and that the USA should be categorised as carrying an unfair economic burden if there is no international coordination (Bolson & Shapiro, 2017). This framing strategy

was pushed through into talking points, speeches, white papers and advertisements by conservative think tanks and members of Congress to fight major policy proposals and frustrate the adoption of the Kyoto Protocol by the US (Nisbet, 2009b). The media followed suit, using the same frames in its reporting.

The uncertainty frame was advanced despite the IPCC report of 1995 stating that consensus was emerging in the scientific community about human activity as the probable source of the warming trend in global temperatures (Krosnick et al., 2000; Wilson, 2000). During the debates on whether the USA should ratify the Kyoto Protocol, most of the US media coverage shifted to the *scientific consensus* frame and contrasted it with the *political conflict* frame (Bolson & Shapiro, 2017). The *contrasting frame* characterised the difference of views between Democrats, who supported the ratification of the Protocol, and Republicans, who oppose it (Bolson & Shapiro, 2017). This frame led to hundreds of newspapers, television, magazine, and radio news stories, as well as editorials, editorial cartoons, and *letters to the editor*. The debate over ratification was further amplified in advertisements, paid for by business and other advocacy groups, and radio talk shows and numerous websites (Krosnick et al., 2000).

Proponents of the *political conflict* frame made a point of combining it with the *uncertainty science* frame (Bolson & Shapiro, 2017) to drive the point that the conflictual views were generated by the uncertainty of climate science. Conservative strategists who supported these frames, challenged the science of global warming by framing evidence on climate change as weak or simply non-existent. This challenge gave prominence to the potential net benefits that might result should climate change materialise and argues that the policies meant to respond to climate change would be economically destructive and ineffectual, advocating for the *response efficacy* frame (McCright & Dunlap, 2003).

Through the confusion of contrasting frames, the media effectively assigned parity between scientific evidence on climate change and the arguments of interest groups hellbent on generating uncertainty to protect their interests and maintain the policy *status quo* (McCright & Dunlap, 2003; Brulle, 2014; Boussalis & Coan, 2016). The issue of giving equal time to the scientific consensus *and uncertainty science frames*, led Bolson and Shapiro (2017, p. 8) to complain that this kind of media coverage simply validated and helped the efforts of a minority of “contrarian”

scientific voices, at the very least, who opposed what was already consensus scientific and public opinion.

The US film industry brought the *disaster frame* into the mix in May 2004 by releasing a movie about climate change titled *The Day After Tomorrow*, which highlighted an impeding catastrophe if action was not taken immediately (Bolson & Shapiro, 2017). However, this frame generated unintended consequences when climate change sceptics used it to attack the science and its proponents as promoting 'alarmism' and driven by partisan and ideological agendas (Nisbet, 2009b). Former US vice-president, Al Gore's Nobel Prize film titled *An Inconvenient Truth* only helped to galvanise the *political conflict* frame as Republicans and sceptics were not to be swayed, instead raising their denialist voices higher (Nisbet, 2011; Bolson & Shapiro, 2017). Although Gore's six years of political campaigning on climate change succeeded in mobilising a base of concern among Democrats, the *political conflict* frame hardened Republican attitudes (Bolson & Shapiro, 2017). By 2008, President George W. Bush's last year in office (2009), Gore's efforts had helped boost belief in climate change among Democrats to 76%, while belief among Republicans remained virtually unchanged at 41%.

The *political conflict* frame is regarded as having helped to establish the basis for all subsequent and ongoing partisan divisions among Americans regarding climate change (Bolson & Shapiro, 2017). The US media has also framed climate change as an *economic issue* (Zamith et al., 2012). Biden's (2019) climate change policy supports this analysis as it concentrates on economic initiatives to enable Americans to mitigate and adapt to the changing climate. Furthermore, this frame is manifested in the sceptical view that transitioning to clean energy could have devastating economic consequences as some industries might have to go out of business.

4.8 Framing of climate change in South American media

Framing of climate change in South America is not uniform across the different media and countries (Zamith et al., 2012). Most media in the region portray climate change as a legitimate, though avoidable, phenomenon affecting multiple nations. The *uncertainty* frame, which is prevalent in the US media, is rare in the South American media (Zamith et al., 2012). The *economic* frame is far more dominant

in the region, “with anecdotal evidence suggesting that opponents of measures to address climate change may be increasingly turning away from questioning the science behind it and instead highlighting the prohibitive costs of ameliorating the issue” (Zamith et al., 2012, p. 350). This frame is used in several other countries, including South Africa (see Chapter VIII). Media in this region relies heavily on government sources. This practice has often been criticised and blamed for politicising climate change and has generated concerns that because these sources are more likely to present mainstream and status quo views and partake in conflict scripts among institutional actors, the scope of debate is streamlined and limited (Bennett et al., 2008). The South American media’s “overreliance” on government sources has had the effect of excluding impartial expert voices of scientists and academics, who might facilitate public understanding of this complex scientific issue (Zamith et al., 2012). Reliance on government sources may have the effect of framing climate change in ways that promote political interests instead of the goal to address the crisis. In a study of Chilean media framing of climate change, Hasbún-Mancilla et al. (2017) found that the main sources used in digital media were national government officials, to the exclusion of individuals and civil society. This resulted in a high degree of consensus among the government officials in framing climate change as an economic opportunity, but other frames, such as those relating to the physical basis of climate change, were absent (Hasbún-Mancilla et al., 2017). They criticised this approach, saying it might influence a design of public policies with a technocratic bias, losing the possibility of building an integral vision of the development of the country.

Studying media coverage of climate change in Chile, Dotson et al. (2012) found that media content is based on the political ideology of the publication concerned. Liberal newspapers cover more stories and present more thematic and diverse frames than their conservative counterparts (Dotson et al., 2012). Framing through a *conflict* paradigm is the dominant frame in the two newspapers that were studied, namely *La Nación* and *El Mercurio.* The newspapers regarded issues related to climate change as “a conflict of people versus nature, business versus environmentalists or government regulation, and parties clashing over actions or regulations” (Dotson et al., 2012, p. 75). Dealing with the fact that climate change requires extensive, long articles, the two publications approached the issue in different ways. *La Nación* would balance its reporting between episodic and thematic frames, while *El Mercurio* weighed more on framing climate change as a

short term or episodic event (Dotson et al., 2012). In the South American context, *conflict* frames are contained in stories that focus on the conflict between two or more stakeholders, such as government and business, or people versus nature. Dotson et al. (2012) also found the Chilean media to employ *episodic* frames, which relate to news stories that focus on specific events (episodes), such as a particular act passed by Congress. *Thematic* frames are also used to refer to news stories that focus on given themes, such as climate change, in general, or changes in automobile emissions over time. There is also the *economic* frame, but newspapers tended to use the *conflict* frame more frequently than the *economic* frame, with *La Nación* accounting for 53% of the conflict frame, while *El Mercurio* had 40% (Dotson et al., 2012). The *economic* frame was used in 30% of articles in *La Nación* and in 20% of articles in *El Mercurio,* while both publications had more stories featuring economics, even if the subject was not the predominant frame (Dotson et al., 2012).

The Argentinian press reported about climate change as part of an international political agenda that generated media interest through conferences on climate change hosted by the UN (Mercado, 2012). Therefore, the Argentinian media frames climate change as an international issue (Mercado, 2012). It has also emphasised the catastrophic consequences of climate change (Zamith et al., 2012). Having studied two of the country's leading newspapers, *Clarín* and *La Nación*, Mercado (2012) recognised four frames that are employed to define and establish the terms of debate in news about climate change: *political conflict*, *risk*, *environmental sustainability*, and *business opportunity*. The *political conflict* frame is found in news stories that present a contrast between the players in the climate change discourse (Mercado, 2012). This frame uses nouns such as *controversial, debate, or conflict*; verbs such as *demand, claim or defend*; and militant language such as *war* and *battle* (Mercado, 2012). The risk frame is identified through catastrophic language in news articles that focuses on the worst projections of climate change impacts (Mercado, 2012). The *environmental sustainability frame* is apparent in articles that emphasise the global environmental crisis and the need to turn the situation around into an opportunity to achieve sustainable development. The *opportunity* frame presents climate change as a global phenomenon that can be exploited for economic development and increased business (Mercado, 2012).

In Brazil, the extent of concern about climate change is higher than almost anywhere else in the world, with nine out of 10 Brazilians considering climate change a serious problem (Dayrell, 2019). Brazilian public opinion on climate change has been influenced by public events and scientific conferences, while NGOs and corporates have driven initiatives that have added pressure on the government to take appropriate action (Viola, 2013). Brazilian newspapers tend to follow English language newspapers and largely focus on high-profile events in their reporting about climate change (Hellebrandt & Hellebrandt, 2010). The Brazilian media increasingly identified human activity as the source of climate change (Dayrell & Urry, 2015) leading to its framing as such. Fewer than 1% of articles in a study by Carneiro and Toniolo (2012) framed global warming as resulting from natural causes. Their study concurred with the suggestion that the media in Brazil was influenced by international events as it found that the IPCC, the Kyoto Protocol and the UN were the most cited sources. Supporting the same charge, Dayrell and Urry (2015) found that Greenpeace was regularly mentioned in the press, as were global figures in climate change discourse such as Gore, former UN secretary-general, Ban Ki-Moon and former IPCC chairman, Rajendra Pachauri. The Brazilian press tended not to report on the views of IPCC opponents such as Bjørn Lomborg, Pat Michaels, Lord Monckton, and Sarah Palin (Dayrell & Urry, 2015).

Nonetheless, Brazilian media reporting has apparently ignored an important aspect of climate change in that country, namely the impact of the climate crisis on coastal areas and its inhabitants (Hellebrandt & Hellebrandt, 2010). Poor people living in coastal areas are relatively more vulnerable to the devastating effects of climate change than rich or other people inland (Hellebrandt & Hellebrandt, 2010). This is crucial because the livelihoods of coastal people are based on coastal natural resources, which might be affected severely by climate change (Glavovic & Boonzaier, 2007). However, the news media is dominated by news topics set by an international scientific and political agenda in the Brazilian media and the relative scarcity of issues regarding coastal areas in the media coverage of climate change, suggest the need for urgency in reviewing the communication priorities of scientific and environmental issues in Brazil (Hellebrandt & Hellebrandt, 2010). In framing terms and taking Hellebrandt and Hellebrandt's (2010) findings into account, the Brazilian media reporting largely employs the *international* frame that reports climate change as an international issue and also follows international

events such as conferences or natural disasters. However, Dayrell (2019) praised the country's media for framing climate change as a real phenomenon that poses serious threats to the Earth system, thus playing a key role in raising public awareness of the gravity of the problem. The press' framing of climate change as an international issue, based on international climate negotiations, changed between 2004 and 2009, but Brazilians still assert that developed nations bore more responsibility for increasing global temperatures, although not exempting developing nations from their responsibility (Dayrell, 2019).

4.9 Political ideology dominates UK media frames

Political ideology as a framing source is prevalent in the UK media coverage of climate change, where climate deniers receive considerable space on the opinion pages of some right-leaning newspapers (Anderson, 2019). This enormous coverage is related to campaigns driven by climate-sceptic think tanks in the country (Anderson, 2019). The left-of-centre newspapers, such as *The Guardian* and *The Observer,* advance the positive line on climate change reporting and give more space to the subject than other print news networks (Anderson, 2019). Historically, left-leaning newspapers in the country have been inclined to accentuate the view that climate change is taking place, while right-wing publications have usually presented the science as uncertain (Carvalho, 2007; Schmid-Petri & Arlt, 2016). Ruiu (2021) contends that the British media is immersed in specific political systems, which in turn have an influence on the media model. This is relevant when considering that 60% of national newspaper circulation in the UK is owned and controlled by two companies, Rupert Murdoch's News Corp (UK) and Lord Jonathan Harmsworth, 4th Viscount Rothermere's Daily Mail Group.

Traditionally, the British media has framing climate change in alarmist terms (Whitmarsh, 2011) by highlighting its deadly effects. This has turned out to be counterproductive for engaging individuals (O'Neill & Nicholson-Cole, 2009). According to Whitmarsh (2011), analysis of mass media and online communication of climate change highlighted various competing positions on causes and the very existence of climate change and ways to tackle it, but also included messages of denial, doubt and apathy. The author mentioned *The Great Global Warming Swindle* TV documentary, which was aired in the UK in 2007, as an example of a sceptical or contrarian discourse. The documentary argued that anthropogenic

climate change was a scam fabricated by anti-industrial environmentalists, along with complicit scientists, journalists and politicians, and supported by unreliable scientific evidence. Climategate was used by the British media as evidence of scientific dishonesty about the existence of climate change (Whitmarsh, 2011). Nonetheless, in later years a decrease in representing the consequences of climate change as out of human control, regardless of the political orientation of newspapers, could be observed (Ruiu, 2021). The framing of climate change as alarming but controllable, which has been a peculiarity of the centre-left leaning media, has been decreasing. Right-leaning media had increased their framing of climate change as an alarm, but indicating that it could be contained if action was taken (Ruiu, 2021).

4.10 Framing in African media

Climate change is framed differently by diverse media outlets in countries on the African continent. However, in line with the poor media coverage and scholarship of climate change communication, there are relatively very few studies of the framing of climate change by the continent's media. Nonetheless, Cramer (2008) studied framing by three South African newspapers based in the Western Cape province and found the *human-interest* frames do be unused. *The Cape Times, The Argus* and *Die Burger*, were dominated by three frames: *environment, politics* and *science* (Cramer, 2008). The dominance of these frames was found to be problematic because a lack of news reports on the human impact of climate change (human-interest), meant that the reports were dominated by science and politics of climate change, something that was intangible to ordinary people (Cramer, 2008). This argument was later made in a study about South African media's coverage of COP17 by Johannessen (2013), who argued that the human face and climate change links to local communities were seldom reflected in media reporting. The three media platforms Johannessen (2013) studied, namely *Business Day* and *The Mercury* newspapers as well as television channel *SABC3* evening news, referred to victims of climate change in non-personalised broader descriptions, such as *Africans, poor countries, or poor people*, which limited the possibility to identify and engage with them (Johannessen, 2013). Framing of climate change as a human rights issue was "virtually absent" in the media content during COP17, yet "the value of using human rights to frame the issues, or as a discursive vehicle in storytelling, could help the media bring a human face to climate change"

(Johannessen, 2013, p. 59). The study concluded that the complex nature of climate change appeared to make it difficult for journalists to produce their stories in a human-interest narrative – something that might weaken the relationship between climate change and the protection of human rights.

Another study of framing on the continent involved a South African and Nigeran newspapers and was conducted by Tagbo (2010). The probe found that out of 64 articles in two Nigerian newspapers, most concentrated on the *politics* and *science* frame. The *science* frame was often highlighted in stories about impact and emission mitigation. In *The Guardian* newspaper, 39% of news items framed climate change as a political issue, while 34% and 17% focused on reducing emissions and impact, respectively. The *adaptation* frame was negligible at less than 10%. However, the *environment* and actions (*mitigation* and *adaptation*) frames were prevalent in Nwabueze and Egbra's (2016) study of Nigerian and Ghanaian newspapers. They argued that the *information/awareness* frames were crucial, but were missing in the media coverage, although they were necessary to educate the public on climate change adaptation (Nwabueze & Egbra, 2016). Regarding South Africa, Tagbo (2010) found the *Mail & Guardian* and *The Star* to use diverse frames such as *politics, economics, impact, mitigation and adaptation*, among others. In addition, climate change was framed as being the concern of the privileged and those in government (Tagbo, 2010). The *international* and *human* frames could also be observed in the two publications.

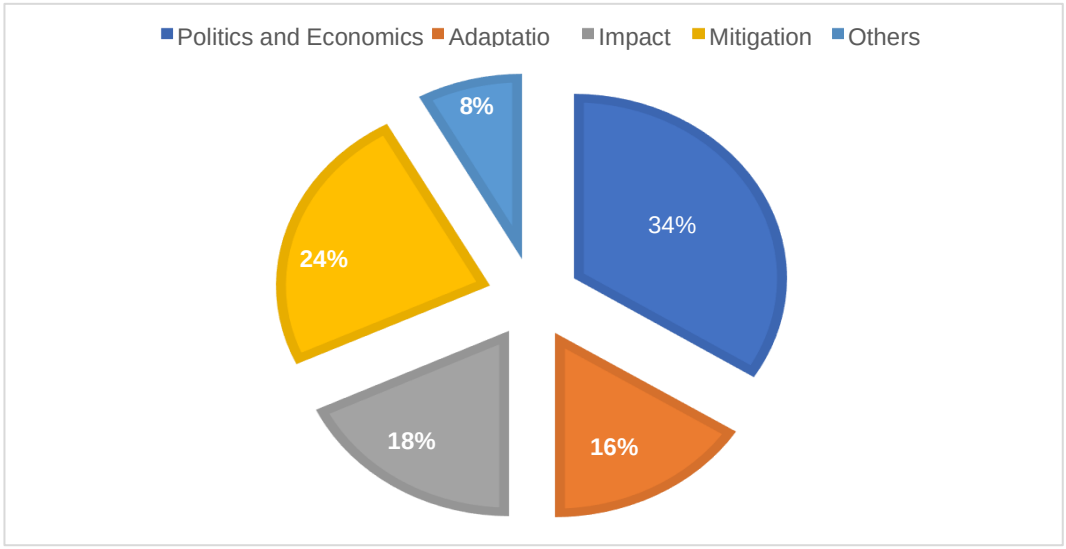


Figure 13: Mail & Guardian framing of climate change.

Source: (Tagbo, 2010).

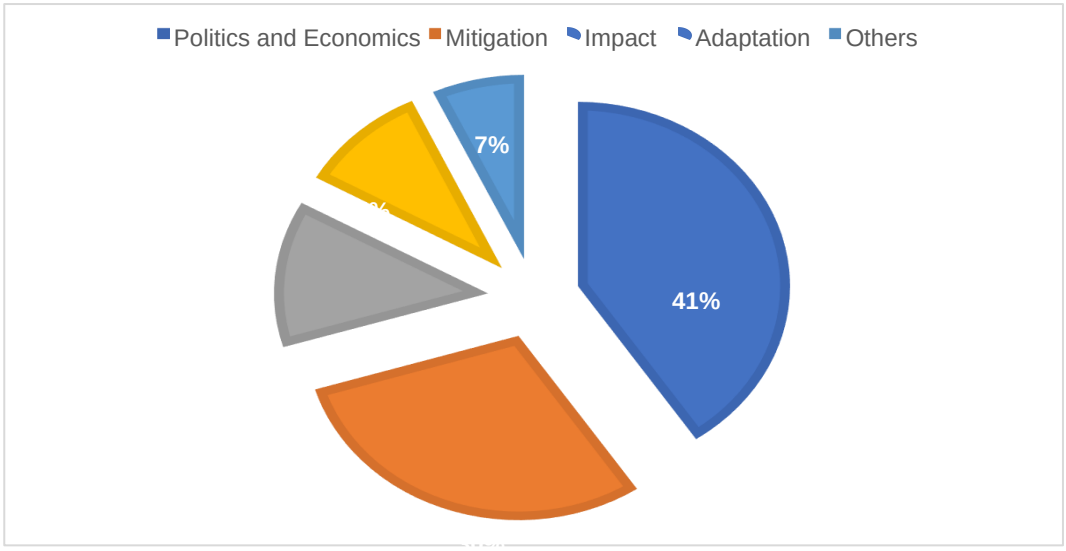


Figure 14: The Star framing of climate change.

Source: (Tagbo, 2010).

In Uganda, climate change is framed as a governmental and international issue, something Nassanga (2013) regards as inappropriate. There is a call for more media coverage and framing within both local and global outlooks to ensure that action on climate change can be taken as a government responsibility, but which must also be extended to the individual, community and global levels. At times, the media employs different frames on the same subject, often attracting criticism for placing deniers and positive campaigners at the same level for the sake of journalistic neutrality (Nassanga, 2013). It has been argued that the supposed neutral media reporting of climate change as a conflict between two opposing positions undermines knowledge about the phenomenon (Mercado, 2012).

To summarise, the issue of framing in media reporting of climate change is central to climate change communication, perhaps even more important than the amount of reporting that the media can afford the subject. This is so because framing is about describing climate change in particular terms. Doing so has implications, not only in terms of making the issue salient, but also for the public understanding of the science and related issues. This is important because a progressive and coherent representation (framing) of the effects of climate change that contains action-oriented messages, might contribute to increasing public engagement (Hart & Feldman, 2016). Conversely, framing climate change and related issues as disputable, out of human control and uncertain, might increase confusion and discourage action (Ruiu, 2021). Hence, this PhD study goes beyond a mere

analysis of how much stakeholders have communicated climate change to analysing how the issue was framed. The idea is to establish the sort of framing that might have been used and whether it contributed to positive public understanding and encouraged action.

4.11 Agenda-setting in media coverage of climate change

Apart from framing, the media decides on the news to be published in the face of competing stories. Thus, it engages in agenda-setting, which is about the salience of news items in news bulletins. Investigating salience in media coverage is also important in that the mass media has a unique ability to draw public attention to societal problems, such as climate change (Pianta & Sisco, 2020). The mass media serves a normatively significant role in contemporary society of being the conduits through which society learns about issues that are distant from their environments (Moy et al., 2016). The mass media's task includes bringing to the fore information and viewpoints that cultivate disagreement, debate, and democracy (Moy et al., 2016). The media operationalises this task by, among others, providing different levels of coverage on any issues, thus being able to shape individuals' perceptions of the relative importance and order of importance of the issues they cover (Moy et al., 2016). In performing these tasks, the media engages in agenda-setting – a notion that was introduced to media theory by Maxwell E. McCombs and Donald L. Shaw, in a 1972 ground-breaking article titled *The Agenda-setting Function of Mass Media*. For McCombs and Shaw (1972), news media professionals play an important role in shaping political reality through choosing and displaying news in platforms. The two scholars tested this theory by interviewing voters in Chapel Hill, North Carolina (USA) and asking them about their greatest concerns for the upcoming elections. They questioned prospective voters by asking the question as to regardless of what politicians said, what their two or three main things were, which they thought the government should concentrate on doing something about. The answers from the prospective voters revealed a strong relationship between the prospective voters' key concerns and the political issues reported by several news organisations in the area (McCombs & Shaw, 1972). This study by the two scholars accentuated the role of agenda-setting in shaping public opinion.

The agenda-setting theory helps society understand climate policy politics by identifying factors that help the climate change issue rise up and stay high on the

agendas of government and NGOs (Pralle, 2009). In this regard, several agenda-setting studies have shown that media coverage is partly the reason why people focus attention on environmental problems and that the degree of attention is in accordance with the amount of attention the media affords the subject (Stamm, 2000). While it might sound simple and perhaps misconstrued to imply that the media pushes certain agendas, agenda-setting is a necessary exercise in the news production process. Simply put, agenda-setting is merely the newsroom process of selecting what and how news is covered and the prominence of news stories in bulletins. The agenda-setting activity of the news media is in line with the actual definition of journalism, which is to be the "activity of gathering, assessing, creating, and presenting news and information" (American Press Institute, 2021).

The media has an unenviable task of having to select which stories to publish due to the limited space available in their publications. Thus, media theory has come up with the term 'issue attention' to describe the amount of attention the mass media dedicates to a particular subject in relation to the amount of attention they simultaneously dedicate to other subjects (Schäfer et al., 2014). The attention given to an issue compared with others, be it the amount of reporting it gets or its ranking among other stories, has agenda-setting effects on the publication's audience. The more attention an issue receives, the more it is to appear important to the audience (Schäfer et al., 2014). Mass media attention to climate change tends to rise during major international conferences or climate catastrophic events, leading Schäfer et al. (2014) to argue that rather than being the media's own choice to give attention to climate change news, there are factors behind their decisions in this regard. In discussing such factors, the scholars used the model developed by Liu et al. (2011) to identify, arrange, and interpret a variety of factors that could be behind media attention to climate change issues. The model was developed to explain the factors behind the attention that the media and the US Congress afforded climate change (Schäfer et al., 2014).

In terms of this model, the first group of factors is made up of "problem indicators", namely factual data on the subject (Liu et al., 2011, p. 406). The said problem indicators might present themselves in different ways, but two distinct indicator types are discernible: factual and baseline information indicators, and short-term extreme weather conditions (Liu et al., 2011). Factual and baseline information indicators in the case of climate change are GHGs in the atmosphere or long-term

climate fluctuations (Lyytimäki & Tapio, 2009). Short-term extreme weather conditions (Liu et al., 2011) are regarded as particularly important because they are highly newsworthy due to the potential harm they cause and due to the fact that they often linked to global warming (Carvalho & Burgess, 2005). The second class of factors relates to focusing on events, which pushes concern above the threshold applied in determining crucialness (Liu et al., 2011). These factors do so because by making otherwise hidden issues visible, they introduce new magnitudes, offer policy alternatives, and rally people and interest groups behind a particular issue (Liu et al., 2011, p. 407). Other events that might be important to the media, in this regard, include G8 summits that discuss climate change, publication of IPCC report, or cultural events such as the launching of Gore's movie titled *An Inconvenient Truth* (Liu et al., 2011).

The third factor in the model is 'feedback', following the multiple streams theory advanced by John Kingdon in his book titled *Agendas, Alternatives and Public Policies*. 'Feedback' refers to the interactions between role players and pressure groups on societal issues, such as public grievances, pressure from interest groups, or opinion polls (Schäfer et al., 2014). This aspect of the model includes feedback from scientists, who often play a leading role in issues that involve scientific and technological doubt and complexity. Such feedback can increase media and policymakers' attention to an issue (Liu et al., 2011). While Liu et al. (2011) focused solely on political and scientific feedback, Schäfer et al. (2014) added other role players, notably NGOs and industry actors, which they said have been shown to be successful agenda builders on climate change. It is hence that this PhD study included them in the probe.

4.12 The importance of different sources of climate change news

As afore discussed, most people in the world learn about climate change from the media (Newman et al., 2020). The media serves as a bridge between the sources and consumers of climate change information (Siyao & Sife, 2021). This places the media in a crucial position of not only informing society about the crisis, but also encouraging response through behaviour change. Therefore, the media is challenged to access reliable, timely and up-to-date information on the climate crisis to raise public awareness. Such information needs to correctly outline the impacts of climate change, as well as outline the steps for better management of the crisis (Dinshaw et al., 2012; Debela et al., 2015). In this regard, it is important

that the media uses the correct sources which contain relevant information. News reporters are expected to identify, choose and use the most reliable and convenient sources of information (Ansari & Zuberi, 2012; Hossain & Islam, 2012; Takahashi et al., 2017). The said sources can be people (particularly climate change experts), literature and films, etc. The sources are expected to be diverse, accurate, relevant, timely, and exhaustive (Statrasts, 2004; Das, 2012).

Multiple sources of information in covering climate change ensure diverse points of points of view, strengthen the quality of news stories and strengthen their authenticity (Lulagambi et al., 2011). Nonetheless, caution should be exercised to avoid generating and disseminating contradicting information (Zakar, 2005). It has been suggested that to avoid the dissemination of misleading information, news from the climate deniers should not be combined with information from those who campaign on the existence of climate change (Siyao & Sife, 2021). Thus, it is important for journalists to select and use non-contradicting climate change information sources or make a thorough synthesis of information from diverse sources (Siyao & Sife, 2021). Mercado (2012) also decried the elevation of contrarian views to the level of climate consensus views saying it increased uncertainty of climate change and the steps need to address it.

4.13 Summary

This chapter discussed various concepts of climate change communication, scholarship on the subject, and media coverage. The literature that was analysed in this chapter suggests that communication is at the centre of the fight against climate change. The media is shown to be a leading driver of climate change awareness and action, because it transmits messages from and between stakeholders. The discussion on climate change communication scholarship has provided an overview of research in this field, covering various parts of the world, including South Africa. The literature reviewed touched on various subjects which are pertinent in climate change communication, in general. Crucial for this PhD study is the framing theory that has been discussed as being central to media understanding and media coverage of climate change. The literature discussed how the subject is framed in various countries and regions of the world, indicating that framing of climate change is largely informed by the country's socio-economic needs and ideological inclination. The issue of framing of climate change, which was extensively analysed in this chapter, was presented as being crucial since it

places the issue in context so as to enable society to understand and take action. The agenda-setting role of the media in climate change communication was discussed as being crucial. It is clear from the literature that without the application of the two theories (agenda-setting and framing) in communicating the climate crisis, public understanding and consequent action would be impossible. As highlighted, the application of the two theories in communication allow for salience of the climate issue in the media, which focusses public attention, and guides the public to make sense of the issues relating to global warming and related phenomena. This PhD study spends a considerable amount of effort gathering and analysing data on the framing of climate change by the stakeholders whose communication is being probed. Furthermore, the importance of divergent sources of climate change information in media reporting on the subject was analysed. Caution was aired to avoid confusing the public by combining information from climate change believes with information from deniers.

The overview highlights the relatively limited climate change communication research on the African continent, compared to other jurisdictions. The literature is critical of the media coverage of climate change and research in certain countries and regions. Africa is mentioned as one such region that was mentioned as suffering from such inadequately. Concern about this has been expressed when juxtaposed with the vulnerability of the continent to the climate crisis.

CHAPTER V: THEORETICAL FRAMEWORK

5.1 Introduction

Having mapped out the various issues concerning climate change communication and climate change science, in previous chapters, this chapter discusses the theoretical grounding of the thesis. In research, theoretical framework is formulated to explain, predict, and understand phenomena (Gabriel, 2008). It explains the path of a research and grounds it in theoretical constructs (Adom et al., 2018) of the subject being studied. Thus, theoretical framework is the structure that can hold or support a theory of a research study by introducing and describing the theory that explains the existence of the research problem (Swanson & Chermack, 2013). The theoretical framework is the foundation from which all knowledge is built in a research study, serving as the structure and support for the rationale, the problem statement, the purpose, the significance, and the research questions for the study (Grant & Osanloo, 2014).

Climate change communication, or simply climate communication, is a field of science communication and environmental communication which focuses on studying the theories, methods and outcomes of communicating the climate crisis. Most climate communication and scholarship within this field is concerned with i) the mechanisms related to public understanding and awareness of and perceptions of climate change; ii) the cultural values and emotions of individuals related to social norms; and iii) the ways in which these components influence the engagement and action in response to communication (Nerlich et al., 2010; Moser, 2010; Chadwick, 2017). Several climate communication researchers often regard increased understanding as key to action in response to global warming (Singh et al., 2017; De Meyer et al., 2021). The subject has been discussed in more detail in Chapter IV.

Without throughgoing communication, community involvement in addressing the crisis will be made more difficult. Action to deal with the crisis will not be possible, since this has to be taken by individuals and communities. Several institutions now recognise that the risks associated with climate change and, most importantly, the risk of the failure to address the crisis. The World Economic Forum has reported that climate action failure will be among the top global risks in terms of impact over the next 10 years (World Economic Forum, 2021). Communicating climate change,

with a view to advocating and accelerating change, whilst building resilience to risk, should be at the centre of any organisation's response to climate change (Hutcheon & Richards, 2021). For Hutcheon and Richards (2021), organisations have a mandate to take action and the opportunity to help mould the future in the face of a changing climate. The need for education, training, public awareness, public participation, and public access to information to mitigate climate change, has been internationally recognised since 1992 in the UNFCCC Article 6 where stakeholders (Parties to the Convention) are required to undertake these tasks (UNFCCC, 1992). Communication and education were particularly re-emphasised in Article 12 of the 2015 Paris Agreement (UNFCCC, 2015), and were also included in UN Agenda 2030 SDG 13, where it is clearly stated that there is a need to improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning (United Nations, 2015). The IPCC special report in October 2018, included a demand for increased climate change education and communication to "accelerate the wide scale behaviour changes consistent with adapting to and limiting global warming" (IPCC, 2018a, p. 22). It is in this context that the notion of 'climate change communication' is key to addressing the crisis, thus a worthy theoretical framework to underpin this study.

This PhD thesis examines climate change communication in South Africa as it was reflected in media coverage of the climate activities of key stakeholders: policymakers (politicians and civil servants), corporate entities, scientists and academics, NGOs and the media itself. The exercise aims to discern whether such communication has helped address climate change or it has been merely driven by politics and money. The choice of the media as the window through which to probe climate change communication by these stakeholders is based on the understanding that media coverage of an issue helps create public salience and has the potential of influencing several processes, including policy formulation and response. Conversely, if an issue is not portrayed in the media, it is likely to disappear from the public agenda and policy debates (Lyytimäki et al., 2020), limiting the chances of any action in response. The absence of an issue in the media would be equivalent to the non-existence of such issue in the public mind. The public rely on the media for information. In the case of climate change, the media plays an even more important role in that climate change events, such as natural disasters, tend to take place in faraway locations, making knowledge about

them only accessible through the media. Since the first UN climate change conference in 1995 (COP1), in Berlin, the media, newspapers in particular, have been crucial in communicating climate change (Mulaudzi & Kioko, 2020). Woldemichael (2020) positioned the media at the centre of the fight against the crisis. According to Woldemichael (2020), the media has immense control over people's thoughts concerning issues that take place around them. If people do not receive adequate and nuanced climate change coverage, they do not understand the science; they fail to see how it affects their local communities, and think that climate change is beyond repair, which creates a general societal paralysis (Woldemichael, 2020).

The fact that the media plays a critical role in communicating climate change so as to aid the fight against the scourge is not disputed, but what has preoccupied researchers is issue attention (Schäfer et al., 2014). Issue attention has an agenda-setting effect on audiences, creating a situation where the more attention an issue receives in the media, the more likely the audience is to perceive it as being important (Dearing & Rogers, 1996). Moreover, Downs (1972, p. 39) conceptualised the *issue attention* model to explain that the perceptions of what Americans perceived as crises do not reflect real changes in conditions, but rather a "systematic cycle of heightened public interest and then increasing boredom with major issues". Downs (1972) explained the model in five main stages, namely: i) pre-problem; ii) alarmed discovery and euphoric enthusiasm; iii) realising the cost of significant progress; iv) gradual decline of intense public interest; and v) the post-problem stage. The third stage of the model, realising the cost of significant progress, explains the portrayal and public interest of issues.

There are various factors that influence media coverage of climate change, with different scholars offering their terminologies to describe the factors. Russill and Nyssa (2009) advanced the concept of tipping points, mentioning that it informs media coverage of climate change in the UK and USA. Tipping points in the climate system describe the maximum level, which when exceeded, large changes in the system or noticeable impacts can be expected. Moser (2016) identified major climate-change-inspired calamities and major events such as IPCC conferences, among others. Various studies on the subject have largely focused on three streams that can drive media coverage of climate change, namely: problem indicators, focusing events and feedback (Liu et al., 2011; Schäfer et al., 2014).

Problem indicators characterise the enormity of the problem underlying a particular climate issue. Focusing events generate increased levels of public attention to the issue at stake and feedback is about the societal groups' communication in response to problem indicators or focusing events (Barkemeyer et al., 2017).

In short, media coverage of climate change is driven by a series of events, be they tipping points, problem indicators, conferences on the subject, or other events. The same happens with the media's agenda-setting and salience. In theoretical terms, the media's agenda-setting for climate change coverage is driven by these occurrences. Another crucial issue in the investigation of climate change communication or media coverage of the climate crisis, in particular, is how the subject is framed (see 4.6).

5.2 Summary

Investigating agenda-setting and framing in climate change communication is central to any study on the subject. The two main purposes of communicating climate change are to achieve public understanding of the subject and encourage response. Without understanding the factors that propel any communication on the subject, it would appear impossible to gauge whether any communication is effective or not.

CHAPTER VI: METHODOLOGY AND RESEARCH STRATEGY

6.1 Introduction

In line with the aims and objectives as well as the research questions of this PhD study, the methodology used is media content analysis, following a quantitative and qualitative textual analysis. These enabled the study to uncover the underlying cognitive context in which climate change has been communicated through three South African newspapers: The *Rand Daily Mail*, *Mail & Guardian* and *Business Day*. Media content analysis is a specialised field of research, which functions as a branch of content analysis research methodology. It is used to study a broad range of texts, ranging from transcripts of interviews and discussions in social research, television, radio and advertising content (Macnamara, 2005; Saraisky, 2015). For Krippendorff (2013), content analysis allows for content sensitivity and has the advantage of being a modest research technique that is able to deal with unstructured and large volumes of data other than interviews or experiments. In this PhD study, the media content analysis methodology helps explore agenda-setting and framing in analysing news stories. Through exploring these, it is possible to answer the 'how' in the research question.

Qualitative textual analysis involves the use of qualitative data, such as interviews, documents and participant observation data. Communication researchers use this research method to describe and interpret the characteristics of a recorded or visual message; its purpose is to describe the content, structure and functions of the messages contained in texts (Frey et al., 1999). Qualitative research is ideal for this PhD study in that it helps understand the data in ways that give emphasis to meanings, experiences and views of the persons or institutions cited in the news articles that were analysed. Qualitative contextual analysis was conducted by means of selecting news articles, and gathering enough quantities, followed by systematically sorting and summarising their content in line with the research questions. Through this process, raw data was turned into useable evidence through data reduction methods. The data was subjected to a process of qualitative coding, which, according to Gibbs (2007), is a way of indexing or categorising the text so as to establish a framework of thematic ideas about the said data. In this regard, the coding entailed identifying passages in news articles that reported

about climate change or related subjects. The articles were labelled and linked to the research questions.

6.2 Case selection and time span

Case selection refers to the method by which cases are chosen for investigation in a research project (Gerring & Cojocaru, 2016). Selecting cases for investigation has always been a challenging issue. The commonly held view is that researchers should choose cases that are similar enough to be comparable, but only differ on variables (Seawright & Gerring, 2008). For this PhD research, news articles on climate change and related subjects published by the *Rand Daily Mail*, *Mail & Guardian* and *Business Day* were chosen as cases for investigation. This selection was informed by the objectives of the study and followed a case selection process known as purposive sampling. This is a type of non-probability sampling where researchers use their own judgement when selecting respondents or cases for their study (Foley, 2018). Researchers use purposive sampling when they intend targeting a particular set of respondents or cases, which fit a particular category (Foley, 2018). Purposive sampling is appropriate for this study given that it is necessary to use the researcher's own judgement in selecting the sample that would fit the research strategy to be able to answer the research questions. A random selection of publications would simply not have helped in achieving the conducting the study in that some publications might not have covered the subjects being studied, for instance. Using the media to establish communication behaviour of societal institutions is based on the concept that the media is a critical vehicle of climate change communication (Boykoff & Rajan, 2007; Moser, 2016; Bolson & Shapiro, 2017; Anderson, 2019). Media coverage of global warming is not only a good measure of how the issue is communicated, but it can influence the public's perception and policymaking on climate change (Vu et al., 2019).

The three publications in this PhD thesis correctly fit the purpose of the study in that: i) the *Rand Daily Mail* provides a historical account of media coverage on the climate, since it was the country's only national daily newspaper of its time (1902-1985); ii) *Business Day* and the *Mail & Guardian* are offshoots of the *Rand Daily Mail,* having been established shortly after the closing down of this newspaper. Also crucial for the study is that *Business Day* and the *Mail & Guardian* took different editorial directions – the former following a pro-business, conservative approach and the latter pursuing a progressive ideology. This divergence is crucial

for the study as it helps access a diverse range of views on the subjects under investigation. Furthermore, preliminary observations have revealed that the two publications have consistently reported on climate change, therefore, were deemed to possess articles that would be useful for the study.

The period of the study of 120 years convincingly meets the qualities of a longitudinal study. Through a longitudinal approach, the study provides the much-needed historical account of the issue under study, which helps unearth any changes in discourses over time. This time span enabled the study to examine the communication of climate change in South Africa over a long period of time, thus being able to make a well-informed analysis. An analysis of climate change communication during the apartheid era, up to 1994, on the one hand, and the post-apartheid era, on the other, was conducted, although no major differences were identified.

The now-defunct *Rand Daily Mail* is one of South Africa's oldest newspapers that started publishing on 22 September 1902, reportedly to champion the cause of the working man, although the said working man at the time only referred to a white man (Pogrund, 2000). Although not the first publication in the city, the newspaper was launched a mere 16 years after the city of Johannesburg was founded (i.e., 1886). The first owner of the *Rand Daily Mail* was mining magnet, Harry Freeman Cohen, who had the idea after receiving an offer to purchase equipment that was used to print the *Standard and Diggers News,* which had closed down following the Anglo-Boer War between 1899 and 1902 (Pogrund, 2000). Its first editor was Edgar Wallace, a British journalist who had covered the Anglo-Boer War for the *London Daily Mail*. The newspaper changed ownership only two years later when Cohen died. It was purchased by another mining magnate, Abe Bailey. The newspaper, together with its sister title, the *Sunday Times*, which began publishing in 1906, was known to support the views of the mining houses, although it also supported white mineworkers (Pogrund, 2000). The publication adopted non-racialism several years later, moving away from its earlier editorial policy that barred black people from being featured, except in stories where they were reported to be responsible for the division among whites. Throughout the 1930s, the publication supported the Chamber of Mines (now Minerals Council of South Africa) and the ruling United Party, coating disdain from Afrikaner nationalists (Pogrund, 2000). The paper is credited with having "pioneered" in

popular journalism, introducing illustrations and cartoons, entertainment features and an improved layout. In later years, the *Rand Daily Mail* gained fame for its generally anti-government editorial policy, something that is suspected to be the real reason behind its ultimate closure. The newspaper published its last edition on 30 April 1985.

Business Day was launched on 1 May 1985, a day after the *Rand Daily Mail* closed down. The new publication was started by the same company that owned the *Rand Daily Mail*, the South African Associated Newspapers (SAAN). Thus, *Business Day* is regarded as a direct replacement of the *Rand Daily Mail.* It was established as a pro-business publication, adopting a conservative market approach to news (Keogh, 2006). The newspaper has since its inception been publishing on weekdays and is distributed nationally. With the advent of the internet, it also publishes an e-paper. The publication describes its focus to be on covering all major national and international news, with a specific focus on the South African economy and business sector, the political economy, companies and financial markets (Business Day, 2021). Its self-confessed "specific focus on the South African economy and business sector" is also revealed in its coverage of climate change, with evidence suggesting that it has promoted climate change communication that favours business. The said communication broadly frames climate change as an economic issue and urges caution in the implementation of measures to curtail CO_2 emissions, for instance. The communication largely targets the business community which is broadly known for its reticent stance in the climate change discourse (see Moser, 2016; Thaker, 2019).

The *Weekly Mail* (later renamed *Mail & Guardian*, see Chapter I) was launched on 14 June 1985, a month and half after *Business Day* started publishing. It established itself as an alternative, left-leaning newspaper, vehemently opposed to apartheid and determined to close the gap left by mainstream journalism, which was accused to either be indifferent to or supporting apartheid. It was launched by now Prof. Anton Harber and Irwin Manoim – two journalists who were retrenched when the *Rand Daily Mail* closed (Keogh, 2006). The editorial in its first edition proclaimed:

> "The *Weekly Mail* is not just another newspaper. Consider how it was started. Not by businessmen more interested in the accounts than the news. Not by a political party wanting a mouthpiece for its views. It was

> started by a group of journalists put on the streets by the closures of the Rand Daily Mail and the Sunday Express. We were convinced that many people felt that existing newspapers were not fully servicing their needs and were unhappy about the newspaper closures. We also felt that it was time we made sure our journalism was no longer dictated by interests outside of journalism. We were tired of being at their mercy."

It was clear from this editorial that the publication was determined to shake both the journalism and political spaces in the country. It took a progressive approach on all matters, something that is evident in its coverage of climate change. This aspect matters immensely for this study in that it has also been suggested that in instances where the media takes a progressive stance towards climate change, governments tend to follow suit (Mercado, 2012) and individuals tend to believe what they get from the media (Mahl et al., 2020). Furthermore, a progressive and coherent representation of the effects of climate change that contains action-oriented messages might contribute to increasing public engagement (Hart & Feldman, 2016). The paper advocates urgent action to tackle climate change and has been critical of the sluggishness that has been shown by the government and the business sector in dealing with the climate crisis.

6.3 Data collection methods

All articles that were used in this PhD study were obtained from digital sources, published in digital platforms or posted online as PDF copies, particularly in the case of articles that were originally published in print form before the advent of internet publishing. For the *Rand Daily Mail* and *Mail & Guardian,* the source was the Sabinet Reference website, available through the University of the Witwatersrand's e-Library. *Business Day* articles were accessed from the NewsBank archives, using the Arena Holdings online network. Based on the selection criteria and the search words, 514 articles were accessed with regards to the *Rand Daily Mail.* However, 296 could not be used for the study because they were either duplicates or did not address climate change, in any respect, although contained some of the search words. For instance, applying the *change in weather* search words would bring out weather reports, which were several, but not relevant to the study. Duplicates arose from the fact that search words could pull out same articles during different searches. Thus, only 218 articles from this newspaper could be used for the study. With regards to the *Mail & Guardian,* 312 were

selected following a similar process of excluding irrelevant articles. For *Business Day*, 298 articles were selected.

To answer research question no. 9, which is a comparison of the status of climate change communication scholarship between South Africa and other countries, a meta-analysis of studies on media coverage of climate change was conducted. This part of the study entailed the examination of data from the only two available studies that compare climate change communication scholarship between several countries globally. This was found to be the only method to answer the question as it would be too onerous to conduct original studies within the present PhD project. This method is well defendable in research where it's known as 'meta-analysis'. Fagard et al. (1996) argued that meta-analysis, which is effectively a literature review of previous studies on a particular subject, offered researchers the opportunity to critically evaluate and statistically combine results of comparable studies. Strohmeier (2015) added the description that meta-analysis is a set of quantitative statistical tools used to analyse and integrate research findings across several studies. This study conducted a meta-analysis of two massive studies, the first having investigated the issue covering the period 1957-2010, and the second being a worldwide sample across 41 countries during 2008, covering 113 leading national broadsheet newspapers. The number of articles that were selected from each of the three publications was regarded as being sufficient to enable the study to answer the research questions. The articles were selected as they came up during the online search. Although there is no claim that the articles used in the analysis were the only ones ever published by the three newspapers during the periods covered, every effort was made to include all relevant articles that were found.

6.4 Search words for news articles

The search words were:

1. Change in rainfall patterns
2. Change in temperature
3. Solar variability
4. Change in weather
5. El Niño
6. La Niña
7. Climate change
8. Climatic change
9. Drought
10. Decrease in rainfall
11. Global warming
12. Environment

13. Greenhouse gases
14. CO_2 emissions
15. Earth cooling
16. Earth warming
17. Ice age

It was necessary to use as many search words considering that some of the terminology that is used today for ‘climate change’ and related subjects was not in existence when some of the articles were published, particularly with regards to the *Rand Daily Mail*, which ceased publication in 1985. Articles with only a passing reference to the search words without discussing climate change or global warming were excluded. As it will be revealed in the data, the word ‘drought’ featured in several articles reporting on the drought in South Africa and several parts of Africa. However, the articles did not link the drought to climate change possibly because scientists had not begun to do so. Therefore, such articles were not included in the analysis, because they did not talk to climate change or global warming.

The articles that were used in the analyses were of all genres, i.e., hard news, features, opinion pieces, editorials, and letters to the editor, as long as they discussed the issue of climate change by containing one or more of the search words. This was because the goal of the study was to establish the stakeholders that were communicating on climate change using the media.

CHAPTER VII: DATA PRESENTATION AND ANALYSIS

7.1 Empirical evidence

Data for the three publications is presented under headings based on the research questions.

RQ1. How policymakers, climate scientists, NGOs, the corporate sector and the media have communicated climate change, through the media from 1902 to 2021?

The general trend in the three publications is that: i) most articles on climate change or related topics are obtained from foreign news networks, mainly American and British, with an occasional appearance of some European countries; ii) there is a strong prevalence of articles reporting about climate change as an international rather than a national issue; iii) the four most cited sources in stories about climate change are scientists/academics, policymakers (government officials and representatives of statutory bodies), corporate or business sector representatives and NGO activists; iv) the three publications mainly relied on climate events such as conferences and disasters in their agenda-setting for reporting on climate change and v) the publications largely used the scientific, political, economic, environment, health and opportunity frames in their reporting of climate change. All the three publications have gradually increased their coverage of climate change even though such coverage fluctuates in accordance with the happening of events such as climate disasters, conferences and the releasing of scientific findings. It seldom follows day-to-day experiences of climate change.

7.2 Rand Daily Mail data analysis

Having published when climate change was not a topical policy or economic issue, most articles on climate change in the *Rand Daily Mail* mostly cited scientists (see Figure 15), who were the main stakeholders that were engaged in studying the Earth's climate and issuing reports. Research on climate change was largely conducted by western scientists, during the newspaper's time, hence the majority of articles were lifted from western publications, citing international scientists. Most of the quoted sources were scientists or academics (82%; N=177) (see Figure 16). Very few articles cited local scientists. Policymakers, NGOs and businesses were minimally present in communicating climate change through news articles in the

publication (see Figure 15). Policymakers were cited in 11% of the articles and the remainder were journalists' own writings without citing any sources, as well as members of the public in the form of *letters to the editor. The a*rticles reveal that governments of the world played very little role as the issue of 'climate change' had not yet become a policy matter. Figure 15 shows the absence of news articles citing NGOs*.* Literature on the history of climate change activism suggests that it arose from efforts by environmentalists to influence international policy negotiations subsequent to increased scientific data on the subject (Nulman, 2015; Partelow et al., 2020). This suggests that climate change activism started in the late 1980s as governments and the UN intensified work on climate change. Thus, the subject was not in the NGO activism agenda during the *Rand Daily Mail*'s publication, hence the absence of these stakeholders in global warming articles in this publication.

Businesses are also not reflected in the data (see Figure 15) because there were no articles that cited the corporate sector in the climate change public discourse. The sector joined the public discourse in the late 1990s (Thaker, 2019, but more so after the releasing of the IPCC AR4 in 2007 (IPCC, 2007), which categorically linked global warming to climate change and blamed the burning of fossil fuels, mainly by industry (Greenberg et al., 2011). Although the media in other parts of the world had occasionally written about the role of industry regarding GHG emissions (e.g., Cowen, 1957; National Library of New Zealand, 2021), the climate debate had not reached the stage where businesses were required to play any role, thus their absence in the media. Although the newspaper contained some news articles on pollution in South Africa, they did not place the blame on the private sector and it was not mentioned the news reports in this regard. It is impossible to criticise the media for this failure to bring business into the discourse since it largely relied on scientists' findings and views to formulate news reports, meaning that if the scientists did not bring in the business angle so wouldn't the media.

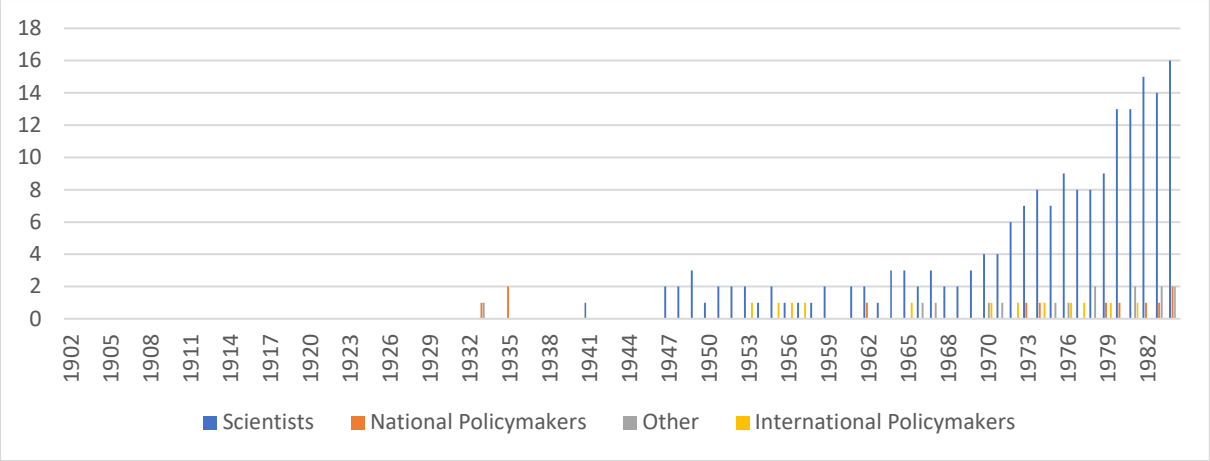


Figure 15: Citing of scientists, local and international policymakers and other stakeholders in the Rand Daily Mail.

The issue of climate change appears to not have been a major news story in South Africa, at the time, since the *Rand Daily Mail* drew most of its articles from international news networks to the tune of 72% or N=157.

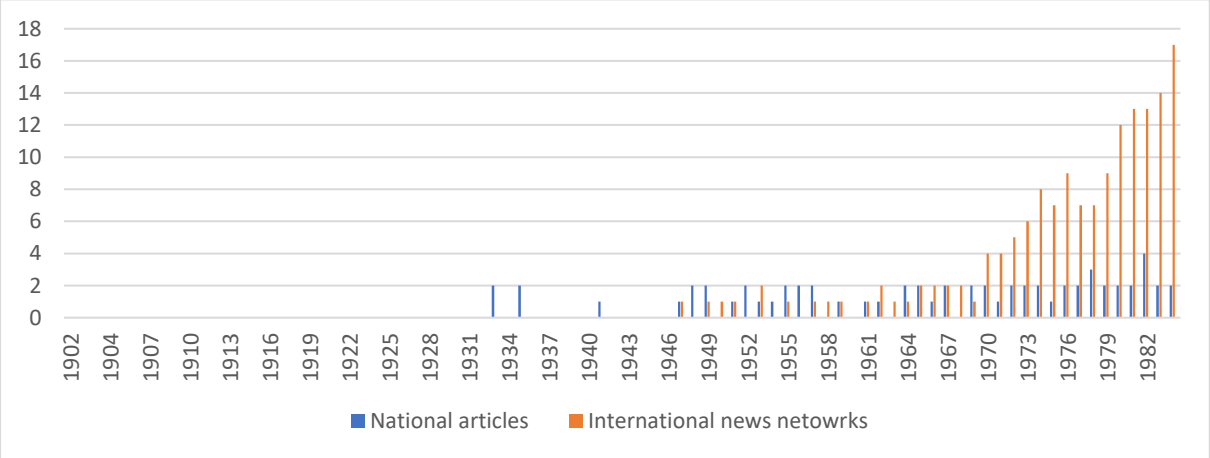


Figure 16: The Rand Daily Mail had more international articles about climate change than national ones.

The search did not produce any articles on climate change, or related subjects, in earlier years of the *Rand Daily Mail* publishing. Most articles prior to the 1930s reported about drought spells in South Africa without linking these to climate change – and certainly not to anthropogenic climate change. The link between drought spells and climate change is first mentioned through a *letter to the editor* on 22 March 1933 from reader, HLM Liebbrandt, called for an investigation into "*recent*" droughts. The reader makes an important observation linking the prevailing droughts to climate change: *"If our recent droughts and the threats of these droughts increasing in the future can be ameliorated only by a small*

percentage of what is claimed by the scheme by its supporters, then we are certainly entitled to insist on a further investigation, for, notwithstanding the reports of the reconnaissance officers, we can accept with absolute certainty that this change in our climatic conditions can only have been caused by either of two factors – or a combination of both – the natural and the human factor. Either the change is a natural process, or the human factor is the cause, directly or indirectly, by hastening the natural process." Interestingly, the reader not only links the drought to climate change, but also invokes anthropogenic climate change, calling it "*human factor*" as one of the possible causes.

Later, on 24 November 1933, another article under the headline *Changed SA rainfall* discussed what it called the *Schwarz 'Lake' Theory*, which suggested that the climate in South Africa was changing due to the drying up of some lakes in the country. It quoted the "Union's" chief meteorologist, Dr Theo Schumann, disputing the findings of a scientific investigation that concluded that the climate in the country was not changing. *"The report of the Drought Commission of 1923 showed that the Union's (referring to the Union of South Africa, as it was known then) rainfall had not decreased measurably. Most scientists who have expressed their views on the subject hold that opinion, although any farmer will tell you our climate has deteriorated. As far as my investigations have gone I must side with the farmers, and against the scientists. During the past forty years there has been a very decided change in our rainfall position*," Dr Schumann is quoted as saying.

Two years later on 8 January 1935, scientists are reported in the newspaper as having confirmed that the frequent droughts that had been noticed in the previous 40 to 50 years were signs of a changing climate. Later in 1941, another article reported on a study of a 35-year long drought spell and cited Mr L. Levenkind, hydrographic surveyor in the national irrigation department, as saying that the drought should not be taken to suggest that the climate of certain areas was getting drier. "*It is not correct, however, to assert from this that the climate of any area is getting drier, in the sense that peaks of high and low annual rainfalls will permanently be followed by lower values*" (RDM, 1941).

What these articles reveal is that the issue of a changing climate was attracting different views from the country's scientists and policymakers. In spite of this, articles reflecting local debates and scientific studies were relatively few – only 28% (see Figure 16). The subject of global warming was scantily reported about

between the late 1930s and the 1940s, possibly because this was the time of WWII, when the world was more concert about the war and climate research might have been to be less important.

The majority of articles in the *Rand Daily Mail* (N=179) do not contain content that relates to South Africa. They were lifted from foreign newspapers and news agencies. Among the early ones is an article published on 17 June 1947, citing Dr Hans Ahlmann, director of the Swedish Geographical Institute, as having told a gathering of American scientists that *"the mysterious warming of the climate of the Polar regions may eventually result in catastrophe for all the low-lying regions of the world"* (RDM, 1947). Most of the articles originated in the US and the UK, with a few from Switzerland and other European countries, largely reporting about scientific findings of a warming world.

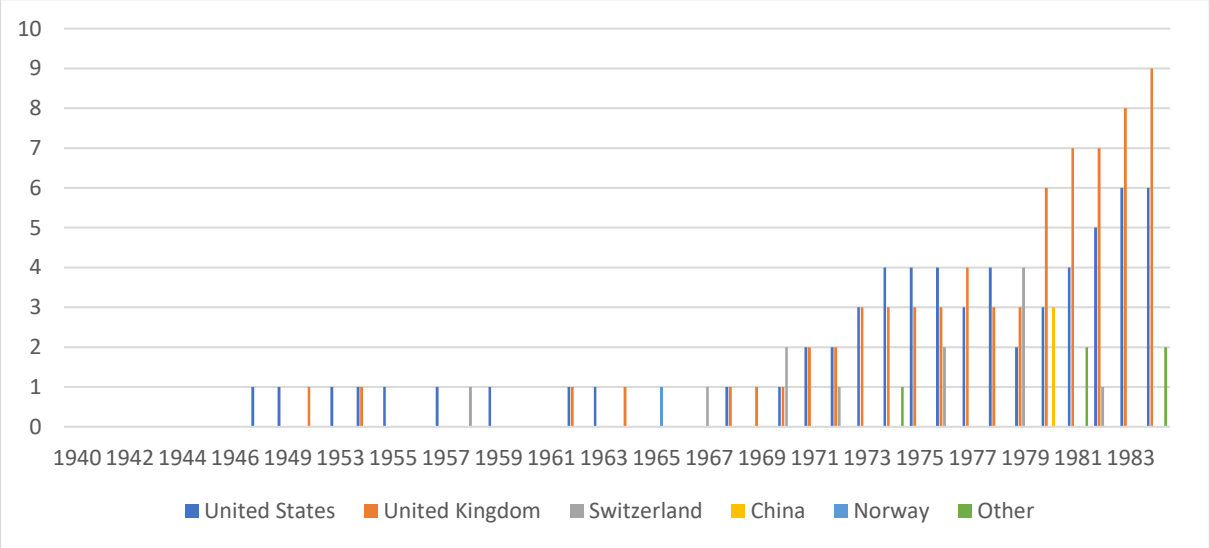


Figure 17: An illustration of western countries from which most climate change stories were sourced and published in the Rand Daily Mail.

A few articles in the 1950s reported on attempts to control the climate and use it as a weapon of war between the US and the then Soviet Union. An article on 30 May 1955 cited a Dr John van Neumann, an American atomic energy commissioner, saying that within a few decades, it should be possible to control the climate, melt polar ice, tame hurricanes as well as use the climate as a weapon of war. On the same subject, US president, Dwight David Eisenhower (1953-1961) is cited in an article on 13 December 1957 as having been advised that the climate could be used as a weapon of war, after experiments in Alaska on lengthening the crop season. The article reported that the placing of carbon black dust on ice and

snow can have a warming effect on the ground and in the atmosphere. This would be the methodology should they need to fight a war using the climate.

Another article on 15 September 1959 reported that scientists would "*soon*" be able to control the climate by harnessing the winds to turn over the waters of the oceans to bring nutrients from the sea depths to the surface. Continuing on the speculation that climate could be manipulated, another article on 4 May 1976 cited a former military weapons consultant revealing that the US and Soviet Union were studying means for improving their own weather manipulation technology to enable using it as a weapon of war. The coverage increases exponentially from the 1960s reflecting various climate debates. Ironically, speculations that the climate could be controlled, not only failed to materialise, but such discussions have largely discontinued during more recent times when it might be more necessary to do so in the context of the rapidly warming global temperatures and changing climate.

The *Rand Daily Mail* registered a gradual increase in climate reporting, thanks to an increase in scientific research, which the publication reported on regularly.

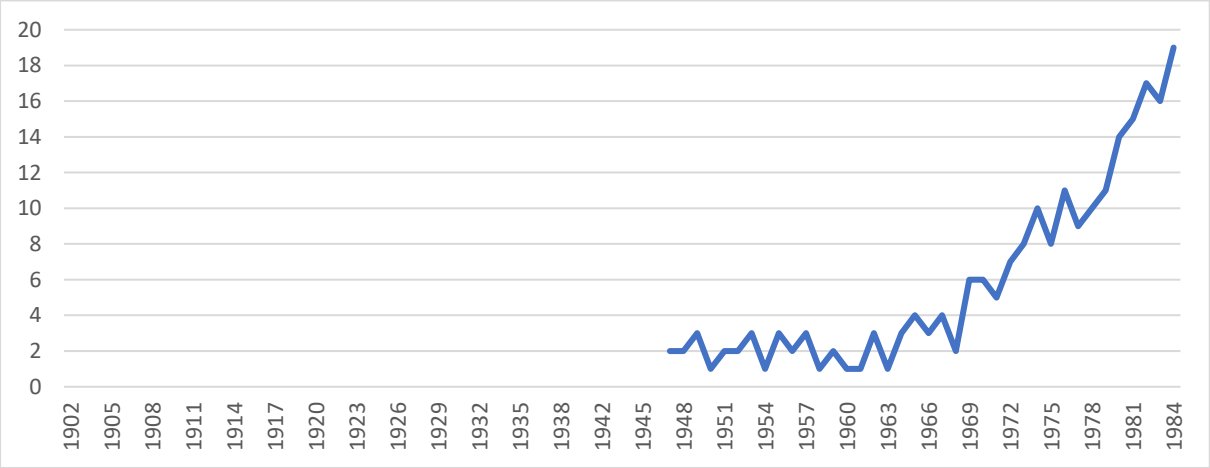


Figure 18: Exponential growth of climate change articles in the Rand Daily Mail.

The anthropogenic nature of climate change came much later into the discourse (i.e., 1970s), even though speculations to the effect existed as far ago as the early 1900s (see National Library of New Zealand, 2021). Apart from the above-mentioned articles and a few others, the 1950s reveal very little reporting on climate change, both locally and internationally. At the local level, in particular, reports largely concentrated on rainfall and drought, rarely mentioning climate change. The following decade saw an increase in articles reporting on scientific studies, which might suggest that scientists were beginning to make a stronger

case of global warming. An article, originating from Oslo, was published on 4 June 1965 reporting that observations over the previous 75 years had led to the conclusion that the Earth was warming. It further reported that Alpine and Scandinavian glaciers had contracted *"dramatically".* This, it added, had coincided with milder winters, leading scientists to conclude that the world, or at least Europe, was warming. The 1970s to the 1980s saw an increase in the amount of news reports about global warming and related subjects, such as anthropogenic climate change, the debate of whether the Earth was warming or cooling and anthropogenic climate change.

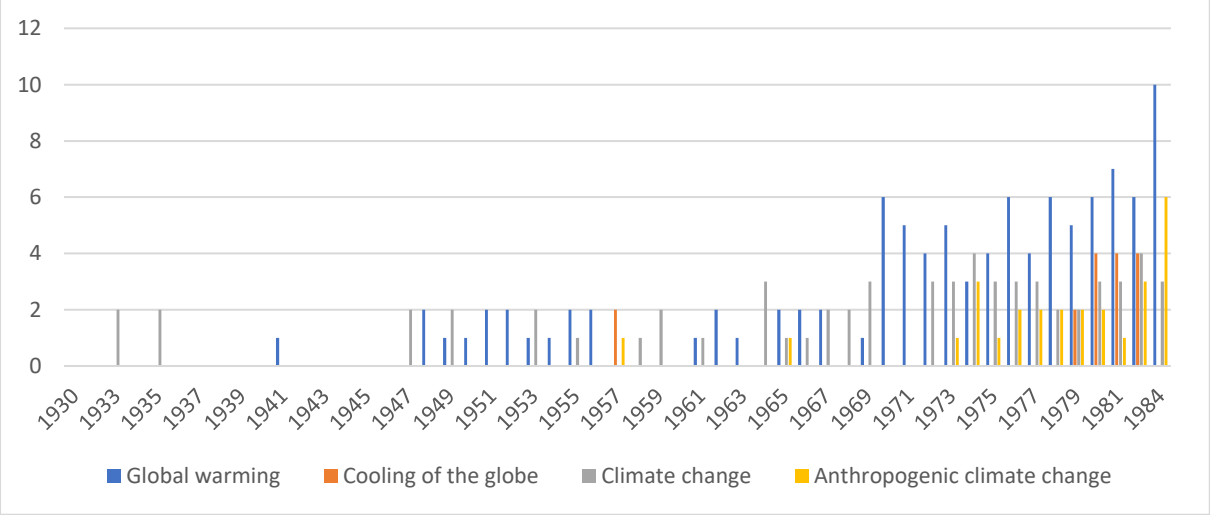


Figure 19: The graph illustrates that global warming, cooling and climate change were mentioned in early reports, while anthropogenic climate change was mentioned much later. The graph features articles from the 1930s since there were none before this time.

From the 1970s, the publication intensified its coverage of issues concerning the climate, continuing to largely feature international articles citing scientific findings and discussions about global warming and consequent climate change. The reporting increasingly brought in the anthropogenic factor of climate change. Speculating on anthropogenic climate change, an article on 1 September 1971 with the headline "*This is an ice age we live in"*, postulated that changes in warming and cooling during the previous 30 years in Arctic regions, were three times larger than in the temperate zones, and added that: "*It is possible that, in these fluctuations, man played a part, and the next dramatic change, such as the disappearance of Arctic ice, may well be identified as man-made*". The article added that man's role in climatic changes was through industrial activity and the burning of crops and vegetation in some tropical regions.

However, an article on 25 April 1974 reported on a cooling world, instead, suggesting that climatologists had found that mean temperatures had been dropping since 1945. Barely a month later, on 22 May, the publication carried a story of a warming world that was resulting in drought in several parts of the African continent. The article cited American scientists as saying that the drought represented a profound change in the climate of the world, something it said was a threat to both the Northern and Southern Hemispheres. Two years later, on 26 April 1976, the paper lifted an article from *The Washington Post,* which reported that the Southern Hemisphere appeared to be experiencing a warming trend while the Northern Hemisphere was becoming cooler. These contradictions in scientific findings reveal that the consensus view on climate change was not arrived at lightly. This suggests that scientists conducted diverse and detailed studies before reaching the consensus that the globe was warming, resulting in climate change.

Although articles citing South African government officials were rare in the *Rand Daily Mail*, a few were found, such as one citing the director of physical planning in the Department of Planning and Environment, JJ Le Grange, making some rather forceful statements against the fight against pollution: "*South Africa, the same as other countries in the world, would never be able to achieve a pollution-free atmosphere"* (RDM, 1973). Le Grange lambasted that the greater demand of the ever-increasing standards of living prevented the achievement of *"some daydreamer's utopia",* meaning the reduction of pollution. The government official does not appear to be a denialist of the pollution problem but sounds very similar to present-day government officials who acknowledge the problem of global warming but are reluctant to take action, in defence of economic and other interests.

On 12 February 1979, the *Rand Daily Mail* reported on what appears to be the first international effort to deal with climate change. It reported on a story of a meeting of the world's weather scientists, which was convened by the WMO to "*decide what our planet's climate is doing and what should be done about it"*. The Geneva conference, which gathered some 300 scientists from all over the world, according to an article on 26 February 1979, heard presentations that humanity was exacerbating global warming. The chairperson of the two-week conference, Dr Robert White, is cited as having told the gathering that "*we can say with some confidence that the burning of fossil fuels, deforestation and changes of land use*

have increased the amount of carbon-dioxide in the atmosphere by about 1.5°C during the last century". White is reported to have added that there is serious concern about the continued expansion of human activities on Earth as it may significantly extend regional and even global climatic changes. There is no mention in the articles whether any South African scientists attended the conference, but an article on 5 April 1979 mentioned the event and brought the issue home, warning that if it becomes too hot, the polar ice caps will melt, sea levels will rise and everyone in Cape Town and along the coast will have to *"clear out"*, creating a *"stupendous"* housing shortage inland. This seems to be the first article found in this publication reporting on the potential impacts of climate change on the South African society. It might have appeared fearmongering at the time, but it is today common wisdom to link climate change effects to socio-economic degradation.

The 1980s saw a flurry of articles on climate change and related subjects, reporting on findings and debates about the issue. An article on 22 December 1980, under the headline *Even the experts can't decide,* reported on a meeting of climate experts in Peking, China, who apparently failed to agree on whether the world was warming or cooling. Chinese and Japanese meteorologists, at the conference, were reported to have found that the world was cooling, and they needed two more decades to research the reasons. The cooling findings were based on studies conducted by Peking University Professor, Wang Shaouw, which found that average temperatures from 1971 to 1980 were lower than those between 1931 and 1960. The Chinese were reportedly supported by neighbour Japan, whose lead climatologist had told the conference that his research had also shown that the world was cooling. However, Swedish meteorologist at the conference, Professor Bert Bolin, is reported to have told the gathering that carbon dioxide in the atmosphere was creating a greenhouse effect, which trapped heat. Half of the emitted amount stayed in the atmosphere and between 28% and 40% was absorbed by plants, while the remainder was taken up by oceans. This had a warming effect on the globe, he told the gathering. Professor Bolin's warming theory was supported by an American delegation which warned that an acceleration in emissions and an increase in tree felling could speed up the warming, resulting in temperature increases of between 5°C and 10°C in polar regions. This would melt ice caps, lead to sea level rises, and could force people away from coastal cities, they added.

Away from the Peking conference, American climatologist Manuel E. López was reported in an article on 1 November 1980, as having found that emissions from fossil fuels had lowered the world's temperature by one tenth of a degree. "*To put this in some kind of a perspective*," he is reported as having added, "*a lowering of the earth's temperature by one-and-one-half* (sic) *degrees would spell the start of another ice age.*" The conference resolved to ask the UN to place the issue of global warming on its agenda.

Research on climatic changes seems to have accelerated henceforth as evidenced by an increase in news reports citing scientists, who were primarily cited for their research (see Figure 15). An article lifted from news agency United Press International, on 8 January 1981, reported on findings from US-based Aspen Institute for Humanistic Studies that there was growing agreement that the build-up of carbon dioxide in the atmosphere would cause a general warming trend of the Earth, which would result in vast changes in rain seasons. The article cited the author of the report, Dr Walter Orr Roberts, as having said that the Earth would be warmer than any time in the last 100 years. The article also reported on disagreements among climatologists on the details of the said climatic changes. This story was followed by another on 20 October 1981 which reported that two American researchers had found "*what may*" be the first sign of a global warming trend, "*perhaps*" caused by a build-up of carbon dioxide in the atmosphere, which could eventually melt polar icecaps. According to the article, the findings were important because they nullified earlier reports of cooling in the northern hemisphere since the 1940s, which seemed to contradict the greenhouse effect and associated global warming theories.

South African scientists did not receive much mention in articles of international efforts to study climate change during the 1980s, apart from one instance when on 25 January 1985 an article reported that local weather experts had been invited by the WMO to join efforts to find ways to make long-term weather projections. There is no empirical explanation on the reasons for the unavailability of South African scientists in international climate research during this period, but one explanation could be the fact that the country was under international isolation due to apartheid, which dictated the exclusion of South Africa in many international activities. The relatively fewer number of articles (28%) originated by the newspaper's newsroom and reporting about climate change in South Africa, might also be explained by the

low involvement of South African scientists in climate research. Most research by South African scientists was mainly on the various drought spells, without touching on the role of fossil fuels on global warming or climate change. In fact, one South African scientist, Prof. Piet Van Rensburg, is cited in an article on 17 October 1983 as dismissing the possibility that coal power plants could be contributing to warming in the cities (let alone the globe). The scientist is reported to have argued that the coal power plants were far away in the rural aeras to be able to cause pollution in the cities. Articles on scientific work in South Africa on the issue of climate change tended to deny the link between the burning of fossil fuels and climate. Prof. Van Rensburg believed that the main culprits of pollution in urban areas were buildings and factories and that cars did not make any meaningful contribution. Professor Van Rensburg's findings and the disputes between scientists, policymakers and farmers on the issue of a changing climate could be indicative of the fact that there was no knowledge about the link the drought and global warming, let alone the causes. Alternatively, the narratives could mean that there was climate change scepticism among some of the country's scientists and policymakers alike.

Several articles also alluded to the fact that South African scientists had been studying the weather for several years, but the issue of a changing climate was scantily looked at. One article published on 12 October 1979 under the headline *Wits unit predicts a dry year*, cited Wits University academic and scientist, Dr TGJ Dyer, proclaiming that records going back to 1910 indicated that the year 1979 would be the second in a seven-year cycle of diminished rainfall, although no link to global climate change is made. Once again, the article reveals something of a disjuncture between academics and state officials. The head of the country's Weather Bureau, Mr DO Trichardt, is cited as having refused to comment on the Wits academic's findings, arguing that *"nowhere in the world would a weather bureau stick its neck out on long range forecasts*" because there are so many unpredictable factors.

The non-attribution of the various drought spells to climate change might be the reason behind the relatively little research on climate change in South Africa, at the time. The *Rand Daily Mail* reported immensely about the drought in South Africa and the sub-continent during the 1980s, but the articles did not draw a link between drought and climate change. One article on 31 December 1983 cited the

South African Journal of Science suggesting that the drought being experienced in the country was 50% worse than any experienced in the past 60 years and it could last until the early 1990s or end in 1988, at the earliest. An article on 4 November 1983 reported that 34 African countries were affected by the drought, prompting a conference in Geneva, organised by the WMO. The article reported that the meeting heard that the drought of the time was a continuation of an earlier one in 1969-1973 from which 200 000 people died in countries bordering the Sahara region of the Sahel. The article mentioned desertification and blamed governments and the international community for failing to prepare for the disaster but made no mention of climate change.

For the period in which the newspaper was in circulation when climate change was not such a topical issue, it can be said that the *Rand Daily Mail* had a fairly comprehensive coverage of the subject. The analysed articles confirm literature that suggests that the bulk of climate change news in the country's media was not about the country and the articles on the subject were mostly lifted from international media (e.g., Tagbo, 2010; Smith, 2013, etc.). While any communication on climate change, such as media reporting, might be regarded as better than none, reporting about the issue in faraway places, without a local context, would have made climate change difficult to visualise. It could also create a sense of helplessness in terms of local communities acting to address climate change (Jones et al., 2017). If something is happening so far, what can someone in a remote village do about it? This would be the question in most minds. Yet, if occurrences such as the drought spells of the twentieth century had been correctly linked to climate change, for instance, it would have made sense to most people and would have challenged them to take action. But as earlier argued, the media would not have taken that step with empirical evidence from scientists.

To summarise, climate change communication in the country, through the *Rand Daily Mail* reporting, might not have been sufficient to drive public understanding of the issue and encourage response in the country. Its reliance on articles lifted from foreign news agencies, most of them not reporting about South Africa, meant that its readers would find it difficult to associate climate change with their own day-to-day lives. Some scholars have argued that communicating immediate, local impacts of climate change can produce longer-term engagement with the issue (Jones et al., 2017). Trope and Liberman (2010) postulated that temporal and

spatial closeness to an issue allows people to assess risks more accurately and make more informed decisions. Cramer (2008, p. 81), who studied media coverage of climate change in Western Cape newspapers, found that locally- relevant reporting was important, because “for your normal reader in the Platteland, or Mitchell's Plain, it means nothing if the polar bear goes extinct. It doesn't affect them”.

Climate change communication may encourage action by making climate change more relevant to individuals (Halperin & Walton, 2018) and affording information and solutions that are relevant to them. This means that the information will have practical application rather than appearing to be an academic exercise. This supports the concepts of place-based communication of climate change, which were advanced by Schweizer et al. (2013) to emphasise the fact that communicating on climate change achieves better results if it is framed in local terms (see 3.8). Other scholars such Scannell and Gifford (2013) and Gislason et al. (2021) also supported the concept.

7.3 Mail & Guardian data analysis

The first article to be found reporting on climate change in this publication is dated 18 December 1987, a little over two years after the newspaper was established. The article, titled *Africa burns in man’s gases*, is not about South Africa, but climate issues on the African continent. It reports that while Africa may have contributed little to greenhouse gases, it was nonetheless suffering the impacts of global warming. This was in reference to the drought that had been affecting different parts of the continent throughout the 1980s. Then, there is a lull in articles about climate change in the publication, until the 1990s. It is also worth noting that the *Mail & Guardian* had a fairly sizeable number of articles on environmental issues, but without a mention of climate change. These have not been included in this PhD study. Furthermore, in 1992, for instance, the publication carried several articles about drought in South Africa and Madagascar, but without drawing a link with climate change. This might suggest that scientists were not linking every drought spell to climate change or the publication did not do so. The fact that an earlier article cited above linked the two issues might suggest that the newspaper would only draw the link if its sources in science did so.

Most early articles in this publication were lifted from foreign publications, citing international scientists, policymakers and NGO activists (see Figure 20). Articles with international content originated from foreign news agencies amounted to N=178 or 57.05%, while those with local, South African content, generated from the publication's newsroom amounted to N=134 or 42.94%. The coverage shows a gradual increase over the years and a tick up during years of major climate events such as disasters and conferences (see Figure 24).

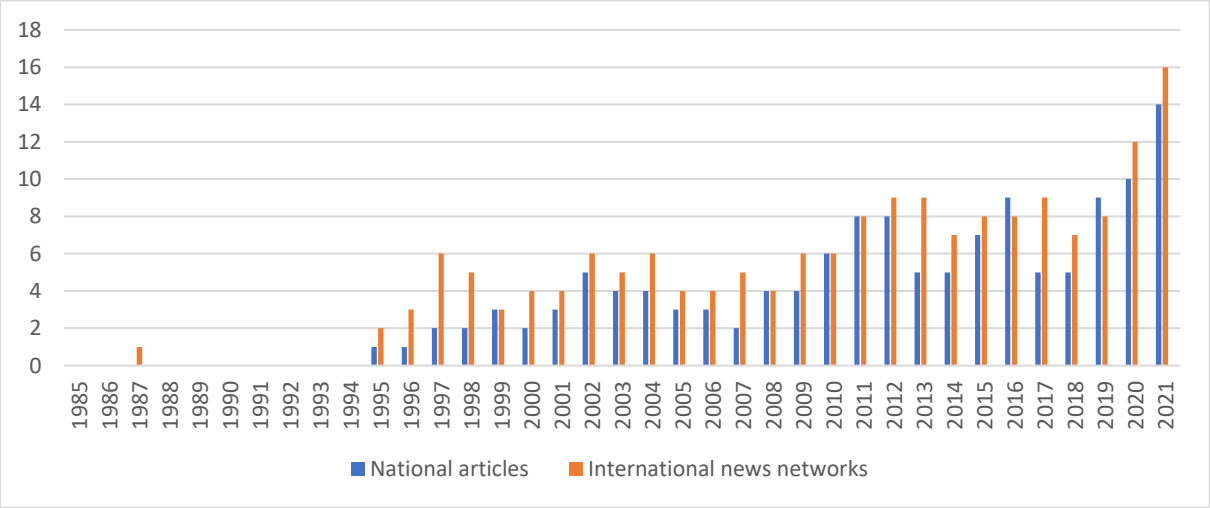


Figure 20: Breakdown of articles with local and international content in the Mail & Guardian.

Articles citing scientists amounted to 31.73% or N=99 articles; policymakers came second at N=76 or 24.35%; NGOs N=69 articles, 22.11%; corporates, N=38 articles, 12.17% and the media N=24, representing 7.69% (see Figure 21). The fact that scientists are leading in the number of articles is explained by the fact that the publication reported extensively on scientific findings, citing researchers. Policymakers are largely reported from climate change conferences, reacting to climate disasters or discussing climate change policy. For instance, major climate event years such as 1995 (COP1), 1997 (Kyoto Protocol), 2002 (WSSD), 2011 (COP17), 2015 (Paris Agreement and 2021 COP26) showed higher citing of policymakers. NGOs earned their mention in the publication from their activistic activities, such as protests, public relations activities, and the implementation of green projects. For instance, an article was published on 31 July 2013 reporting about an NGO-pioneered Cape Town housing project where renewable energy was deployed. NGOs also generated publicity from their participation in climate change conferences and their reaction to climate disasters and involvement in

policy discussions. The sector tended to make use of climate change conferences to raise its voice, as demonstrated by an article on 6 September 2002, during WSSD. The article quoted Greenpeace climate policy director, Steve Sawyer, arguing that "*after over a year of debate, the WSSD energy section does not represent a single step forward… The plan of action is not much of a plan, and it contains almost no action*". Corporates are, in the main, mentioned in instances where they are blamed for exacerbating climate change through the burning of fossil fuels in their business activities or defending themselves from such attacks. On 17 July 2005, for example, the *Mail & Guardian* reported that instead of reducing their carbon emissions, local mining and minerals firms would continue to be "*recipients of vast state subsidies, especially low-priced Eskom electricity, along with public infrastructure investments, like those envisaged for the proposed Coega aluminium smelter*". The same article criticised the carbon-trading strategy to address global warming, saying it could exacerbate other environmental problems in centres like Durban. Businesses are also mentioned reacting to climate change policy, propagandising their efforts to address climate change, or defending themselves from attacks, mainly form activists. As an example, a 3 June 2015 article reports about efforts by six oil companies, Total, Statoil, BP, Royal Dutch Shell, Eni and the BG Group lobbying the UNFCCC for help in setting up a scheme that would put a price on carbon. The energy companies are also reported to have written a letter to the *Financial Times* explaining their move of asking the UN climate body to set up the scheme, saying: "*We owe it to future generations to seek realistic, workable solutions to the challenge of providing more energy while tackling climate change.*" The number of articles shown as 'media', in Figure 21, represent commentaries written by journalists. The newspaper carried several such articles, mostly criticising the government and the private sector for their lack of speed in addressing climate change. This indicates that apart from reporting on what its sources said, the paper had views of its own with regards to climate change. In agenda-setting theory terms, it can be said the *Mail & Guardian* did not shy away from driving a progressive message among its readers.

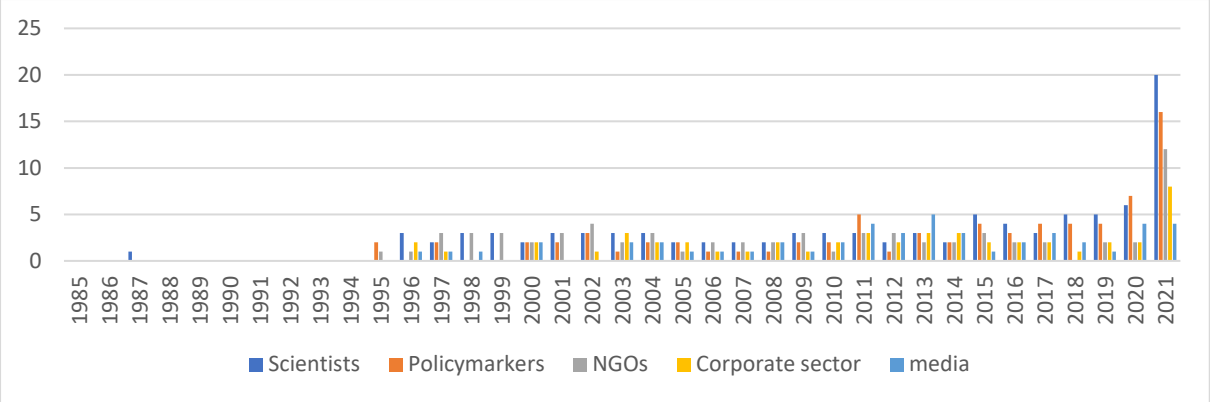


Figure 21: Breakdown of the mentioning of climate change stakeholders in the Mail & Guardian.

Figure 22 gives an illustration of the fact that the *Mail & Guardian's* articles demonstrated dedicated climate activism where progressive climate change positions tended to dominate and reported with a positive tone. Policymakers come out for some critical, even negative reporting, where the publication attacks the government particularly for inaction on climate change. However, policymakers scored higher positive reporting because of the number of articles that simply report on their participation in conferences and mentioning in policy statements. Articles mentioning the business sector are largely critical of industry's role in GHG emissions, or reporting on protests and other activities aimed at forcing action from the sector. The reporting on this sector is largely negative. NGOs receive positive reporting, where the newspaper supports their campaigns to address climate change. Journalists' own contributions were almost entirely in support of action to address climate change or criticising inaction from government and business.

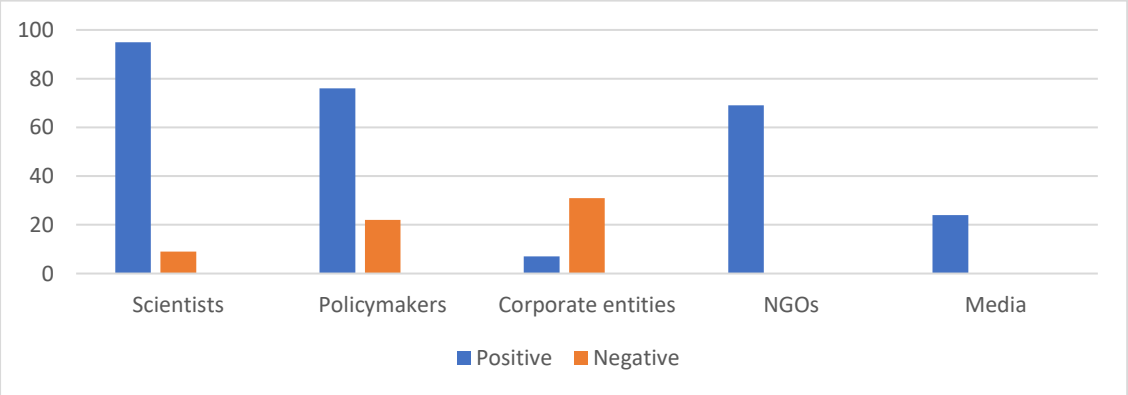


Figure 22: An illustration of the number of articles reporting positively and negatively on different stakeholders.

Certain years, particularly those of major events such as conferences, display higher activity across all stakeholders and this is reflected in the paper's reporting. In the mid-1990s, the publication appeared to ramp up its climate change reporting, starting with an article on 20 April 1995. The article reported that the African continent's climate activists attending COP1 in Berlin (28 March–7 April) had petitioned then President Nelson Mandela to complain that the country's government officials, at the summit, had aligned themselves with western countries instead of collaborating with fellow African delegations to push for solutions suited for the continent. Government scientists appear in a report on 1 October 1997 indicating that South Africa was one of the world's worst prepared countries to face the challenge of reducing global greenhouse emissions. Figure 23 shows that climate change reporting in the *Mail & Guardian* has been on the rise since the mid-1990, while Figure 24 shows a fluctuation in favour of years with major climate events.

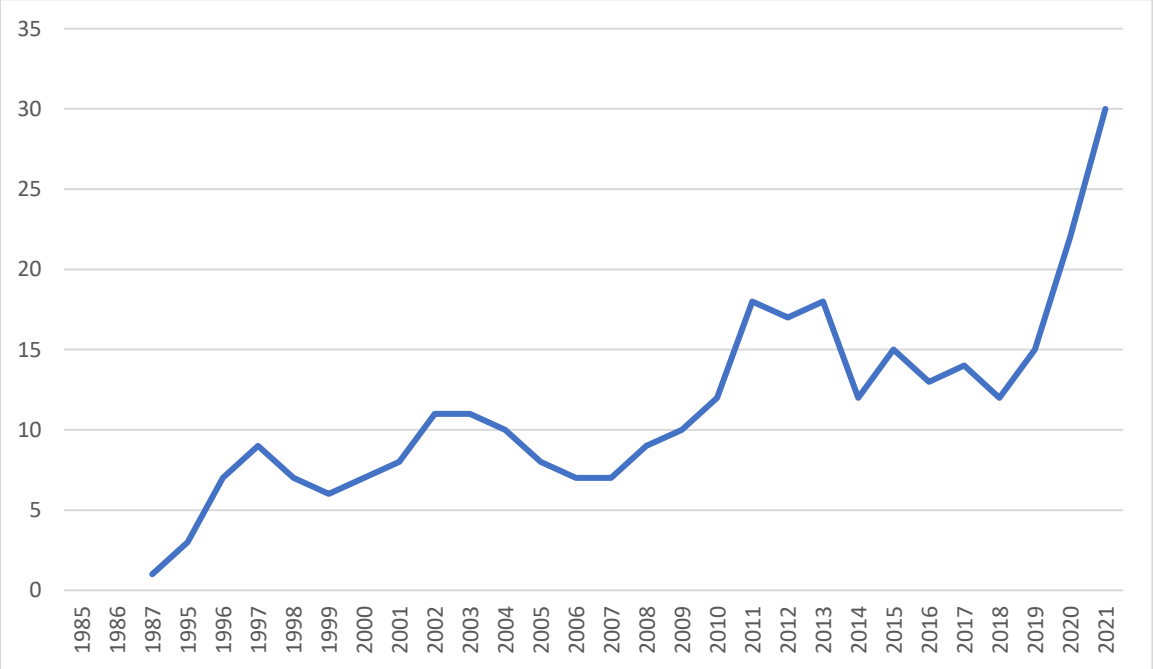


Figure 23: An illustration of the gradual increase in climate change articles in the Mail & Guardian.

The reporting further increased in the 2000s, beginning with reports on the preparations for the holding of the WSSD, held between 26 August and 4 September 2002, in Johannesburg. The WSSD received massive reporting, starting with the preparation stages in 2001, through to post-event. The coverage started with an article on 18 October 2001 reporting that the forthcoming event

would examine progress made since the Rio summit, 10 years earlier, where it was decided that a plan needed to be put in place to stave off an environmental catastrophe as a result of global warming. The voice of the South African government on climate change issues is again scarce in articles during this period, except for a few mentions during the WSSD. By and large, stories in the publication were largely about international issues, mainly reports from scientific organisations and international NGOs. This changes much later, from about 2010, when the paper increases its coverage of local climate issues.

Earlier, in 2004, for example, the reporting followed trends of earlier years, where stories were largely about climate change internationally (see Figure 20), and were mainly inspired by events, announcements of scientific findings and climate disasters. Indeed, the first article on 14 January 2004, cited international scientists warning that global warming would kill a million animal species by 2050, something that would affect tourism facilities such as South Africa's Kruger National Park. During this year and subsequent years, the publication increased its coverage of climate change, often angling its news stories on climate change internationally, but also bringing in information about the issue in South Africa. Another example of this reporting approach is of a story on 7 October 2004 under the title *Bursting at the seams.* The article reported about the effects of climate change on food production globally and in South Africa. Viewing climate change as both a global and local issue was referred to as the '*glocal'* approach by Evans et al. (2018). This reporting should be lauded since climate change is both a global and local issue. Throughout 2004 and the following years, the publication increases its reporting on the climate crisis, reflecting a rise in awareness as articles citing activists taking part in advocacy work were also found. Figure 24 and Figure 25 illustrate the fact that in years of climate conferences, for instance, reporting tended to increase.

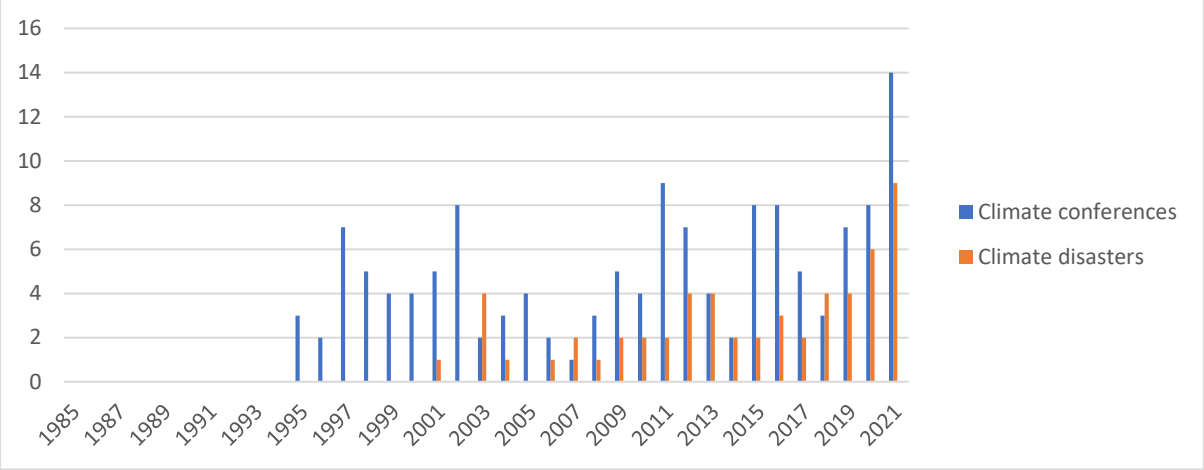


Figure 24: An illustration of the fact that climate change coverage in the Mail & Guardian was inspired by conferences, climate disasters, reports of scientific findings and general discussions on climate change. The graph shows a spike in reporting during conference years, such as 1995 (COP1), 1997 (Kyoto Protocol), 2002 (WSSD), 2011 (COP17), and 2021 (COP26).

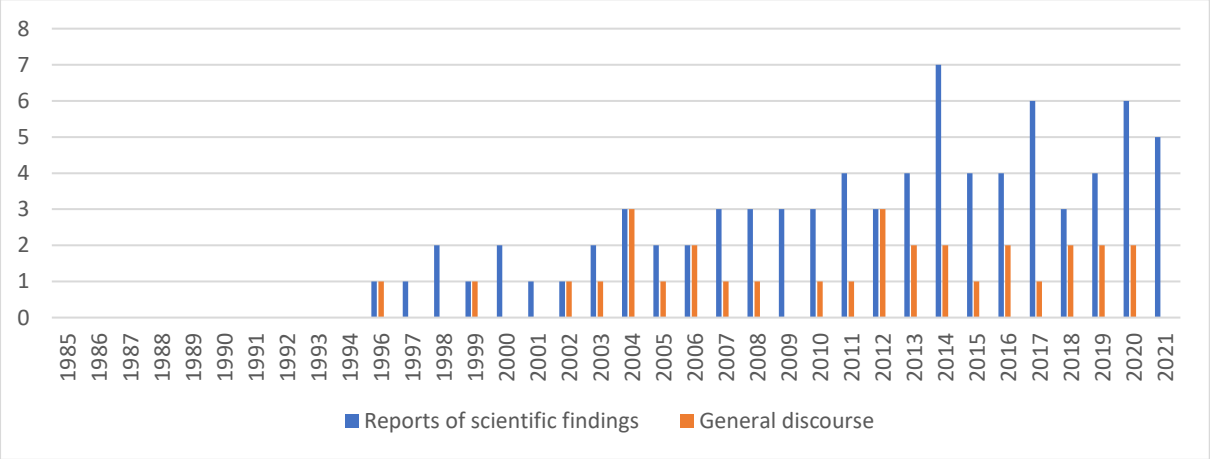


Figure 25: Representation of reports on scientific findings and general discourse in the Mail & Guardian. The graph shows that in years when there were major announcements of scientific findings, such as 2007 (AR4), 2014 (AR5) and 2017 (IPCC) Special Report on Global Warming of 1.5 °C *(SR15), reporting tended to increase.*

The articles tend to increasingly mention the six key themes in the climate change discourse: global warming, climate change, anthropogenic climate change, climate change impacts, mitigation and adaptation. Figure 26 and Figure 27 illustrate the temporal increase based on these main themes in the articles. It should be noted that some articles contained more than one of the themes. For the purposes of this representation, only the main theme on which the article is angled was used.

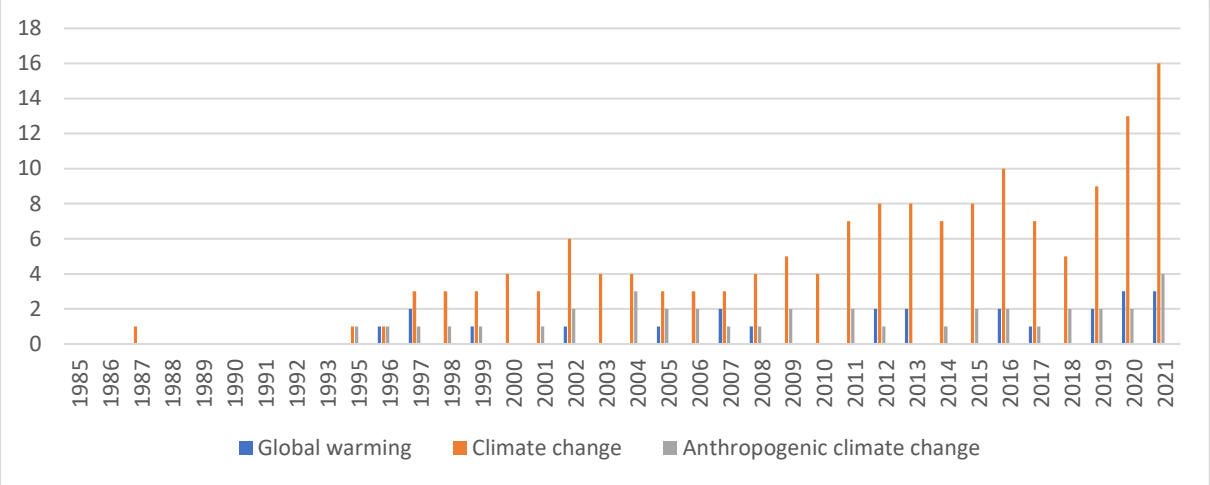


Figure 26: Climate change themes in the Mail & Guardian reporting.

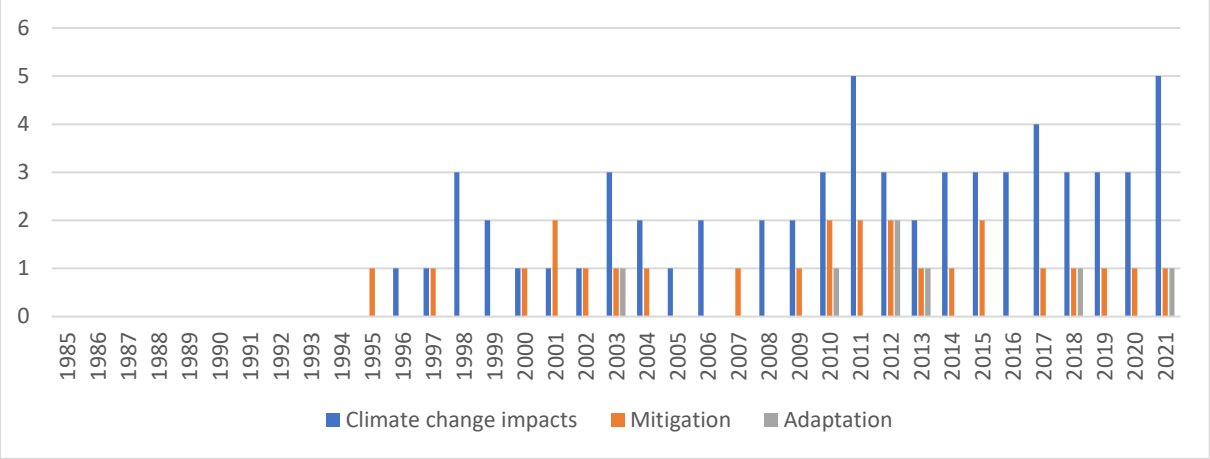


Figure 27: Climate change themes in the Mail & Guardian's reporting on climate change.

Ordinary members of the public are also featured entering the climate change debate through *letters to the editor* pages. A letter to the editor on 13 May 2004 comments about the appointment of Mr Marthinus van Schalkwyk to the position of environment affairs minister and questions whether he had enough political clout to tackle the difficult issues of climate change in the country. The *Mail & Guardian* articles increasingly report on discussions about wider issues of climate change, both nationally and internationally. In this regard, the economics of climate change enter the discourse, with a story about the fact that businesses would be able to trade on carbon limits at the Johannesburg Stock Exchange. Another article bringing the economic frame was published on 27 October 2005, indicating that South Africa, as a developing country, could benefit from the Clean Development Mechanism, under the Kyoto Protocol, to the amount of R2.5 billion to fund climate change fighting efforts.

Furthermore, the publication increasingly featured stories that placed business on the firing line, accused of emitting GHG that exacerbate global warming. Oil companies such as Shell and other oil conglomerates are reported in an article on 30 June 2005 to be facing a hefty legal suit in the US from rural communities and western environmentalists, accusing the companies of causing pollution and global warming. The articles in 2005 also reflect some communication from policymakers, where the country is reported to be playing a key role in charting a future for reducing emissions during discussions in preparation for COP11, which was to be held in Hyderabad, India, from 8 to 19 October 2012.

Contrary to articles in the early 1990s that reported on drought in various parts of the African continent without linking it to climate change, articles in the 2000s start to draw a definite link between the drought and climate change. Since the publication would always rely on scientific findings on its reports on drought and climate change, it can be concluded that the linking of the two phenomena was reflected in scientific findings, this time. South Africa is mentioned as one country where the effects of climate change are exacerbating droughts. Articles in 2006 reflect a massive growth in climate change reporting with various issues being discussed, instead of concentrating on events (see Figure 26 and 27). For instance, the links between climate change and tourism receive mention: "*Apart from climate change, which is breaking off great chunks of ice, mass tourism is the greatest threat the continent (Europe) has ever faced,*" reads an article on 9 February 2006. Another article accusing tourism activities of being among the source of GHG emissions and consequently climate change, was published on 9 March 2006, titled *Keep the wealthy at home.* It argues that the growth of the aviation industry (fuelled by tourism) would increase CO_2 emissions.

Articles in subsequent years follow a similar trend, with an increase in reporting during climate events. On article during the days leading up to COP15, which was held in Denmark on 7-18 December. One salient article in this regard, profiles what it called "*some of South Africa's most respected environmental experts and policymakers*" who would speak at EnviroCon 2009 (see Weir, 2009). Other articles in 2009 are run-of-the-mill reports about the impacts of climate change and other day-to-day discussions thereof, showing a movement towards covering

climate change outside events. On 31 July 2009, for instance, the publication reported that scientists and policymakers in South Africa had decided to produce an Atlas to make climate change information publicly available. Another on 18 September 2009 reported on adaptation efforts in South Africa, writing that experts were developing climate change solutions in view of ecological changes resulting from the crisis. This reporting is crucial because it presents local climate problems and solutions, which are regarded as key in the fight against climate change.

Media reporting on climate change also ramped up in 2010 as South Africa prepared to host COP17, which was subsequently held in Durban between 28 November and 11 December 2011. The reporting increased immensely, in both quantity and quality during this period. This might be attributable to the fact as the conference approached, there was a lot of preparatory work and all stakeholders were increasing their communication. South Africa's role as the host and key player in the Durban discussions was being accentuated in the *Mail & Guardian*'s reports. One such article was published on 30 September 2011, mentioning that the burden was growing on South Africa to broker a deal at COP17. This would be followed by another article on 14 October 2011 under the headline *The world needs progress at COP17* and saying that South Africa would be expected to work tirelessly to ensure that a deal was reached on the implementation of the Kyoto Protocol, which was central to the discussions. While these articles were about an international event, the fact that it was happening in South Africa and it received massive coverage from the local media, including the *Mail & Guardian*, suggests that it had contributed to better public understanding of climate change. The conference and its media coverage would literally have brought the issue of climate change home. However, Johannessen (2013) found that the media coverage of CO17 lacked the human face because it failed to reflect the experiences of local communities in debates. Media coverage of any conference would usually concentrate on the issues being discussed at the event. The attention of both journalists and media consumers tends to be on the event, and it might be futile to bring issues that, although related, might be seen to be 'off beat'. However, the difficulty of reporting on climate change based on conferences lies therein. Conferences tend to discuss top-end international policy issues, instead of day-to-day issues affecting local communities. In the case of COP17, for example, it can be said that local communities, either in Durban or South Africa, did not benefit

much from the conference being held in their vicinity, because the issues discussed had no bearing on their immediate lives.

In years following COP17, local stakeholders appear to be improving their climate change communication, resulting in an increase in the number of articles (see Figure 23). The coverage reaches new hights in 2015, during the hosting of COP21. The *Mail & Guardian* took reporting on the conference very seriously, to the extent that on 3 December 2015, the publication led with a story on the conference and wrote an editorial justifying this decision: "*The Mail & Guardian chose to lead this edition with our eight-step plan to wage war on rising temperatures. We want to help our readers agitate for change before it is too late*." There is no noticeable change in the nuance, except a marked increase in the mentions of policymakers, corporates and activists. The newspaper's own communication also increases as can be seen through the above-mentioned article where the publication takes matters into its own hands by publishing its own stance on climate change. This is a normal occurrence in publications, where journalists express their views on current affairs through editorials and columns. Through these, the *Mail & Guardian* tends to not shy away from expressing its views, mainly on institutions it blames for climate change or inaction against it. The approach is important in that editorials in newspapers highlight the importance of an issue in the news thus playing an agenda-setting and salience roles. Editorials shape debates in the public sphere by influencing opinion on crucial issues in the public domain (Firmstone, 2019).

The newspaper gave some considerable coverage to the drought in KwaZulu-Natal in 2015 and 2016 but did not link it to climate change. One such article was written on 5 November 2015 discussing the drought without mentioning climate change, but blaming it on El Niño: "*The government has already allocated $26-million to KwaZulu-Natal in a bid to mitigate the impact of the drought that has been blamed on the El Niño weather pattern*." A news analysis on 28 January 2016 also did not link climate change to the drought, but "*local weather phenomena then mixed with an increasingly powerful El Niño*". The publication appeared to be in line with scientific findings such as Ndlovu and Damlie (2020) and Karlie (2020) who associated the drought with global climate drivers, including El Niño, rather than a product of climate change. The non-linking of the drought to climate change but to

El Niño should be surprising since there are several phenomena that can cause different types of weather.

Articles in 2021, the final year covered by this PhD study, showed intense climate change reporting in the *Mail & Guardian* covering various themes and paying particular attention to the announcement that South Africa had secured funding pledges for the just transition from coal to a carbon neutral economy (Wadula, 2021). The publication went to the extent of issuing a special edition on COP26, anchoring it on the just transition subject. Other articles in the special edition dealt mainly with climate change impacts, mitigation and adaptation.

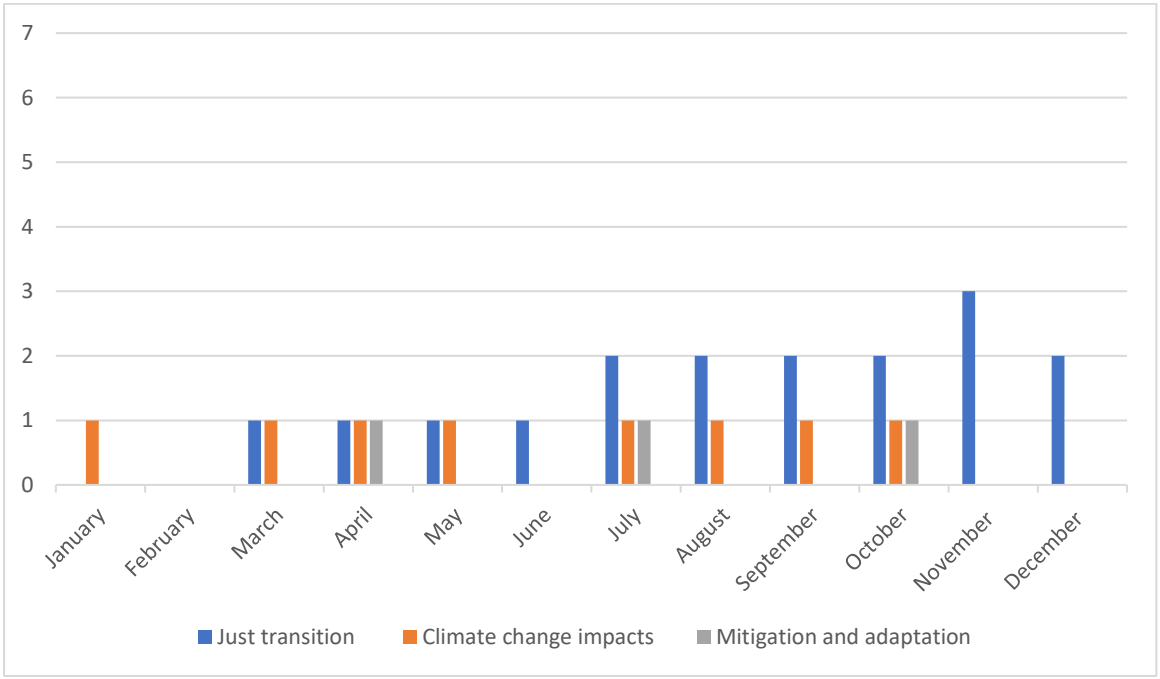


Figure 28: Mail & Guardian reporting on key themes of the just transition, climate change impacts, mitigation and adaptation in 2021.

The overall coverage of climate change in the *Mail & Guardian* reflects a progressive approach to the fight against climate change. By and large, its articles focus on efforts to address climate change, siding with science and NGOs who are engaged in efforts and campaigns to reduce GHG emissions. The publication spares no effort to castigate policymakers and corporates, in the main, whom it views as delaying action against climate change. This is evident in the balance between positive and negative citing of stakeholders (see Figure 22) and the messages in editorials and opinion pieces penned by the publication's own journalists. Although the coverage of global warming only started to show consistence in the mid-1990s, it increased rapidly in subsequent years and

appeared to be in-depth and focusing on some of the pertinent debates on the subject.

7.4 Business Day data analysis

Articles on climate change and related topics in *Business Day* tend to largely present the views of big business. This is not surprising given the overall editorial positioning of the publication, which is about covering business, finance and economics. Based on the articles accessed for this PhD study, the publication started to report about climate change in 1988. The publication's articles in the early 1990s featured climate change scientific reports, beginning with the coverage of the releasing of the IPCC's AR1 in 1990. In 1992, there was further noticeable coverage, with several articles on the Supplementary Report to the IPCC Scientific Assessment. The coverage did not increase by much until 1995, the year COP1 was held. The coverage shows an increase in years when international climate change conferences are held or major IPCC reports are released, as shown in Figure 29. The year 1997 also saw an increase in reports covering the adoption of the Kyoto Protocol. Another spike in reporting was in 2002 during the holding of the WSSD in Johannesburg. In 2006, *Business Day* reported on several climate events, including the releasing of the IPCC's Guidelines for National Greenhouse Inventories. This would be of particular important to the publication's business readership because the said guidelines were for the reduction of emissions by industry through the introduction of carbon tax. The 2009 COP15 was held in Copenhagen and *Business Day* undertook considerable coverage, concentrating on the conference's decisions on climate funding. In line with *Business Day*'s inclination to financial matters, the publication dedicated immense coverage to the conference's agreement that developed countries would contribute to efforts to address the climate crisis by providing US$30 billion for the period 2010-2012 and would mobilise long-term finance of a further US$100 billion a year by 2020 from a variety of sources. Reporting also increased in 2010 and 2011, with articles largely covering the holding of COP17. The next major increase happens in 2015 with reports about the Paris Agreement. The year 2018 had fewer articles. In 2020 and 2021 reporting concentrated on COP26 and climate disasters in northern Europe, North America and China. This exposition emphasises the already stated fact that reporting on climate change increases during the holding of conferences and other climate events.

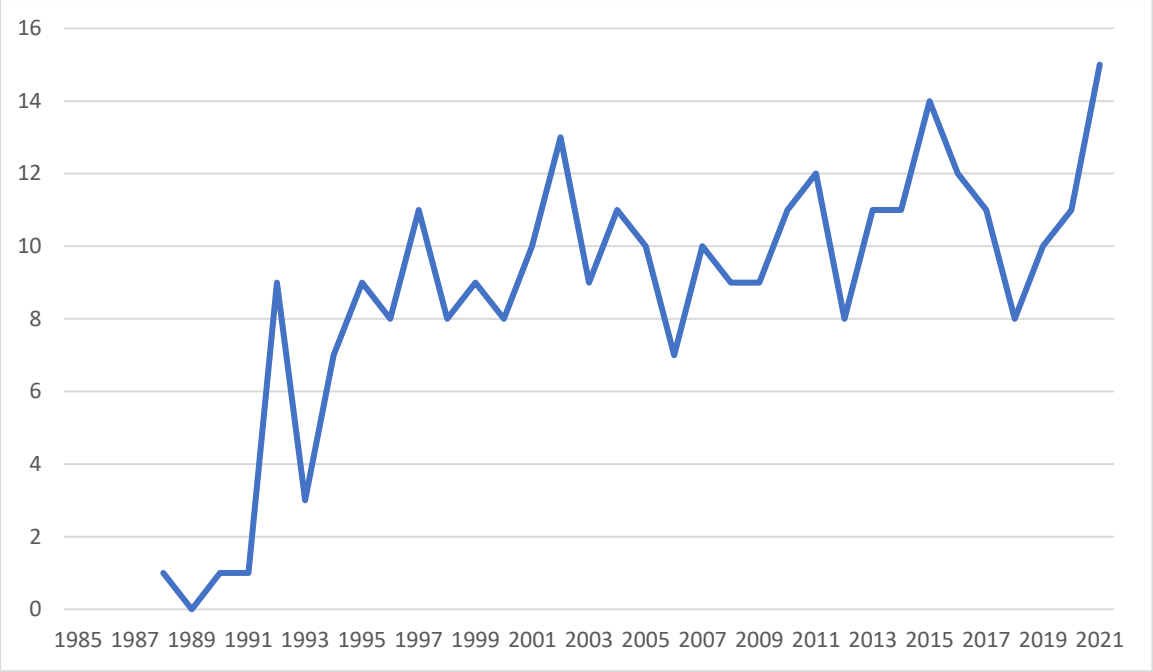


Figure 29: Temporal presentation of climate change reporting in Business Day. The graph shows that coverage increases in years when international climate change conferences are held, such as 1995 (COP1), 2002 (WSSD), 2009 (COP15), 2015 (Paris Agreement) and 2021 (COP26).

Business Day also followed the trends of the *Rand Daily Mail* and *Mail & Guardian* when it came to using stock news items from foreign agencies instead of own coverage, especially in earlier years before 2000. Of the 298 articles, N=161 (54.02%) were lifted from foreign news agencies. This trend has since been changing with local articles on the increase.

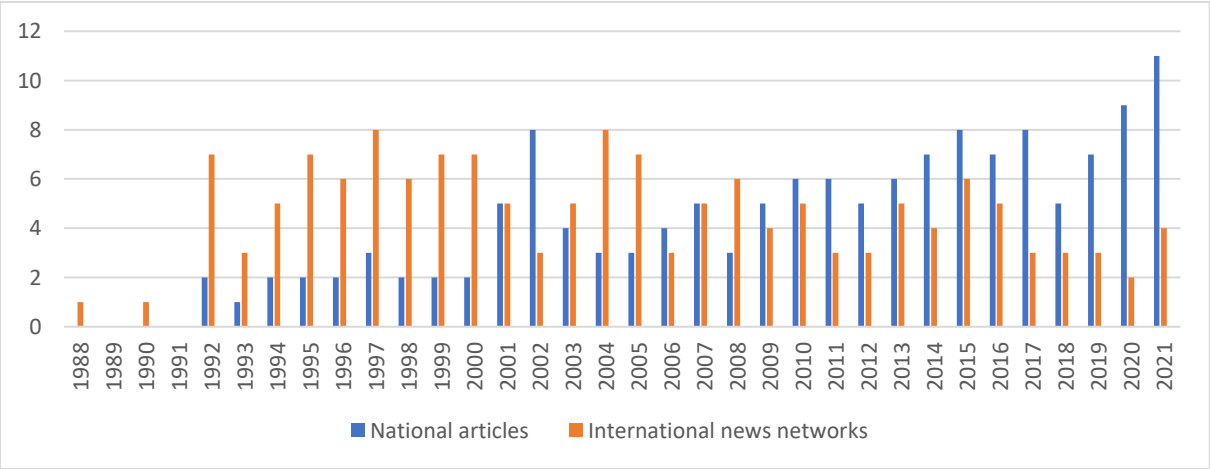


Figure 30: Representation of national and international climate change articles in the Business Day.

Another noticeable factor in *Business Day*'s reporting of climate change is that, at least in earlier years, climate change stories were in the *International* or *World* sections of the newspaper, with a few exceptions when they were in the *Environment* section. Placing articles in the *International* or *World* sections, could imply that climate change was regarded as a foreign issue by the publication. In many respects, this might have been the case because the articles concerned were about climate change in foreign countries and the stories were selected from foreign news sources. Needless to repeat, this type of coverage has been criticised on grounds that by not focusing on local climate change issues they have the potential to create the impression that climate change is a geographically distant issue, with no real impacts on local communities, and therefore not worthy of action. Placing them in the *Environment* section would have seemed most logical, particularly in the early days when the term 'climate change' was not widely used. However, critics have argued that the climate change issue is more than an environmental one, and permeates other areas such as politics, economics and health, among others (e.g., Moser, 2016). Confining the subject to the environmental pages might limit its scope.

In later years, after 2000, *Business Day* ramped up its coverage on climate change, and although largely keeping to business, finance and economic perspectives, the reporting became more diverse, including a focus on the environment, politics and health, among others. The corporate sector scored a higher mention in the articles, achieving N=98 articles (32.88%). Policymakers followed with N=77 (25.83%), scientists at N=59 (19.79%), NGOs with N=39 (13.08%), and the media scored N=25 (8.38%).

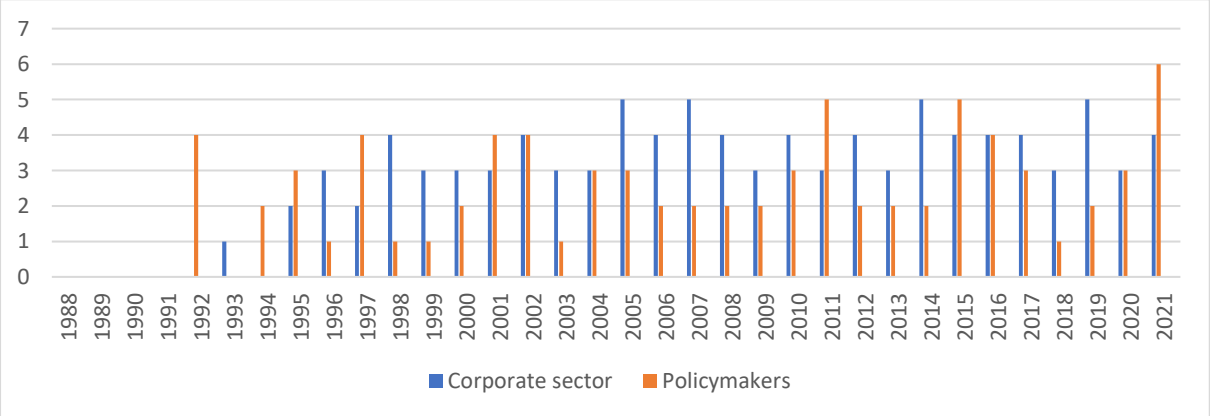


Figure 31: An illustration of the citing of corporate sector stakeholders and policymakers in Business Day.

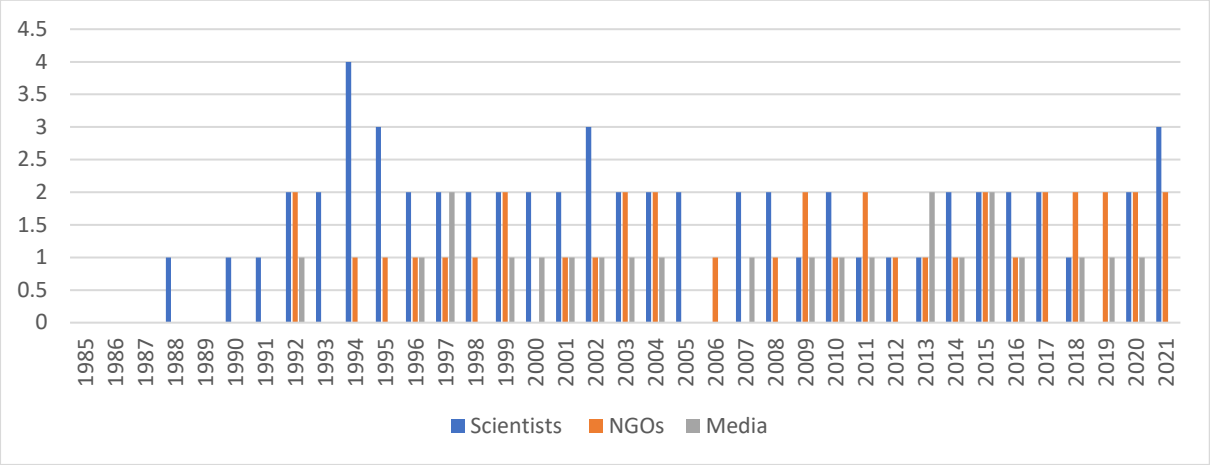


Figure 32: Citing of scientists, NGOs and the media in Business Day's reporting on climate change.

True to its business inclination, the publication would almost always bring in a business perspective to the issue of climate change. For instance, it brought in the business angle when reporting about the Kyoto Protocol: "*KPMG climate change & sustainability director Neil Morris says though the details of the text need to be analysed for businesses to understand the short-term consequences, the long-term message is certainty that the green growth path is the one to follow. Business also now has certainty that the market mechanisms of the Kyoto Protocol will still apply, such as the clean development mechanism which allows emission reduction projects in developing countries to be funded by the earning and selling of carbon credits. National Business Initiative CEO, Joanne Yawitch, says the implementation of the Cancún decisions will be important in the future, not least the hope that the green climate fund will become an important means of financing mitigation and adaptation measures in SA."* In this specific article, policymakers and NGO activists were also referenced, in the form of then environment minister, Edna Molewa and SA lead negotiator, Alf Wills, as well as the WWF's Tasneem Essop, representing NGOs. But the article was angled on business and the money issue occupied most of the article's space, while scientists were not mentioned.

Another particular characteristic of *Business Day's* reporting, compared with that of the *Mail & Guardian*, for instance, is the inclination to the cautious approach to action in addressing climate change. Articles in the *Mail & Guardian* revealed a forceful support to action against climate change, largely citing scientists and NGO activists. Business, as reflected in *Business Day* articles, does not appear to adopt a denial approach but comes across as more cautious with regards to

implementing various measures to address climate change. For instance, an article on 24 November 2011 reporting on what was to be discussed at COP17, the publication brought in the voice of business sounding the usual caution: *"SA business will be watching closely for any decisions that might change the workings of carbon markets, the flow of international finance, and policy certainty. Every sector has a vested interest in the outcome*, *according to KPMG's resource economist Rohitesh Dhawan*." This approach, although not reflective of climate change scepticism, can be described as 'climate action scepticism' or by the term 'climate change delaynism', which this PhD thesis proposes. The 'delaynism' approach advocates delay in action against climate change. It could also be related to climate obstruction (see 2.5.1.) However, in later years, *Business Day* tended to drift towards reporting on the business opportunities emanating from action against climate change, such as investment in renewal energy.

In short, articles in *Business Day* reveal a communication pattern that suggests: i) the publication started covering climate change more seriously around the mid-1990s; ii) the publication largely follows climate events, mainly conferences, rather than issues in its coverage of climate change; iii) the majority of its articles were lifted from foreign news agencies; iv) the voice of business was louder, with most articles being angled on business, economics and finance; v) NGO communication was relatively small, in contrast with the *Mail & Guardian*, for instance, where it was sizeable; vi) the publication tacitly supports the view largely held by business that there should be caution and delay in action against climate change under the pretext that hasty action would harm the economy and jobs.

RQ2. How have the publications performed in agenda-setting in their coverage of climate change?

7.5 Agenda-setting in the Rand Daily Mail

As earlier discussed in Chapter 4.11, newsrooms decide on what stories to publish and their prominence in news bulletins. By doing so, the media engages in agenda-setting, meaning that they put out to the public what they think is crucial, thus setting the news agenda and influencing public debates on important issues of the day. In the context of the agenda-setting theory of media coverage, which postulates that the quantity of media reporting on an issue receives may be more important than the content of the items being reported about (Mazur, 2009; Schäfer

et al., 2014; Wonneberger & Vliegenthart, 2021), it is believed that the more people see an issue in the media, the more the said issue is likely to be a reality in their minds. With climate change, the agenda-setting process has shown that media coverage is partly the reason why people focus attention on the issue and that the degree of public attention often results from the amount of attention the media affords the subject (Stamm, 2000; Schmidt et al., 2013). Schäfer et al. (2014) found that the amount of climate change representations that people encounter in the mass media are linked to their awareness of the issue, pointing toward an agenda-setting effect. Schäfer et al. (2014) posited that because the mass media attention to climate change tends to rise during major international conferences or catastrophic climate events, the media's choice of issues to report on is dictated by those events or factors. Liu et al. (2011) called them 'problem indicators', meaning the events indicate how the media should set its agenda in covering climate change. As discussed as part of the response to RQ1, the three publications whose articles were studied also relied on conferences, climate disasters and reports on scientific findings for their coverage or agenda-setting.

The *Rand Daily Mail* operated during a time when climate conferences were few in number, only involving scientists such as the Oslo and Peking WMO conferences. There were also no reports of climate policy conferences as the issue had not yet become a matter of socio-economic concern. Stories on climate disasters, except reports of melting glaciers and warming in the Northern Hemisphere, were almost non-existent in the publication. This could be due to the fact that science at the time was not attributing climate disasters such as droughts and other calamities to global warming. The publication's stories were largely influenced by scientific reports, considering that during its era, the issue of global warming was under research by scientists who made findings and the media reported on them. General public discourse informed mainly by the reports on scientific findings, also played a role as problem indicators in media coverage of climate change.

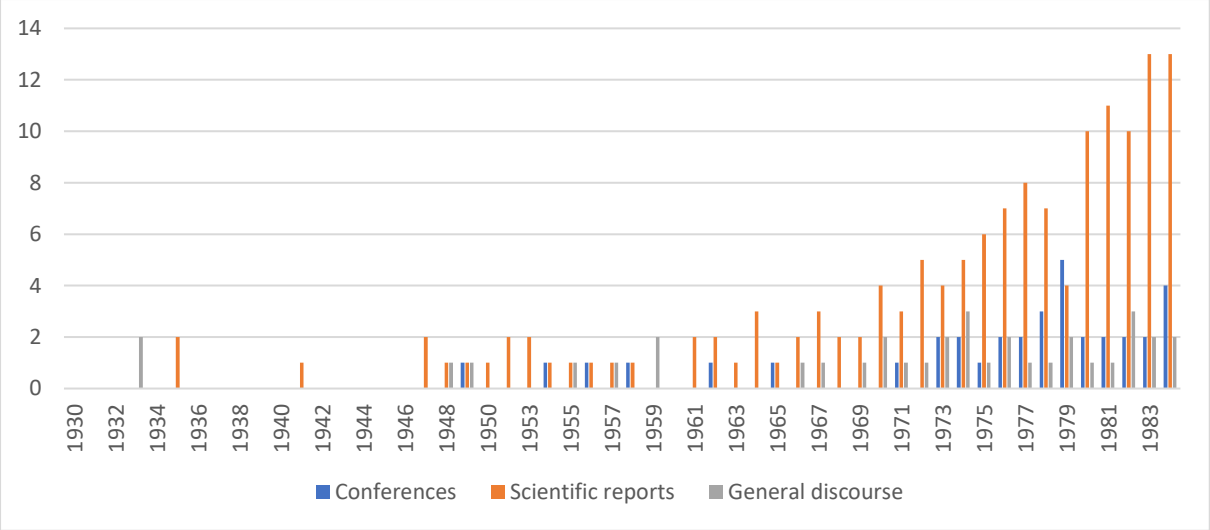


Figure 33: The factors that influenced agenda-setting in the Rand Daily Mail.

Generally, *Rand Daily Mail* articles reveal the scarcity of climate change communication by the South African governments, suggesting that policymakers of the time were a minor factor in the publication's agenda-setting. There were very few reports reflecting the involvement of government in climate change events or in general public discourse. Government, as a sector in climate change, is mentioned in 13 articles only, or 6% of all 218 articles.

No.	Date	Headline
1	24 November 1933	Changed SA rainfall
2	8 January 1935	Is South Africa drying up?
3	3 October 1935	Climate does not cause backwardness
4	17 June 1947	SA aid for polar mission sought
5	5 September 1973	South Africa will never be pollution-free – Le Grange
6	5 September 1973	Pollution the price of SA progress
7	25 April 1974	It's enough to send shivers up your spine
8	25 July 1972	Paying the price of poor planning
9	18 September 1984	Transport system a threat
10	12 October 1979	Wits unit predicts a dry year
11	3 October 1983	Crunch close as heat grips SA
12	24 October 1984	The high cost of breathing
13	25 January 1985	SA Weathermen to join global forecast project

Table 5: Articles citing South African policymakers.

Generally, the *Rand Daily Mail* reveals a relatively small number of articles N=218, taking into account the long period of 83 years (i.e., 1902-1985) (see Figure 16). This can be explained by the fact that during the publishing years of the *Rand Daily Mail*, climate change was in the early stages of scientific investigation, with no firm conclusions or links to socio-economic life. Media coverage of climate change and related issues was also low in other countries, owing to the same reasons. Studies on the trajectory of climate change in other parts of the world reveal low figures, in the early stages, from less than 700 articles in Western Europe and North American English-language newspapers in 1988 to 7 500 by 2006 (Mercado, 2012). In the UK, media reporting quadrupled between 2003 and 2006, prompted by among other developments, former US vice-president, Al Gore's documentary titled *An Inconvenient Truth,* released in 2006, and the publishing of the Stern Review on the Economics of Climate Change, the same year (Boykoff & Roberts, 2007).

7.6 Agenda-setting in the Mail & Guardian

The articles in this publication revealed the dominance of four problem indicators that informed its agenda-setting: climate change conferences, extreme weather events, scientific reports and general discourse. Climate events are an important platform to drive agenda-setting in media reporting and consequent public understanding of global warming. Baumgartner and Jones (1993) argued that the existence of multiple arenas for policy decision-making (such as climate conferences) increase opportunities for agenda-setting and policy change. According to Pralle (2009), climate events were important in that they might lead to issues in those events being placed on the media agenda and provide climate advocates an opportunity to advance a new understanding of the issue. The events that influenced coverage in the *Mail & Guardian* include COPs and other UN gatherings such as the WSSD. Local events include conferences organised by the government, such as the EnviroCon 2009. Both national and international events accounted for N=137 or 43.91% (see Figure 36). This number was boosted by various factors, mainly South Africa's hosting of COP17 and the various COPs that have been held since 1995.

Extreme weather events such as droughts, storms, floods and heat waves are particular focal events, which are visually dramatic and obvious, thus attracting media coverage and prompting broad communication on climate change issues.

These events are often treated as symbols of climate change even though it is sometimes difficult to connect some of them to global warming with certainty. The underlying nuance in most articles was the reporting on negative impacts of climate change. Reporting on extreme weather events plays an important role in driving public understanding of climate change. Depicting such events in the media enhances the potential of EEA coverage which serves as an instrument to communicate local climate impacts to the general public. When the media reports on events, be they conferences or climate disasters, the societal feedback factor kicks in. See Chapter 4.11 for a discussion on societal feedback.

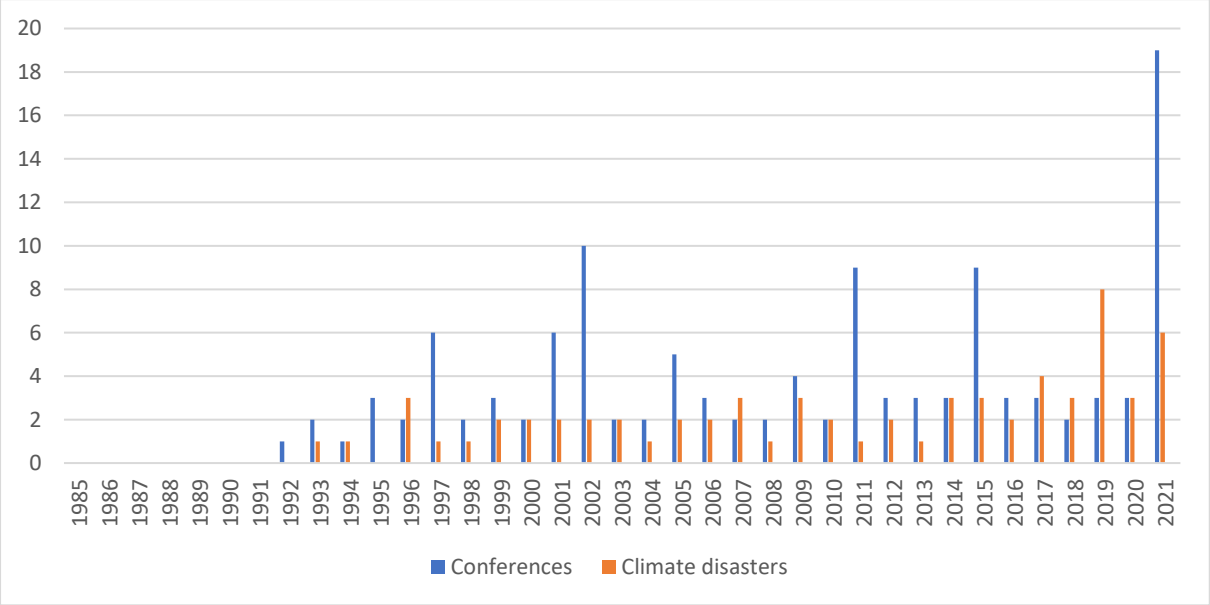


Figure 34: Data showing that in years in which major international conferences were held, there was an increase in news reports on climate change in the Mail & Guardian. Such years include 1995 (COP1), 1997 (Kyoto Protocol conference), 2002 (WSSD), 2011 (COP17), 2015 (Paris Agreement), 2021 (COP26).

Years with major international climate change conferences attracted increased media coverage. Coverage would also increase in years when climate disasters were experienced, such as in 2017 (floods in KwaZulu-Natal), 2019 (Tropical Cyclone Idai in Mozambique) and 2021 (Tropical Cyclone Eloise in Mozambique; fires in the US and Canada and floods in German and Belgium). The publication gave ample coverage to scientific reports, as well as views from NGOs and members of the public. Articles in these genres also tend to increase during conference years, suggesting the coming into play of the societal feedback factor where public discourse on climate change increases. Scientific findings also tend

to be released and reported about during, or in anticipation of climate conferences. Even though events such as conferences are crucial in boosting media coverage of the climate crisis, they are not regarded as being the most ideal drivers for media coverage of climate change. This approach has been criticised as 'default journalism' and for enabling a situation where climate change is reported from an elite policy perspective, which is largely what takes place at climate conferences. Reporting informed by conferences leaves grassroots communities out of the climate discourse or drives the feeling that response to the climate crisis is the preserve of conference goers and not society in general.

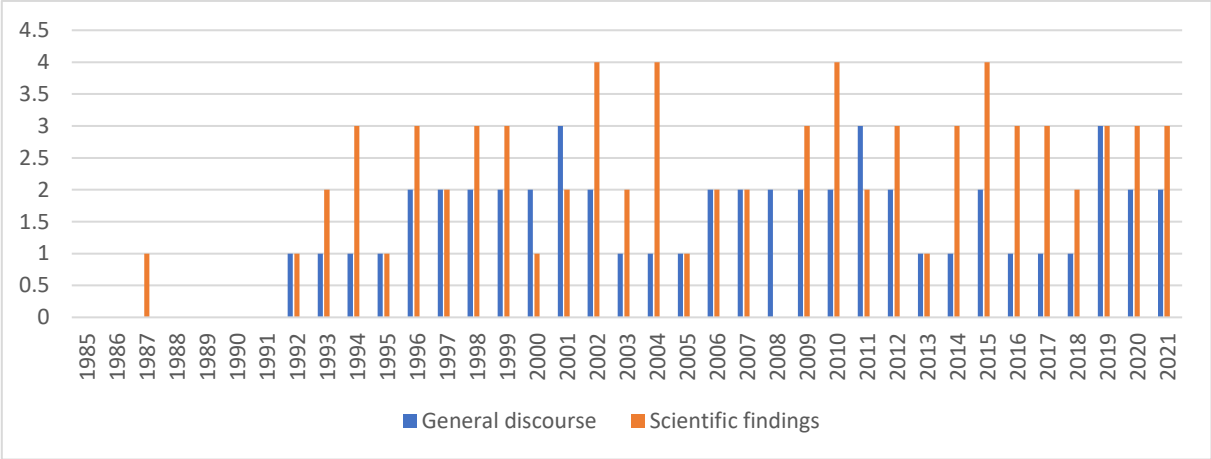


Figure 35: General discourse and reports of scientific findings as drivers of climate change reporting.

7.7 Agenda-setting in Business Day

This publication's coverage was also informed by climate events such as conferences and climate disasters, in the main. One early article on 19 April 1988, headlined *Climate change threatens coastal cities*, reported on an announcement of a conference that was to be held in Toronto, Canada, in June that year, to discuss climate change. In agenda-setting terms, it can be said that the publication used the event as a problem indicator. This approach is prevalent in most of the publication's articles. Later events, such as COP17, which was held in Durban in 2011, saw a surge in the number of articles. It is thus that Friedman (2021) criticised the South African media for its failure to report on the releasing of the Sixth Assessment Report (IPCC, 2021), saying that while the report was a primetime newsmaker across the world, it received little coverage in the South African media.

RQ3. How did the various stakeholders in South Africa frame various aspects of climate change?

7.8 Framing in the Rand Daily Mail

Investigating framing of climate change helps ascertain the essence, magnitude and prominence of that is attributed to the climate crisis. With regards to framing by the media, audiences rely on news frames to form their opinions and comprehend issues. As extensively discussed in this PhD thesis (see 4.7), during the framing process, certain aspects of a topic in the news are highlighted, offering the reader an interpretation of the problem, its causes, moral evaluation and possible solutions. The framing theory also studies how specific facets of an issue gain better consumer attention over others (Nisbet, 2009b). The frames that were identified in this PhD study were deducted from the contents of headlines and angles of news stories based on salience. The are similarities with those in Table 3.

Data obtained by this PhD study suggest that the *Rand Daily Mail* framed climate change in three keyways, as follows:

Frame	Description
Scientific	The publication interprets scientific findings.
Looming disaster	The newspaper reported on warnings that scientists were issuing regarding the future impacts of climate change. This frame would later become the catastrophe frame when the impacts of global warming are observable. It is worth noting that the catastrophe frame is not found in the *Rand Daily Mail* content, suggesting that scientists, at the time, were not attributing extreme weather events to climate change.
Work in progress	Articles report on the fact that the subject of climate change is under constant investigation and some findings cannot be confirmed.

Table 6: Breakdown of frames in the Rand Daily Mail's coverage of climate change.

Worth noting is the fact that although the above breakdown was arrived at based on the main themes of the articles, diverse frames can be found in single articles. For instance, the 17 June 1947 article citing Dr Ahlmann contains all the three frames in that it reports on scientific findings, warns of a looming disaster from climate change and urges further studies. Various factors would explain these frames. During the publication period of the *Rand Daily Mail*, climate change was largely a physical science issue, where only scientists were preoccupied with studying various phenomena that were later classified as climate change. Consequently, the media largely reported on scientific work with regards to global warming, hence the scientific frame. Through this framing, the media interprets scientific findings and exert considerable influence on scientific priorities and practices in society (Hulme, et al., 2018).

The second frame, looming disaster, is reflected in warnings that scientists were already making about the future impacts of climate change. This frame would become the catastrophe frame in later years when the predictions were confirmed by extreme climate disasters. As afore stated, this framing can be traced from articles from as far back as 1947 where Dr Ahlmann was cited as warning that the warming of the glaciers "*may eventually result in catastrophe".* Into the 1970s and 1980s, the looming disaster frame was being used with increased intensity as scientists tended to be more confident about their predictions of climate change catastrophe. An article on 26 February 1979, for instance, reported on the potential catastrophic impact of the "*continued expansion of men's activities*" on Earth with regards to the burning of fossil fuels, deforestation and changes in land use. The tone of articles reflecting the looming disaster frame is that of something that will potentially happen, hence the choice of this frame characterisation. For instance, on 24 October 1984 the paper cited University of Munster's Dr Wilfred Bach, warning that there would be "*potentially*" disastrous effects of greenhouse warming.

The third frame, work in progress, reflects caution in arriving at definite conclusions about global warming and climate change. Various scientists discuss the findings of their studies on global warming stressing the need for further investigations. The earliest manifestation of this frame comes in the form of a letter to the editor from a reader on 22 March 1933. HLM Liebbrandt wrote to the newspaper calling for an investigation into "*recent*" droughts. The frame is also used in an article on 18 January 1935 under the headline *"Is South Africa drying up? Rainfall drop in*

the last 50 years". The article suggests that further studies were needed to understand the reasons for the warming that was causing prolonged spells of drought. The article specifically calls for an investigation of the causes of the warming, hence it fits the work in progress frame.

The work in progress frame should not be confused with the uncertainty frame, which has evolved from the 1990s. The uncertainty frame refers to a scenario where there is a claim of a lack of enough scientific knowledge or disagreement over the existing knowledge at a particular in time (Friedman et al., 1999). The distinction between the work in progress and the uncertainty frames is that the former is more positive and often open to further studies, while the latter firmly disputes, or casts doubt on the science. The uncertainty frame was not found in the *Rand Daily Mail* articles because it evolved from the 1990s, long after the closure of the newspaper.

7.9 Framing in the Mail & Guardian

Data from the *Mail & Guardian* reveals the emergence and proliferation of new frames that were not found in the *Rand Daily Mail*. This is explained by the fact that the two publications operated in two distinct eras as far as climate change discourse is concerned and they dealt with different subjects, albeit on the same issue. The *Rand Daily Mail* operated in an era where climate change was largely an area of continuous exploratory scientific research, sometimes with no firm conclusions being arrived at. Furthermore, climate change had not become a political or policy issue, therefore, it was much less of a societal concern compared to the later era of the *Mail & Guardian*. When the IPCC released AR1 in 1990, the issue of climate change entered a new terrain of policy, thus also informing the framing of the subject. The new frames have included the political frame, the economy frame, the environment frame, the health frame and the sceptic frame, which could also be termed the uncertainty frame. These frames add to the usual ones, the scientific and impact or catastrophe frames. Data from the *Mail & Guardian* also show the emergence of the opportunity frame in later years (2000s), which presents economic and sustainable development opportunities brought about by new technologies aimed at mitigating and adapting to climate change. For the purposes of this exercise, the economic frame discusses the economic impacts of climate change, rather than the opportunities thereof. Economic opportunities are presented as the opportunity frame. The work in progress frame

that was prevalent in the *Rand Daily Mail* is not observable in the *Mail & Guardian*, which could reflect the fact that science had reached much certainty of the science of climate change. This does not mean that scientific research on various aspects of climate change had stopped, but that the key questions had been settled.

Some articles displayed more than one frame. For the purposes of this exercise, only what was regarded as the main frame due to its dominance throughout the story was considered in the analysis. The frames were identified using the four frame functions theory advanced by Entman (1993), which was to diagnose causes, suggest remedies, make moral judgements and define problems. Based on the analyses of the articles in the sample, the frames and their descriptions are as follows:

Frame	Description
Economy	Climate change is discussed on the basis of its impacts on the economic.
Political	Political debates on climate change. It discusses political options to address climate change. It also reflects conflicts among different stakeholders.
Opportunity	This frame refers to discussions about the inherent opportunities of addressing climate change. These include a clean environment, sustainability and new investment opportunities, among others.
Health	Climate change poses a threat to human life.
Scientific	Scientific reports are covered immensely with a message that scientists' advice and warming should be heeded.
Impact or catastrophe	The impacts of climate change are catastrophic. The frame also moans the fact that not enough is being done to mitigate the impacts of climate change.
Environment	Discusses the environmental impacts of climate.
Sceptic	Criticism of climate change sceptics.
Cost of action	Measures to address climate change are regarded as costly.

Table 7: Breakdown of frames in Mail & Guardian's coverage of climate change.

The political frame often appeared in articles citing policymakers discussing policy issues relating to climate change. One example is an article on 13 December 2011

under the headline '*Canada pulls out of Kyoto Protocol'.* The decision to pull out was criticised by an opposition New Democrat member of parliament, Megan Leslie, who called it a political move that would save the government from reporting that Canada was falling short of its targets. It appears a lot in reports on climate conferences. The economy frame refers to the bringing of the economic angle to climate change debates. An article on 16 August 2005, for example, discussed the intention of chemicals company, Omnia, to apply to become eligible for emission-reduction projects under the Kyoto Protocol. The article argues that the measure under the Kyoto Protocol makes economic sense. The environment and the impact or catastrophe frames sometimes share similarities, although they are also distinct in that the former often discusses the environmental impacts of climate, while the latter discuss broader impacts which are beyond environmental degradation and include issues such as migration and economic ruin.

The health frame has recently been discussed as the possible solution to encourage action against climate change in the face of a number of challenges ranging from scepticism, policy failures and apathy to take action. Health researchers and practitioners argue that framing climate change as a human health issue has the potential to prompt policy changes in the direction of action (Sauerborn et al., 2009; Watts et al., 2015). The hypothesis is that policymakers and all other powerful interests generally care about their health and that of their constituents (Rossa-Roccor et al., 2021), and that health tends to be an issue of concern for every human being.

The *Mail & Guardian* has taken a progressive approach to climate change as it can be seen in articles in the political and economy frames. In an editorial on 03 December 2015 the publication wrote: "*Political scandals. Investigations to uncover a wide variety of wrongdoing. Corporate malfeasance. These all demand our attention as a news publication. But they pale in comparison with an environmental catastrophe looming on a planetary scale. Which is why the Mail & Guardian chose to lead this edition with our eight-step plan to wage war on rising temperatures."* This position of the newspaper can be seen to inform its framing of climate change.

It is encouraging that the sceptic frame has only been reflected in international articles. News stories about the climate crisis in the country tend to be on the consensus side. This might also reflect the fact that, in its progressive approach,

the *Mail & Guardian* would not report on domestic sceptical views. In spite of limited scepticism in the country, as reflected in the absence of reports on their views, there has been much criticism that neither government nor business have done much to address climate change in spite of not disputing it. What has tended to happen is that government and business have spoken about the need to fight climate change, but they have not matched this with action. This approach has not been reduced into any frame in this PhD study.

7.10 Framing in the Business Day

In Business Day, the economy frame, encompassing business and finance, loomed large compared to other frames. As a business publication, it sought to angle their climate change stories on the economy, save for a few exceptions where stories did not contain any business information, or it was not dominant. The publication often brought in the economy frame or made it the stronger one in most of its reports, mainly due to the fact that its readership is from business, finance and economic spheres. As an example, an article published on 15 December 2011 under the headline "*COP17 – Binding deal in 2015*" was about an undertaking to work towards a legally-binding emissions reduction agreement by 2015, but the publication brought in the economy angle, reporting that business welcomed the measure because it gave certainty that the "*market mechanisms of the Kyoto Protocol will still apply*".

Following closely was the political frame, which reflected policy discussions. There were only three articles framed on scepticism, something that should be encouraging in that it would suggest that *Business Day*'s main sources, which are mainly the corporate sector, were largely on the consensus side of climate change, in spite of their reluctance to implement measures to reverse the crisis. The sceptic frame was represented by articles that reported on sceptics' views about ending the usage of coal in business activities, citing all sorts of economic reasons. It also features an attack on the IPCC: "*Professor Philip Lloyd of the Cape Peninsula University of Technology's Energy Institute says the IPCC should be called the 'LieIPCC' since only half of its authors are scientists and all their predictions have been proven wrong*." Overall, the following frames were used:

Frame	Description
Economy	The economy is highlighted as the key factor in efforts to address climate change. Caution against hasty action is sounded as this might harm economic growth.
Political	Discusses the political debates around climate change. Tends to warn policymakers against hasty action as this might harm the economy.
Opportunity	Reflects investment opportunities that would result from new technologies used to address climate change, such as renewable energy.
Health	Health impacts of climate change.
Scientific	Scientific reports are given adequate coverage, although always tempered with economic or business considerations.
Impact or catastrophe	The impacts of climate change on the economy and business.
Environment	Environmental degradation would be harmful to the economy and business.
Sceptic	Gives a voice to climate sceptics, criticising scientific findings and policies.
Cost of action	Measures to address climate change are regarded as costly.

Table 8: Breakdown of frames in Business Day's coverage of climate change.

The dominance of the economy frame could be said to muddy various debates on climate change, particularly the measures necessary to fight it. For instance, an article about curtailing coal emissions, published on 31 August 2015, reads: "Global stage is set for a battle over carbon reduction – for coal-reliant South Africa it means loss of jobs, foreign exchange earnings and integrated source of energy." This approach clearly suggests that South Africa would be harmed by taking action to address climate change. The approach emphasises economic losses while ignoring the harm that climate change would inflict on the country. It also ignores the harm that coal production and usage to generate energy causes on health (see Chapter 2.12.5). A sub-frame of costs of action against climate change as a justification for no action can be introduced to explain the role of politics and money in the climate change discourse. See RQ7 for a detailed discussion.

RQ4. What is the relationship between government and media frames of climate change?

Boykoff (2011) suggested that the media and government often emulate each other's frames. This was not apparent in the *Rand Daily Mail* articles. The relatively

small number of stories citing policymakers in the *Rand Daily Mail*, for reasons afore discussed, makes it difficult to explore the relationship between government and media framing of the climate crisis.

7.11 Mail & Guardian and Business Day

The *Mail & Guardian* published during a time when the government was more active in climate change discourses following the ascending of the subject into the public policy arena from 1988. The newspaper used frames such as the political, economic, environment, health, scientific, impact or catastrophic, opportunity and sceptic. Apart from the obvious political and economic frames, the government largely framed climate change along the lines of its impacts on food security and agriculture, the environment, health, human settlements, disaster management, fresh water, transport, energy, trade and finance. Therefore, although government's framing, as reflected in news media articles, has been ambiguous, articles in the two publications reflect framing that is closely related to that of the two newspapers.

However, this might not reflect agreement between the government and the media on climate change. It could be a factor of a few features: Government's positions on climate change appears to be on the consensus side, but it often raises questions and drags its feet when it comes to implementing mitigation measures, in particular. Then, the event-inspired reporting by the two publications, simply reflects the views of government that are presented in conferences, thus leading to the two newspapers adopting government framing. However, the *Mail & Guardian* tended to take a critical view of some of the government's ambiguities with regards to its positions on various aspects of the climate crisis. *Business Day* seemed to celebrate government statements about delaying action on climate change, therefore aligning itself with the state's frames. In an article on 31 August 2015, for instance, *Business Day* went to the extent of criticising government commitments to address climate change: "*To tackle its heavy greenhouse gas emissions, the South African government has made ambitious commitments to the international community and for several years has been trying to devise a carbon tax that will simultaneously damp already weak economic growth*." This article appears to spur government's inaction on climate change.

On the contrary, the *Mail & Guardian* would take a more forceful approach, castigating industry and government for their delay in responding to the climate crisis. Writing on the subject, on 18 June 2015, the *Mail & Guardian* was more forceful in praising the carbon tax measure and apportioning blame for failure to implement it: "*Bullying and lobbying by industry have delayed South Africa's carbon tax, despite it being the one policy instrument that can reduce carbon emissions straight away*." This is an indication that while the *Mail & Guardian* would be more direct in criticising government inaction, *Business Day* seemed aligned to the state's tardy approach, and sometimes taking an even more conservative approach. This relationship might be owing to the publication's support to the cautious approach also adopted by both its main audience, the business sector and some sections of the government.

On the other hand, the *Mail & Guardian* appeared ready to report on views that castigated government's cosy relationship with polluters. In an article on 24 February 2015, headlined *'Companies guilty of air pollution get a five-year reprieve'*, the publication took a critical approach to government's decision to delay action against polluting corporates: "*Bobby Peek, of non-governmental organisation groundWork – an environmental justice service and developmental organisation – said communities invest a lot of faith in government to do the right thing and here it has said 'stuff you, we are backing the corporates'*." The two divergent approaches by the two publications are prevalent in a number of articles, reflecting that the *Mail & Guardian* seemed to take a more critical approach to government, while *Business Day* would be softer, all because it aired on the side of business, which walked alongside government in inaction against climate change. Therefore, while there is a relationship of similarity in the framing of climate change between the government and the media, the emphasis on action is different as far as the *Mail & Guardian* is concerned, but similar to that of the *Business Day*.

RQ5. What is the relationship between the academic/scientific communities and media framing of climate change?

7.12 Rand Daily Mail

Based on the citing of academic and scientific communities in news articles in the three publications, it can be deducted that they have framed climate change in several ways, but mainly on its impacts, usually using the term 'catastrophe'. Of

the N=177 articles, or 82% that featured scientists in the *Rand Daily Mail,* N=112 or 63.37%, conveyed scientists' warnings that global warming and the resulting climate change would have catastrophic impacts, thus using the impacts or catastrophe frame. One of the earliest articles was published on 8 January 1935 citing South African scientists sounding an alarm about veld burning practices, over-stocking and unsympathetic grazing that were causing climatic changes in the form of "*undesirable soil and vegetational conditions*". Another story on 17 June 1947 citing the director of the Swedish Geographical Institute, Dr Hans Ahlmann, suggesting that the warming of the climate of the Polar regions might eventually result in catastrophe for all the low-lying regions of the world.

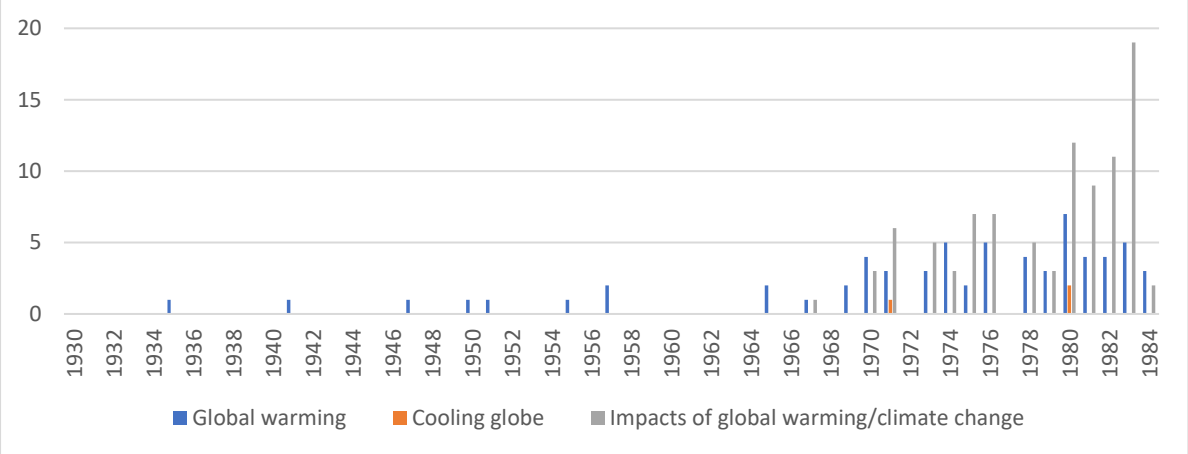


Figure 36: Temporal reporting on global warming, cooling of the globe and impacts of global warming and climate change. The counting in the graph starts in the 1930s because there were no articles found before then.

The media largely adopted the same frames as those of the scientists. Even when the media expressed its own views of climate change in editorials and opinion pieces, these tended to follow the scientists' framing of climate change. In some instances, journalists used language meant to strengthen the messages coming from scientists, thus aligning to the scientists' framing. An article on 13 February 1979, for example, was headlined *End of even-tempered weather?* The writer, Nigel Hawkes, reported about a "*major*" WMO conference in Geneva and said the scientists "*cleverly*" chose one of the "*chilliest*" years in Europe to hold a conference on the climate (RDM, 1979). The language the writer used was their own – not the scientists' – although it appeared to have been calculated to strengthen the views expressed by the climate scientists. One sentence, for instance, clearly expresses

the interpretation (framing) of the writer: "*The commuter delayed by frozen railway points or the motorist in a snowdrift may as well contemplate the Ice Age*" (RDM, 1979). Another article on 26 February 1979 sought to drive home the message from scientists that "*man's activities*" were responsible for climate change, which led to changes in the weather. It was headlined "*We're changing the weather".* This sort of headline was clearly designed to get society to assume the blame for the changing weather, by strengthening the message from scientists. This means that the media, in fact, chose frames that strengthened the scientists' framing. Therefore, it can be concluded that the media framing of climate change, as reflected in the *Rand Daily Mail* articles, was closely aligned to that of the academic and scientific communities.

The same framing could be detected from the *Mail & Guardian* articles, which also tended to frame climate change the way the academic and scientific community did. *Business Day* articles largely present consensus between the publication and scientists on the reality of climate change, except for three that publicised views from sceptics. There was not much disparity between the publication and the scientists framing of climate change, although it was clear that the newspaper was more inclined to portray the view of business of a cautious approach to action. In spite of this framing, the newspaper did not frame climate change against science, in any way.

RQ6. What is the relationship between NGOs, the corporate sector and media framing of climate change?

Articles on NGOs and the corporate sector were virtually absent in articles from the *Rand Daily Mail*. This could be explained by the fact that NGOs started their involvement in climate change matters in the 1980s (Partelow et al., 2020), even though there have been active environmental NGOs in South Africa from the 1960s. Although the country saw an upsurge in environmental NGO activities from 1965, several of them were ineffective and failed to rally support for their causes (Steyn, 2002). They were slow to react to the new demands of the global environmental movement and governmental activities that had a harmful impact on the environment (Steyn, 2002). Internationally, NGOs existed from the late nineteenth century, created by mainly middle-class lobby groups who were concerned with nature conservation, wildlife protection and the pollution that arose

from urbanisation and industrial development (Elliott, 2020). Their role in environmental discourse only increased after the UN Conference on Environment and Development, also known as the Earth Summit, in Rio de Janeiro, Brazil, in 1992 (Partelow et al., 2020). This might explain why NGOs were not featured in the *Rand Daily Mail*, which ceased publication in 1985.

The corporate sector was also absent in news stories in the *Rand Daily Mail*. Business was, for the most part, uninvolved in climate debates during this publication's era. This gradually changed once it was established that CO_2 emissions were caused by the burning of fossil fuels mainly in business activities and that there was a need to curb them, meaning that businesses would have to play a role. Internationally, business involvement on matters of climate change started in 1989 when, in the US, the National Association of Manufacturers and the petroleum and automotive industries established the Global Climate Coalition to lobby against potential government actions to address global warming (Gelbspan, 2005). However, this was after the *Rand Daily Mail* had ceased publication.

Articles from the *Mail & Guardian* and *Business Day* reveal that NGOs largely framed climate change along themes of the environment, economy, health, impact or catastrophe and opportunity. The earliest article that was found in the *Mail & Guardian* citing NGOs was published on 30 March 1998 under the title "*Africa boils in man's gases".* It framed climate change along its impacts, suggesting that it was responsible for diseases and famine affecting people in Africa. It also framed climate change as a health and famine issue. The environment frame was also apparent in another article published on 22 May 2006, titled "*Permission to over-pollute?".* It reported about a debate in Europe where policymakers were under pressure to tighten the pollution limits on European industry. Here, the three key players in the climate debate are cited as taking different approaches to the climate change debacle. The article cited NGOs wanting action against corporates to force them to reduce emissions as a means to mitigate "*catastrophic*" climate change. Corporates hold on to the economic frame, arguing that "*hasty*" action would harm the economy. Policymakers hold on to the political frame, having to balance the arguments from both sides as they are compelled to come up with policy measures.

With regards to the framing relationship between the NGOs, business and the media, the '*Permission to over-pollute?'* headline makes it clear that the publication

and NGOs stood together against the corporate sector and they were criticising policymakers: *"European officials are under mounting pressure to tighten the pollution limits on European industry in the second phase of its flagship emissions trading scheme. Such a move is essential, critics said, to restore the scheme's credibility and to make a meaningful contribution to tackling climate change. Officials involved in planning the first phase of the scheme stand accused of being grossly overgenerous in issuing polluting permits to 12 000 European power plants and industrial installations, responsible for more than half of the European Union's carbon dioxide emissions.*" The publication itself, framed climate change along themes of politics, environment, economy, health, impact or catastrophe, opportunity and scepticism, and often agreed with NGO framing. Articles referencing the corporate sector are in two main categories: i) reflecting the sector's own communication and ii) reflecting attacks on the sector by mainly climate change activists, the media or policymakers. For instance, an article dated 30 October 2003 and titled "*Greens lose patience with oil giants"* reported on protests by climate activists against oil companies, demanding that they change their business practices to cut emissions. In contrast, another article from 18 November 2004 cited Frater Asset Managing, arguing that climate change was an investor issue and that asset managers in South Africa should use their collective power to demand that businesses disclose their strategies to manage climate change risk. A further article in the same vein was published on 5 July 2012 quoting Coca-Cola executives as saying that they were producing recyclable bottles to fight climate change. Policymakers are largely cited in instances where they come up with policies to get society to fight climate change. One such article was published on 26 April 2006, citing SA Treasury officials saying that taxation policy would be introduced to support the fight against climate change. In general, the *Mail & Guardian* was largely on the side of NGOs when it came to framing climate change. It largely reported about activism against corporate entities and governments whenever protests or other action was undertaken to force them to act against climate change.

Business Day articles were stronger in reflecting the views of the corporate sector which framed climate change as a predominantly economic issue. NGOs were cited largely framing climate change as an environmental issue, and also emphasising the catastrophic nature of climate change. The publication acknowledged the activists' concern for the environment when, for instance, it

wrote in an article on 6 January 2015 that: *"At stake are billions of dollars, countless jobs and, if activists are right, the fate of the global environment itself."* But even here, the economics of climate change could not be left out. Broadly read, the articles attempted to provide a balanced view of all stakeholders, but its inclination towards the corporate sector and the framing of climate change as a largely economic issue could not be missed.

In summary, the reviewed data reveal that the *Rand Daily Mail* framed climate change the same way as the scientific community did during its publishing years. Policymakers, NGOs and the corporate sector had not joined the discourse until much later in the 1980s. The *Mail & Guardian* tended to frame climate change in the same way that as NGOs did. It took a progressive approach that was often followed by climate activists. The newspaper largely differed with government and the corporate sector, often acting as a source of pressure to force these institutions to respond to climate change. *Business Day* framed climate change in consort with the corporate sector, largely advocating caution in taking steps to address climate change, supposedly to avoid harming the economy.

It is clear from this exposition that the media seldom adopts its own framing, independent from its sources of news. In the particular case of climate change media reporting, where the media largely follows events such as conferences, climate disasters and scientific reports, the media appears to adopt the framing employed by its sources. This might not appear to be a problem, at face value, but in scenarios where the government and the corporate sector, for instance, have been hesitant in their approach to take action to address climate change, the media might find itself mimicking negative framing. The reporting in *Business Day* is a good example. This would be detrimental to efforts to address climate change given the media's ability to mobilise society. The remedy lies in the media approaching climate change as an 'issue' rather than an 'event', so that it can be able to report on it on an ongoing basis, reflecting daily experiences of communities and employing framing that is issue rather than event-based. This way, the media will report independently on powerful entities, such as businesses, and adopt its own frames based on their own interpretation of the crisis.

RQ7. What has the role of money and politics been in climate change communication in South Africa?

This research question is crucial in that it helps this PhD project establish whether climate change communication in South Africa has been influenced by factors such as money and politics. Probing any such possible influence would help in understand the role this might have played in formulating the country's response to the climate crisis. Money has been described as the oxygen that fuels the fire of global warming (McKibben, 2019). This suggests that money is invested in projects that inspire activities that result in GHG emissions which ultimately exacerbate global warming. Money has also led some climate stakeholders to resist taking action to address the climate crisis. With regards to politics, the NIMTOF factor (see Chapter 3.7.2) and other political considerations could lead to the stifling of efforts to address climate change. As argued hereunder, Minister Mantashe's approach to addressing the climate crisis is informed by political considerations. The minister's approach does not advance the cause of reversing climate change.

The role of money and politics in climate change communication in South Africa is less evident in articles in the *Rand Daily Mail,* largely because during its era, climate change was largely the domain of science and had not entered the business and political spheres. When the climate debate reached a point where governments were required to pass policies that would require businesses to cut GHG emissions, politics and money entered the discourse. The media reporting captured the debates which were characterised by: i) businesses being blamed for the emissions; ii) governments being required to adopt policies to limit emissions; iii) both governments and businesses resisting pressure from several stakeholders and society, in general, to act against climate change. An article in the *Mail & Guardian,* on 18 July 2005, under the headline *ExxonMobil takes heat on global warming* reported: "*For years, ExxonMobil has intentionally put its own profits above a clean environment and the health of America's families."* Continued investments in fossil fuels industries have also been blamed for hindering the fight against climate change. The same article blamed ExxonMobil for "*undermining efforts to combat global warming"* in its pursuance of monetary gain. Another article on 08 January 2015 took the same view that corporates were not showing any willingness to reduce emissions to address climate change, because of money: *"…Though the likes of Anglo American, Sasol, Exxaro, BHP Billiton, Shell and their*

funders, such as Nedbank, Standard Bank and Absa, have known of the likely consequences of climate change for decades, they remain long on sly rhetoric while showing few, if any, signs of changing their core business models to the degree demanded by climate science". On 28 July 2021, the *Mail & Guardian* reported that "*Coal on a drive to delay its demise",* saying the industry was on a charm offensive to defend the coal business, mentioning among other things, that the industry would rather opt for "*clean*" and "*green*" coal technologies instead of abandoning coal. It added that "*the sector remained crucial to the domestic economy"*, bringing the money factor to the debate. The stance of the coal industry, of inaction against coal, is closely aligned to the petroleum industry's own tactics to delay their action in combating climate change, in defence of their bottom line. An article in *Business Day* on 21 September 2021 reported on the petroleum industry's announcement that it would not be able to implement the technology to meet government's clean fuel emission limits, which have been scheduled to start in September 2023. South Africa lagged behind other countries when it came to clean fuels, reads the article, but the petroleum industry now blames the financial losses it has suffered, as a result of the Covid-19 pandemic, for its inability to implement the said technologies. This is in spite of the fact that the issue of clean fuels was first introduced by the government as far back as 2006, when it published new standards that prohibited the addition of lead (Pb) into all grades of petrol and the reduction of the level of sulphur in diesel (Department of Minerals and Energy, 2006). Fifteen years later, in 2021, the industry now blames the Covid-19 pandemic for its intention not to implement the regulations. The industry seems to be on to something of a blackmail, when it informed government that should it be forced to go ahead with the required changes, the cost should either be passed on to the consumer, or the state should reimburse the petroleum companies. They also threatened job losses, a similar threat being made by the coal industry. In all this, money is clearly a factor on how climate change is communicated by business. The key assertion of the communication is that of cautioning, sometimes threatening that any attempt or action to practically address climate change would have dire financial consequences that would lead to economic decline, job losses, and social upheavals.

Articles in the *Mail & Guardian* reveal various instances in which money, represented by business, played a role in climate change communication in South Africa. An article on 17 January 2005 titled *Putting a price on fresh air* could not

have presented the issue more starkly: *"… Because minerals-energy-complex corporations and the World Bank have set the agenda, South Africa will probably become a leading guinea pig for the privatisation of the air*". Reflecting a debate in defence of money in the climate discourse, *Business Day* reported on 24 November 2011 that if a carbon tax was to be imposed for South Africa to reach CO_2 emission targets, coupled with steep electricity prices, this would be "*the last straw*" for many businesses. The usual arguments of economic downturn and job losses were mentioned, citing SA's Energy Intensive User Group chairman, Mike Rossouw, and the then Chamber of Mines, now Mining Council of South Africa. The article adds: "*But it's important to keep in mind that SA's reduction targets are conditional on international finance and technology transfer … This is a massive caveat*," Global Carbon Exchange CEO Kevin James is quoted as saying. These reports clearly demonstrate that business, or money, informs climate change communication by some stakeholders, such as the corporate sector and government.

Politics enter the field of climate change since any actions against the phenomenon require policy and legislation, which is the domain of politics. Carter (2015) identifies three main strategies developed by mainstream political parties to respond to the emergence of any new issue of social interest, such as climate change: i) to outrightly reject the issue (adversarial strategy); ii) to ignore it (dismissive strategy); iii) to accept it and integrate it into their discourses and policy programmes (accommodative strategy). The collusion between politics and money/business in climate change inaction is exposed in an article on 24 February 2015 in the *Mail & Guardian* which reported that the environmental department had given most of South Africa's polluters a reprieve of up to five years to comply with air quality legislation. The article added that the government had given up to 1 000 polluting companies until 1 April 2015 to bring their facilities into compliance with legislation imposing CO_2 limits for financial reasons. This action was criticised by climate activists as a "*licence to pollute*" and "*making toxic air legal*". In *Business Day*, the corporate sector's voice is all about protecting their business interests by delaying action against climate change. Of course, this is not overtly done. Protecting the economy, jobs, etc. are the defences used by business when called upon to implement measures to address climate change. Of the N=123 articles referencing business, N=77 (62.60%) contained this message. Politics, as in the government's approach to climate change also lands in this narrative, although

there could be divisions among various politicians. Government policy, as often expressed by President Ramaphosa and Minister Creecy, tends to emphasise the need for the country to move away from coal powered energy, for instance, while Minister Mantashe favours the continuation of coal as a source of energy. Mantashe has courted controversy by insisting that new coal power stations should continue to be built, while Eskom CEO, André de Ruyter, and other government officials were talking about plans to stop building new coal stations and not renovate any that reach the end of their circles.

On the other hand, government has always conditioned its actions against climate change on funding from developed countries, meaning that if such money was not forthcoming, coal pollution, for instance, would continue unabated. Then President Jacob Zuma made this clear when opening COP17, as cited by a *Business Day* article on 28 November 2011: "*He said the states parties had a responsibility to re-affirm the multilateral rules-based system anchored by the Kyoto Protocol and to provide the funding needed to address impacts of climate change through activating the Green Climate Fund.*" The same sentiment has been expressed by Minister Creecy who penned an opinion piece for *Business Day* on 15 August 2021 headlined: "*Africa committed to a low-carbon future, but help is needed.*" Creecy affirmed that "*to avoid the stark future foreshadowed by the IPCC report, COP26 needs to prioritise securing finance, technology and capacity building support from developed to developing countries*".

The government has since won the argument that western powers should provide funding for the just transition, following the pledging of approximately R131 billion for the just transition from coal to a carbon neutral economy (see Wadula, 2021). However, the insistence on western funding before any action could be taken against climate change may have cost the country a lot in terms of efforts to address the climate crisis. While it would not make any sense to invalidate the arguments from business and government, with regards to protecting the economy and jobs, for instance, it is clear that both have made money a condition for action against climate change. In protecting coal and claiming to protect economic growth and jobs, the protagonists of this view are oblivious of the opportunities presented by new climate change technologies, which some analysts believe would offset any losses from the closing down of the coal business. For instance, the price of solar and wind power has dropped by between 90% and 70%, respectively, in the

past years (McKibben, 2019). Furthermore, a 2020 analysis revealed that the cost of renewable energy is becoming smaller than that of coal (Steyn, 2018). The lifetime costs (when including subsidies) of power are $31 per megawatt-hour for utility solar and $26 per megawatt-hour for wind, while the cost of increasing capacity was $41 for coal and $28 for natural gas (Chroback, 2021). On the other hand, a report by the International Renewable Energy Agency (IRENA, 2021) shows that 162 gigawatts (GW) or 62% of total renewable power generation, added in 2020, had lower costs than the cheapest new fossil fuels option. With regards to jobs, the World Resources Institute has found that climate-friendly investments were better job creators (Jeager et at., 2021).

It can be understandable that those who have invested in fossil fuels industries, such as coal, would want to defend their investments, therefore, they would drag their feet when it comes to implementing climate change measures that would require them to abandon their investments. Politics' defence of coal might have more to do with pandering to South Africa's powerful trade unions. President Ramaphosa could not have been clearer when discussing Minister Mantashe's resistance to coal transition: "*Mantashe* is a *coal miner*. His *love* for coal is *deep*. His *love* for *coal miners* is even *deeper*. *When you listen to him, have* that *at the back of your mind*" (Phakathi, 2021). Mantashe is a former coal mineworker and cut his trade union teeth in this industry. He started working at the Matla Colliery in 1982, where he co-founded and became the Witbank branch chairperson of the National Union of Mineworkers (NUM) (People's Assembly, 2022). He went on to become NUM secretary-general before entering active politics. Mantashe's defence of coal might be from this historical context but also a political move to appease the trade unions for political reasons. The unions, themselves, have come out against the transitional from coal, insisting on guarantees that there will be no job losses. Congress of South Africa Trade Unions (Cosatu) spokesperson, Sizwe Pamla, said the following when discussing the issue of transition from coal: "*We simply cannot afford to lose a single job when unemployment has pushed past 44%, nor can we allow communities to become lifeless ghost towns*" (Cronje, 2021).

While the stance that no move on measures to address climate change would be made until funding from western governments is sound and has won the day, it is conceivable that it has retarded a lot of possible actions that could have been taken

for the country to mitigate and adapt to climate change. For instance, the devastation caused by the flooding in KwaZulu Natal, in April 2022, could have been minimised had appropriate adaptation measures been applied. These might not have required massive funding, but they might not have been undertaken as the country was not moving on any measures until western funding was secured. Engelbrecht et al. (2022) blamed the devastation caused by the floods on a lack of adaptation measures, commenting that "*part of the response (to the effects of climate change) is to reduce systemic vulnerabilities through climate change adaptation. High-risk land exposed to natural hazards must be identified and indicated on land-use schemes. Zones designated unsuitable for development must be adhered to and enforced. Local governments should guide development, even if informal, onto safe and well-located land. High-risk communities must be consulted and educated about the risks and alternative housing sites provided for relocation*".

The above data point to a clear role of politics and money with regards to the way in which climate change is communicated in South Africa. It also reveals that the country has not made any serious moves to address the climate crisis as it premised its approach on money being made available by western governments. There is a need for a change in policy direction to ensure that resources can be mobilised within the country, especially now that there is strong evidence that addressing climate has potential economic and sustainable development spin offs.

This PhD thesis regards government's and the business sector's reluctance to address climate change as an undertone to protect political and business interests, and constitutes obstructionism. The cost of action is used as a justification yet the real reason is the protection of profits and the safeguarding of political interests. For instance, the petroleum industry was expected to implement measures to add lead into all grades of petrol and the reduction of the level of sulphur in diesel in 2006, as a step to mitigate climate change. They failed to act on the government's instruction and in 2021, they opportunistically pointed to the losses they suffered as a result of Covid-19 as the reason why they would not be able to implement the measures.

Government has held onto the position that it needed money from western countries to finance the transition from coal. As discussed earlier in this thesis, $8,5 billion was committed by various western governments at COP26 in November

2021, but by the beginning of 2023, there was no news on the implementation of the just transition. This is as a result of politics coming in the way of addressing climate change, where every argument has been used to delay action. The actions of government and business, in this regard, can also be explained as part of climate obstructionism (see Depledge, 2008).

RQ8. Which institutions have had the strongest impact in their communication of climate change in the country?

The data analysed from the three publications, *Rand Daily Mail, Mail & Guardian* and *Business Day* reveal a mixed picture concerning the country's key climate change stakeholders and the strength of their impact through communication. This research question would probably be best answered by polling readers of the three publications, something that was not part of this PhD study. However, data already presented in the above sections of this PhD study provide some idea of the amount of communication each sector produced, from the point of view of mentions in news articles. To recap, the stakeholders whose communication was analysed based on coverage in the three publications are the media, government institutions categorised as policymakers, academics and scientists, activists from NGOs and the business sector. The analysis below discusses how the stakeholders fared in the three publications.

7.13 Rand Daily Mail

As already discussed, scientists dominated coverage in articles in the *Rand Daily Mail* due to the fact that during its publishing time, climate change was largely a subject of ongoing scientific research, and the media merely reported on scientific findings released by scientists. The issue had also not reached the policy and economic spheres, thus stakeholders such as policymakers, NGOs and businesses, for instance, did not engage in any communication, therefore were not featured in any of the publication's article. In this regard, scientists were cited in 82% or N=177 of the articles conducting research on climatic changes. Policymakers were cited in 11% and the media's own writings, without citing any sources, were cited in 7% of the articles (see Figure 15).

7.14 Business Day and Mail & Guardian

In *Business Day*, the corporate sector scored a higher mention in the articles (see Figure 31). Qualitatively, however, the corporate sector did not seem to advance any communication that could be regarded as fostering understanding and action to address the climate crisis. Most of the articles citing South African businesses, in particular, were largely discouraging action to address climate change, citing concerns such economic slump and job losses. The business sector was also reported in negative circumstances when it came under attack for GHG emissions. The communication of South African policymakers is sometimes ambiguous and contradictory or lacking a coherent approach. Government has not really had any communication campaign with coherent messages about climate change in the same way it has had on HIV and AIDS or the Covid-19 pandemic, for example. In the absence of such a campaign, it is not possible to determine the impact of government's climate change communication. Research findings suggesting a massive climate change illiteracy in the country by Chingwete et al., (2018) and Roberts and Struwig (2021) attest to an absence of government communication on the climate crisis.

The presented data show the extent of citing of climate change stakeholders, which might reveal the impact of the communication of these entities raising awareness about the climate crisis. Media coverage of climate change has been recognised as the one vehicle for driving public understanding of climate change because of its ability to reach many people. Start and Hovland (2004) suggested that media and communication campaigns were a strategy often used by organisations to promote socially desirable results. Amiraslani (2020, p. 229) put it succinctly, writing: "Media are vital and influential conduits for transferring updated knowledge and news to the public." On the other hand, the theory of media salience suggests that media attention to an issue is measured by total mentions the issue receives in the media (e.g., Anantram, 2020). In this regard, although this PhD study did not focus on the impact of the news articles on readers of the three publications, the mentions of different stakeholders that have been presented in the data (see Figures 16, 22 and 33), can be taken to suggest that the amount of coverage the stakeholders received correspond with the impact their communication has made to the publications' readers and, by extension, society.

Of critical importance is that do not score high in any of the three publications, although coming second in both the *Mail & Guardian* and *Business Day*. This is of major concern and may suggest that the government has not taken climate change seriously over the years. As earlier pointed out, in spite of having hosted two major climate conferences, WSSD and COP17, the government did not appear to champion any particular climate change measures in those events. Communication on the event was more about hosting rather than climate change messages. A further omission with government communication can be detected in instances when it sends NDCs to the UNFCCC. The NDCs are poorly communicated in the country and make commitments which are not backed by any concrete plan of action or timetable for achieving the promised targets. South Africa's commitment to be carbon neutral by 2050, for example, is questionable because there are no concrete steps that have been communicated to ensure the attainment of the stated timeframe. The absence of such steps or lack of their communication thereof, are simply symptomatic of poor communication and not conducive to efforts to involve society in addressing climate change. If addressing climate change and achieving carbon neutrality will require societal involvement, government failure to communicate the steps it plans to take in this regard, will make such effort all the more difficult. The government needs to address the issue of climate change communication with more seriousness as the country embarks on a just transition (see Wedela, 2021). The fact that there is no terminology in indigenous languages for 'climate change' (see BBC, 2010) suggests that non-speakers of English and Afrikaans are not addressed on the subject in ways they can understand the crisis. This is a major communication failure.

In conclusion, the climate change communication impact by all the stakeholders, who have been analysed in this PhD study, reveals that: i) government (policymakers) communication is lacking. No article was found revealing any government climate change communication strategy or campaign; ii) scientists have largely been featured releasing important findings of their studies, but they are lacking with regards to concerted efforts to communicate their findings, other than relying on the 'goodwill' of the media; iii) NGOs have skilfully communicated climate change through public relations campaigns such as penning opinion pieces in the media, press briefings and other publicity events; iv) the corporate sector almost presented no effort at communicating on climate change, other than defending itself when being attacked for GHG emissions or reluctance to reduce

polluting activities; v) although only catching up with the climate change story in the mid-1990s, the media appears to be making considerable efforts to communicate climate change.

RQ9. Compared with other countries, what is the status of climate change communication scholarship in South Africa?

The issue of climate change communication scholarship has been discussed by various researchers who, by and large, have agreed that South Africa and Africa, as a whole, trailed western countries (e.g., Cramer, 2008; Shanahan, 2009; Tagbo, 2010; Bosch, 2012; Smith, 2013; Suliman, 2018). This was also apparent in a comprehensive meta-analysis study conducted by Mike S. Schäfer and Inga Schlichting in 2014, entitled *Media Representations of Climate Change: A Meta-Analysis of the Research Field (*Schäfer & Schlichting, 2014). The meta-analysis examined 133 studies on media coverage of climate change from 1957 to 2010. The analysis concluded that climate change communication scholarship concentrated on western countries, a view that was backed by African scholars, Oyedele (2015) and Mahl et al. (2020), among others.

Another meta-analysis by Barkemeyer et. al. (2017) reveals a similar picture which puts South Africa at number 33, behind several countries. South Africa was the only African country to be included in this particular study because of its position as the leader in emissions on the continent, accounting for 1.27% of total world emissions and ranked twelfth highest emitter in the world (Ritchie & Roser, 2017; Sguazzin, 2021). With regards to media coverage, a sub-field of climate change communication scholarship, Barkemeyer et. al. (2017) investigated media coverage of climate change by *Business Day, Cape Argus, Cape Times, Daily News, Financial Mail* and *Pretoria news* newspapers, and found an average of 0.58 articles per newspaper issue. Australia, for instance, registered 3.9 (Barkemeyer et al., 2017), thus demonstrating a major gap between the two countries and suggesting that South Africa is far behind. Painter (2017) and Painter & Schäfer (2018) also studied media coverage in different countries and reached conclusions that are not very different from other researchers.

Based on the above referenced studies and the data obtained for this PhD study, certain conclusions can be drawn, starting with the fact that the three publications whose articles were analysed, obtained most of their articles from foreign

publications. The *Rand Daily Mail* obtained N=157 (72%) from foreign news sources, the *Mail & Guardian* N=178 (57%) and *Business Day* had N=161 (54%).

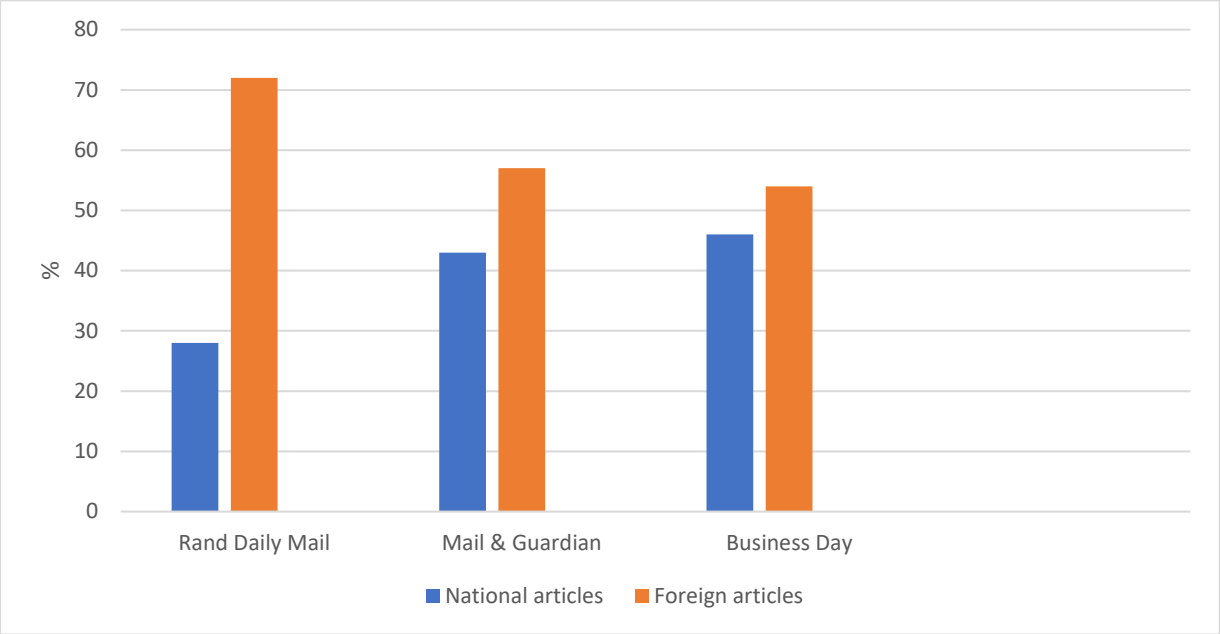


Figure 37: Breakdown of articles sourced nationally and internationally in the three publications.

This breakdown, in itself, suggests that South Africa's media coverage has been poorer and dependent on foreign publications. Climate change media coverage and climate change communication scholarship in comparable developing countries such as Argentina, India and Chile were fairly similar to that of South Africa. One striking similarity with Chile is the framing of climate change as an economic issue by the media and policymakers (see Hasbún-Mancilla et al., 2017). This framing was also found in Business Day, for instance, where the publication and the government have reduced the question of addressing climate change to an economic issue. Media in Argentina, Chile, Brazil and India, for instance, also tended to frame climate change as an international issue and suggest that steps to address it should be taken by western countries (e.g., Dotson et al., 2012; Mercado, 2012; Thaker, 2017). South Africa's media, on the contrary, did not quite follow this trend in spite of sourcing the bulk of its articles from foreign media. Articles originated from the publications were firm on the fact that the issue was a national issue and that steps to address it needed to be taken locally, albeit with western finding.

The picture of poor media coverage and scholarship is similar across most African countries, as already discussed in this PhD thesis. Tanzanian newspapers, for example, covered climate change focussing on impacts, adaptation, climate change conferences and policy, politics and development (Elia, 2018). In that country, 77% of climate change news articles were sourced from foreign news agencies (Elia, 2019). A comparison with several countries might be more complex in the absence of a specific study to that effect. However, the issue of most articles being sourced from foreign news agencies is prevalent in South Africa, Tanzania and Nigeria, where the percentage of articles sources from outside media stands at 64.3% (Batta et al., 2013). There are also similarities with regards to framing, where climate change is framed on climate disasters, politics, the environment, health and economics, in the main.

CHAPTER VIII: DISCUSSION

8.1 How South Africa has communicated climate change

When the releasing of the IPCC AR6 on 9 August 2021 was poorly covered by the local media and did not attract much public attention, academic and political commentator, Friedman (2021), argued that this was the case because the mainstream in South Africa believed that the country had experienced no climate disasters, therefore it did not care much about climate change. People who dominate mainstream debates are only interested in threats when they actually cause damage, not when they are predicted by scientists and academics (Friedman, 2021). These observations are backed by the fact that even though local and international scientists have been producing research and communicating their findings throughout the twentieth century, climate change communication from other key stakeholders is lacking. The country only became part of the mainstream climate change communication in the late 1990s, judging from the data obtained from the three publications that were part of this PhD study.

In this regard, this PhD study has made five key findings about how climate change has been communicated in South Africa over the past 120 years: i) media coverage of climate change has historically relied on reports from foreign news networks; ii) media coverage of climate change is largely informed by events such as conferences, climate disasters, the releasing of scientific findings and the feedback factor; iii) as a result of relying on conferences for its agenda-setting, media reporting tended to deal with climate change at the top level of intellectual and policy debates, with little about the daily experiences of communities; iv) government communication of climate change has been deficient, which justifies the low levels of public understanding of the climate crisis; and v) climate change communication from the government has been dominated by demands for money from western governments to address climate change. This may have been understood to mean that not even projects that might not have required foreign funding could not have been undertaken. In turn, the government communication, in this regard, may have retarded the implementation of measures to address the crisis which might not have necessarily required foreign funding.

As it was discussed in literature reviewed in this PhD thesis, climate change is best understood by communities if it is discussed from local perspectives, hence the

place-base communication theory (Schweizer et al., 2013; Gislason et al., 2021) and the need for the media to source their stories locally instead of relying on international media networks. Reporting on climate change based on events tends to focus attention at top level policy discussions, thus creating an impression among local communities that the issue does not involve them and there is nothing they can do to respond to it. This assertion is backed by literature reviewed in this PhD thesis, which revealed that in some countries, climate change is regarded as an international issue because members of society mostly see news stories about the issue during international climate conferences (e.g., Mercado, 2012; Nassanga, 2013). On the other hand, Johannessen (2013) remarked that the coverage of COP17, in Durban, concentrated on issues that had no immediate meaning to local communities, indicating that the conference delegates discussed top level international policy issues, which were not the immediate concern of local communities. This PhD study, for instance, found that *Business Day* placed some of its climate change stories in its *World* section. For an ordinary reader, seeing climate change stories in the *World* section can only mean that the issue has no domestic relevance. Readers with no interest in international affairs might not reach the climate change stories in the *World* pages. This does not encourage awareness and action by local communities.

Government's reticent climate change communication dates back to the apartheid era where the government barely featured in articles about climate change or related issues until about the early 1990s. In the 218 articles in the *Rand Daily Mail* from 1902 to 1985, South African policymakers only polled seven articles. The post-apartheid government started to appear in the media in any meaningful way in the mid-1990s when then president, Mandela led the South African delegation to COP1 in Berlin. But even here, government communication appeared passive. The only mention of the government in the *Mail & Guardian* articles, for example, was a complaint to then President Mandela by delegates from African countries that the South African delegation was siding with western governments, ignoring their African colleagues. No article or mention was found discussing the government's approach to climate change at this conference, let alone its communication thereof.

As the post-apartheid South Africa slowly caught up with the climate change issue, COP3 was held in Kyoto, Japan, in 1997, where the Kyoto Protocol was adopted.

The South African government was represented by a low-level official, the deputy-minister of environmental affairs and tourism, Peter Mokaba, while other delegations were led by heads of state. Even worse, South Africa did not appear to play any particular role in Kyoto as articles that reported on the event reveal no major contribution having been made by the country's delegation. This means that not much climate change communication was orchestrated by the government about that event. The same happened when South Africa hosted the WSSD in 2002 and COP17 in 2011. The articles reporting on the events only mentioned the role South Africa played in hosting the conference and mediating in discussions. There appears to be no South African position being communicated apart from the usual demand for western countries to pay for action against climate change in the developing world. For example, a news report on the opening of the event was headlined "*Jacob Zuma opens Durban climate negotiations with plea to delegates"* (Associated Press, 2011) merely reported on a plea made by the former president for delegates at the event to reach agreement on a number of issues. The blurb in the story follows with: "*South African leader urges diplomats at the international climate talks to look beyond national interests for solutions*." Clearly, this communication was not directed at the South African public, but to the conference delegates and reflects no policy position being advanced on behalf of South Africa.

The scientific community has led in climate change communication from the early days in the mid-twentieth century as revealed in analysed articles from the *Rand Daily Mail*. It was the communication from the academic and scientific communities that led to the recognition of climate change as a policy issue. The issue of scientists communicating climate change has been extensively discussed in previous chapters, where their role in this regard is criticised and sometimes said to be inappropriate, particularly when it becomes activism. However, through the media, physical scientists have been telling the story of climate change to a point where other stakeholders such as policymakers, NGOs, the business sector and the media itself, have been educated enough to extend the communication to the public. What appeared to be lacking in the analysed data was the involvement of scientists in communicating the crisis, particularly in South Africa. The poor involvement of scientists in climate change communication could be explained by the fact that communicating climate change has its own intricacies that might not be easily dealt with by climate scientists who are not experts in the field of communication. Communicating climate change should align with people's life

contexts (Burton et al., 2010), something that is not the purview of climate scientists, but communication scientists.

NGOs appeared to have communicated climate change in a more concerted effort compared to other stakeholders. They tended to use the media more effectively. Unlike the government, for instance, which was found to be ambiguous on various climate change issues, NGOs have been clear and forceful in expressing their positions. This is helpful in any communication campaign as it directs recipients of the communication to the exact understanding that the communicator seeks to convey. Real success in addressing the climate crisis will come from involving all the affected communities. This can only be made possible through adequate communication. The corporate sector was reported from three points of view: being blamed for CO_2, defending itself from attacks or advancing the position that there should be caution in adopting measures to address climate change. However, later stories would cite two of South Africa's largest emitters, Eskom and Sasol, advancing progressive views that they are ready to implement measures to reduce emissions. Businesses are the major polluters and should thus carry a massive responsibility to address climate change and communicate on the crisis.

8.2 Political and socio-economic undertones in climate change communication

South Africa's efforts to address climate change have been tied to funding being made available by western countries. This assertion can be deducted from, among others, the country's 2021 NDCs document, which states: "*South Africa's NDC is premised on continued effective multilateral cooperation in the context of the UNFCCC and its Paris Agreement, and the provision of support, both for implementation by developing countries, and for the UNFCCC Secretariat and constituted bodies under the UNFCCC and its Paris Agreement, by developed countries and others in a position to do so*" (UNFCCC, 2021, p. 28). This attitude has pretty much summed up South Africa's approach to addressing climate change over the years and has been evident in most government communication on the issue. This position seems to have won after South Africa received a funding pledge of $8,5 billion from the EU, USA, France Germany and the UK to help finance a just transition from coal to cleaner forms of energy (Paton, 2021). Since this pledge, the government climate change communication has shifted to discussing the implementation of the just transition. At the time of writing this thesis,

the details of the implementation of the just transition had not been revealed, more than a year after the pledge was made.

It would be pointless, now, to discuss whether the strategy of making funding from foreign countries a condition for addressing climate change since that position has now been accepted as demonstrated by the commitment to fund the just transition in South Africa. The debate now shifts to whether the just transition will proceed smoothly, and what political and socio-economic undertones will be at play. To reiterate, just transition refers to the management of a transition to a low-carbon society in a balanced and just manner, based on a given socio-economic context (Presidential Climate Commission, 2022). In this regard, the biggest challenge will be to involve communities, who will be affected by the transition, in the implementation of any measures therein. The World Resources Institute (WRI) found that although South Africa had a strong foundation for a just transition, the dialogue about the subject had mostly remained at the national level (WRI, 2021). WRI (2021) argued that this might create downstream challenges in the implementation of the just transition because concerns at the national level might differ from those at the local level.

The Presidential Climate Change Commission's Framework for a just transition in South Africa document (Presidential Climate Commission, 2022) outlines six considerations, which it says should inform the just transition: i) policy formulation to support a just transition: a just transition presents an opportunity for social redress in South Africa, particularly for vulnerable populations; ii) the coal value chain: South Africa has exceptionally high levels of GHG emissions from coal because it relies heavily on coal for energy; iii) employment and sustainability of livelihoods. Recognising that South Africa has high levels of unemployment, poverty, and inequality, the report says the transition will affect jobs, although it is expected to result in an overall net gain in jobs, since renewable energy, which will replace coal, will be a considerable job creator; iv) financing a just transition: although some funding has already been committed, South Africa requires some R300 billion over the next three decades to finance the transition; v) water security: South Africa is already a water-insecure country and will be challenged with further water insecurity as the climate changes, making water security essential to building climate resilience and supporting a just transition; and vi) governance: achieving a

just transition will require a novel and coherent governance model, where intergovernmental cooperation, including on planning and implementation, will be a key component of effective governance for a just transition.

Missing from the above six considerations is how the just transition will be communicated to affected communities. As WRI (2021) argued, dialogue about the just transition has mostly remained at the national level. To start with, the levels of public understanding of climate change in the country are very low, where more than half of the population has not heard of the 'climate change' concept (see Chingwete et al., 2018; Roberts & Struwig, 2021). Undoubtedly, this fact points to a serious lack of climate change communication and education in the country. Under these circumstances, a transition that will overhaul the lives of hundreds of thousands of people will need to be accompanied, if not preceded, by a massive communication and education drive. It will be a big ask to expect communities to support and take part in a just transition they barely understand its genesis. Climate change communication scholars have theorised that public support for action against climate change is encouraged by public understanding of the subject (Moser, 2010; Nerlich et al., 2010; Moser, 2016; Depoux et al., 2017). Climate change communication scholarship also has it that communication on the subject may galvanise action by making climate change more personally relevant to people (Halperin & Walton, 2018). In this regard, the communication of the just transition to the affected communities will have to be made more relevant to them by making them aware of the dangers they face from coal and the benefits they could accrue by transitioning to a low-carbon economy.

The purpose of this PhD was to investigate how climate change has been communicated in South Africa over the years, taking a particular look at whether politics and money have played any role. Having analysed data from the three publications, this research question can categorically be answered in the affirmative. The analysed data shows that key stakeholders such as the government, who are responsible for policy, and the corporate sector, who are the main sources of CO_2 emissions, have largely communicated messages that are linked to money and politics. The communication reveals little in the way of a sincere commitment to reverse the crisis. Although the argument that government would not afford the just transition, therefore it needed foreign funding, for the purposes of this PhD thesis, the answer is in the affirmative that South Africa's

climate change communication has been nuanced by politics and money. As earlier stated, this approach may have created an understanding within the South African public that the country would not do anything to address climate change until money was made available by western governments. Here's an example: on 24 November 2011, Global Carbon Exchange CEO Kevin James was quoted in the *Business Day* as saying: "*But it's important to keep in mind that SA's reduction targets are conditional on international finance and technology transfer… This is a massive caveat*,". Attitudes such as this may have stifled responses to the climate crisis, some of which might not have required foreign funding.

The thesis findings coincide with the conclusions of various studies that were highlighted in the literature review. Evans (2019) argued that the media tended to follow government narratives on climate change, even when and where they lacked scientific logic. This could be found in *Business Day*'s reporting on climate change where the publication tended to agree with government's claims that hasty steps to address climate change would be detrimental to the country's economy. The data obtained from the three sample publications confirms findings by Moser (2016) that climate change discourse and media coverage tend to increase during the holding of international climate conferences. Findings by Nagel (2021, p. 17) arguing for an "opportunity-oriented communication" to replace the commonly used "fear appeal", was confirmed in this PhD thesis where several articles in pro-inaction *Business Day* tended to warm up to news about business opportunities that would emanate from action to address climate change.

With regards to the framing of various aspects of climate change, this PhD project found that key stakeholders in the country tended to frame climate change more or less the same way that several other countries did. There was a slight divergence that tended to be specific to South Africa, Africa and most of the Global South, but mostly emphasised by South Africa. That is the issue of the cost of addressing climate change. While several countries have raised this issue, it appears to be the central position of the South African government on its approach to addressing climate change. This PhD thesis finds that while this has been a valid argument, it may have stifled other efforts to address climate change, as it was made a *sine qua non* to dealing with climate change. Needless to restate, more than a year since the funds were committed for the just transition, no implementation had started. In other words, the demand for money to deal with

climate change might have been mere obstructionism (see Depledge, 2008) and it's an obstacle to effective communication of climate change as discussed by Moser (2016) in section 3.6.

8.3 Communication obstacles

The sample does not reveal any obstacles stakeholders that may have face by the five stakeholders in communicating the climate crisis. Since the study did not involve interviewing any players, the issue of obstacles can only be deducted from the content of the various messages from the stakeholders whose communication was been reviewed. As earlier discussed, (see Chapter 3.10 and RQ7), the government has not undertaken any campaign to communicate climate change in the same way that it has done with HIV and Covid-19. It also appears the government does not have any coherent policy on climate change, in spite of various documents purporting the existence of one. The contradictions in messages between the president and the minister of environmental affairs, on the one hand, and the minister of energy on the other, are symptomatic of poor communication. This is the only probable obstacle to effective government communication on the climate crisis.

The business sector did not appear to be interested in any communication other than defending itself when coming other attack for is sluggishness in cutting GHG in their business activities. Therefore, there appears to be no obstacle to effective climate change communication as far as this sector is concerned, apart from their unwillingness to address the climate crisis in defence of their profits.

With regards to the scientific community, NGOs and the media, the data does not appear to reveal any obstacles. In the literature review in (Chapter 3.7.1) a discussion was held on obstacles, broadly, without reference to this PhD study. Other obstacles to effective media reporting were discussed by various authors that were cited in the literature review, such as Nassanga (2013) and Elia (2019). However, this PhD project could not establish if the obstacles therein mentioned are prevalent in the South African media or the sampled publications.

8.4 Inaction in addressing climate change

If data in the three publications is anything to go by, climate change communication in the country has been reticent over the period covered by this PhD study (1902-

2021). As has been shown in articles dating as far back as 1933, the issue of a changing climate in the country has constantly been raised by scientists and members of the public, largely because of frequent droughts. However, messages from the government, in particular, appeared not to offer any indication that the issue was being taken seriously. South African scientists, for instance, would from time to time, at least from the 1970s, release findings of studies related to the climate issue. Regrettably, no articles could be found, in the same period, reporting about the government taking the issue seriously by adopting and communicating mitigation measures. In fact, one article appeared to resist action against pollution, saying it would be harmful to the economy. Unfortunately, government apathy appears to be continuing into the post-apartheid era, beyond 1994. The argument of steps to reverse climate change going to be harmful to the economy continue to this day.

In later years, South Africa hosted the 2002 WSSD in Johannesburg, and COP17 in Durban, 2011, but apart from being the host and attempting to mediate between the various positions held by the different international delegations, South Africa appeared to have tabled no own position in any forceful way. Even worse, the articles reviewed do not reveal any communication coming from government or messages directed to the general South African public. The articles reveal that communication from the government about the event was merely about its role as a host. Comparing with the country hosting the 2010 FIFA World Cup, where the government and the country's soccer authorities sought to galvanise entire sectors of the South African society behind the event, the same was not evident when the country hosted the two climate events.

The reviewed data also reveals a trend where the media reports on climate change based on events such as conferences and climate disasters. This type of coverage, based on what has been termed 'problem indicators', can be problematic in that it suggests that unless there is a climate conference or a disaster somewhere, the climate change story does not get reported in the media. Granted that the three publications also reported extensively on scientific findings, this also means the media waits for such findings to put climate news on its pages. The climate change story is lived daily by communities in several parts of the country. Pollution from coal happens every day in the Mpumalanga Highveld, emitting CO_2 into the atmosphere and causing deaths among the local population (see Chapter 2.12.5)

let alone polluting the atmosphere and causing global warming. The media cannot be said to be doing a good job of reporting on climate change by prioritising after effect events of climate change. When a disaster such as a cyclone or flooding has taken place, reporting about what caused it is rather late for the victims and society, in general. The media could be more useful if it kept on reporting on factors that could cause climate disasters in order to prepare communities for future disasters. Ongoing reporting about climate change could help educate communities and enable them to play a role in mitigation and adaptation.

As the country embarks on a just transition, stakeholders will need to take their communication beyond conferences and disasters, to disseminating information about the transition so as to get buy-in from affected communities and economic sectors. Mere climate change news, such as that which comes from conferences and disasters, has proven not to been much useful in encouraging action against climate change (e.g., Moser, 2016). This means efforts will need to be made to ensure that the communication is action-orientated, something that cannot be achieved by concentrating on the coverage of breaking news about the crisis. Communication, including media coverage, would assist society immensely if it also concentrated on the advantages and immediate gains of fighting climate change, such as renewable energy, which can help extend electricity to communities in remote areas and deal with South Africa's shortage of energy.

8.5 The link between literature review, theoretical considerations and findings

Both the literature review and the theoretical framework of this PhD study focused on the issue of climate change communication as an important component of the efforts to reverse the climate crisis. The literature review in Chapter II outlined the science of climate change as a means to contextualise the study. The literature discussed various issues pertaining to the climate crisis, which were confirmed by the findings. The data in the *Rand Daily Mail* confirms findings by Folland et al. (1990) that scientists have been preoccupied with the issue of climate change for several years. Le Treut et al. (2007) also found that the issue was known to humans long before the establishment of the IPCC and its first report in 1990. The articles from the publication reveal discussions from 1933 and 1935 when droughts spells had led to speculation that the climate was changing and scientific investigations had been conducted to find the causes (see Chapter 7.2). another example is that of the American peer-reviewed scientific journal, Monthly Weather

Review, publishing an article in September 1933 titled Is Our Climate Warming? A Study of Long-time Temperature Trends (see Kincer, 1933). They are but a few news stories that confirm the literature review.

Chapter 2.3 discussed the fact that global warming was fuelling climate change. The reviewed news articles in Chapters 7.2, 7.3 and 7.4 reported on various instances when this assertion was made by various stakeholders and confirms the literature in Chapter 2.3 citing researchers such as Denchak (2017). Business Day, in particular, reported extensively on the links between climate change and the economy, confirming assertions by Bolin (2007) cited in the literature review.

Crucially, the literature review discussed obstructionism, which it said was effectively organised opposition to a response to climate change. This was confirmed in articles in the *Mail & Guardian* and *Business Day*, Chapters 7.3 and 7.4, respectively, which reveal this behaviour in the approach of the South African government and the country's business sector. Both have been raising obstacles to measures to address climate change, something that amounts to obstructionism (see Depledge, 2008), which is a genre of scepticism. Obstructions groupings in many parts of the world include climate contrarian scientists (McKie, 2021).

Other important literature review contentions are found in Chapter 4 where discussions on various aspects of climate change communication and its sub-field of media coverage are found. The literature was confirmed in various findings, particularly those regarding media coverage of the climate crisis in South Africa. For instance, the literature review discussed issues such as the fact that media in several countries use climate conferences, disasters and scientific findings as their problem indicators in their coverage (see Boykoff and Roberts, 2007; Boykoff, 2010; Holt & Barkemeyer, 2012, MeCCO, 2018). This was confirmed in the data obtained from the three newspapers (see Chapter 7.5). With regards to media framing of climate change, the seven models of framing climate change which was theorised by Hallahan (1999) and outlined in Chapter 4.6 of this PhD thesis, were apparent in the data in Chapters 7.9 and 7.10.

This PhD study was conducted under the theoretical consideration that climate change communication is key to increased public understanding and action in response to global warming (Singh et al., 2017; De Meyer et al., 2021). This fact was strongly emphasised in literature in Chapters I and IV. The literature discussed

climate change communication in great detail and informed the theoretical framework. In this regard, media coverage and other forms of communication are held as being massively important. This was the reason why media coverage was used to gauge communication by the country's stakeholders. The findings confirm the role of climate change communication in driving public understanding and action. For instance, the government's communication that the country needed funding from western nations to address climate change, has informed the stance of several sectors on their approach to reversing climate change. The business sector, in particular, has held on to the government's standpoint as their stance to addressing the climate crisis. This confirms the theory of climate change communication which argues that the messages that are communicated on the issue have a bearing on how society understands and approaches action against the crisis.

8.6 Similarities of findings with previous existing studies

This PhD study reviewed previous research about climate change communication in South Africa, particularly the aspects of media coverage, public understanding of the crisis and climate change scholarship. With regards to media coverage, similar studies that were reviewed are Cramer (2008), Shanahan (2009), Tagbo (2010), Smith (2013), Johannessen (2013), Evans and Musvipwa (2016), Mulaudzi and Kioko (2020). In public understanding research by BBC (2010) and Mahl et al. (2020), among others, was analysed. Research by Bosch (2012), Evans et al. (2018) and Suliman (2018), among others, were reviewed, probing climate change communication scholarship. All these studies are about South Africa. There were also international studies on the same subjects that were reviewed, but for this exercise, local studies were selected since the PhD project concentrated on the local scene.

Concerning media coverage, there are several similarities, including the issue of the local media relying on foreign media for their reporting. This was apparent in Tagbo (2010) and Smith (2013), for instance. The findings in this PhD study confirmed this finding (see Figure 37). Another crucial aspect that was found in previous studies is the issue of the media relying on conferences and disasters, in the main, for their reporting. Johannessen (2013), in particular, made this finding and it is similar to findings in this PhD study as shown through data in Chapters 7.5, 7.6 and 7.7. The reviewed articles did not do much work about the framing of

climate change by the country's media, except Cramer (2008), who studied the subject in Western Cape newspapers and found that their framing of science and the environment was not conducive to enabling public understanding by its less privileged readers. However, this appears to be a conclusion drawn by the researcher without being supported by data from the said readers. However, there are similarities in the framing, particularly with regard to the scientific and environmental frames in the *Mail & Guardian* and *Business Day* (see Tables 6 and 7). This study could not make findings about the impact of these frames on the readers of the two newspapers, since it did not probe this aspect. This study did not probe public understanding of climate change or climate change communication scholarship therefore, it draws no similarities or differences between the literature review and its findings.

8.7 Methodological framework, literature review and findings

The methodology in this study entailed analysing newspaper reports on climate change to probe the communication of key stakeholders on the crisis. This is in consideration of the fact that media coverage of climate change is considered the most important tool of communication on the crisis (Moser, 2010; Ballantyne et al., 2016; Evans & Musvipwa, 2016). The literature review, in this regard, discussed the importance of the media (see 4.3) from the points of view that most people get their climate news from the media (see Newman, 2020) and the fact that people tend to believe what they get from the media (Mahl et al., 2020). In this regard, the methodology used in this PhD project has assisted in reaching the findings in Chapter VII. There would have been no more practical ways to examine the communication of climate stakeholders without analysing how it is reflected in the media which, as already stated, it's the main platform for climate change communication.

8.8 Contribution to knowledge

This PhD project has broken new ground in terms of new knowledge concerning climate change communication in South Africa. Previous studies have probed media coverage, public understanding and climate change communication scholarship (see Chapter 8.6). This study probed and made findings about the climate communication that has been undertaken by all key climate stakeholders covering 120 years. This is not only new knowledge but important findings that help

in understanding whether the climate communication that has been undertaken by various stakeholders in the country has helped increase public understanding and action to reverse global warming. The study has uncovered the fact that politics and money have underpinned the communication by policymakers and the business sector, and indeed the Business Day newspaper. As afore discussed in the data for RQ7, this finding helps in understanding whether the communication underpinned by the two factors has helped encourage public understanding and response to the crisis.

Furthermore, this study has made a new finding that South Africa was engaging in obstructionism in that its approach to dealing with climate change was one of frustrating any action in response. This finding can be backed by the fact that no project has been implemented despite funding having been committed by western powers, as it has been demanded by the government (see Chapter 8.4). This suggests that the demand for western funding as a pre-condition for the country to implement measures to reverse the crisis was a mere pretext to frustrate action against climate change. This is typical of the tactics used in obstructionism (see 2.5.1).

On the other hand, the literature reviewed in this study has made the thesis a valuable document in that it comprises dozens of studies on various subjects of climate change, ranging from physical science to various theories of climate change communication. Future researchers will be able to access much-valued research in one document.

CHAPTER IX: CONCLUSION

9.1 Thesis summary

Having begun by discussing the role of communication in driving public understanding of climate change, this PhD thesis went on to explore various concepts of climate change communication as a means to place the study in a proper theoretical context. Literature from leading scholars of climate change and climate change communication was reviewed in order to ground this PhD project in scholarship. The literature has made it clear that climate change is already having devastating effects on ecosystems and human systems and is threatening even more catastrophe (IPCC, 2022). Humans have been placed in an unequivocal position of being responsible for the anthropogenic climate of the past century (IPCC, 2021). Because this is the case, there is hope that humans can also act to reverse the crisis. The literature suggests that there is still time to limit disaster if mitigation measures can be pursued. Adaptation will also have to be included in the measures to address climate change because even if mitigation was to be accelerated, the emissions of previous decades would be sufficient to warm the atmosphere and generate climate change (Riedy, 2016). The literature also points to the fact that efforts to address climate change will need to involve the entire society, not just scientists and policymakers. This is because climate change is no longer just a physical science or policy issue, but one that cuts across several spheres of life (Byrd & DeMates, 2014; Basaninyenzi, 2021). In this regard, climate change communication becomes the bridge between various stakeholders. Communication has an essential role to play in not only providing information about the climate crisis, but encouraging people to respond (Moser, 2010; Moser, 2016; Depoux et al., 2017).

The data obtained by this PhD study suggest that South Africa's public discourse on climate change was featured in media reporting on the drought spells that affected the country since the 1920s. The country's media reporting on speculations of climate change in the mid-1930s. Notably, the first article that was found in the *Rand Daily Mail* was published in 1933 discussing the possibility that the drought in the country, at the time, was as a result of climate change that might be caused by human activities. However, most of the subsequent articles cited international scientists presenting reports of warming and cooling in other parts of the world. Local scientists concentrated on drought issues, mainly in the country in

the 1970s and 1980s. While scientists released research findings and the media reported on them, effective communication from key stakeholders such as the government, the private sector and the NGO community only began to communicate on the subject in any meaningful way in the 1990s. The communication from all the key stakeholders tended to have failed to drive meaningful public understanding of climate change, taking into account the fact that the majority of South Africans were not aware of the concept of climate change (e.g., Chingwete et al., 2019) and the issue was not regarded as one of major concern in the country (e.g., Roberts & Struwig, 2021).

This PhD thesis also explored climate change communication scholarship in South Africa and confirmed findings by previous studies that it indeed lagged behind other countries, particularly those in the west (e.g., Cramer, 2008; Shanahan, 2009; Tagbo, 2010; Bosch, 2012; Johannessen, 2013; Suliman, 2018). This has the effect of retarding knowledge of the levels of public understanding of climate change in the country and is not conducive to efforts to address the global warming crisis. Several theories of climate change communication were confirmed in the data that were collected and analysed in this PhD study. These include media agenda-setting dependent on conferences, climate disasters, and reports of scientific findings as problem indicators. Data from the three publications revealed that news reporting on climate change was informed by climate-related events.

9.2 Conclusions

The results presented in Chapter VII allow the study to conclude that climate change has been precariously communicated in South Africa by the stakeholders that have been part of the investigation. The government and the corporate sector, in particular, were found to have been ambiguous in their communication, something that might have impeded public understanding and action to address climate change. Data from the *Rand Daily Mail*, which was published during the era of the previous colonial and apartheid governments, reveals that climate change was not taken seriously by the governments of the time, at least from a communication point of view. The reasons may be diverse, including the fact that climate change was not a major policy issue, at the time.

Business Day and the *Mail & Guardian* were established in 1985, three years before major climate change events in the US with a presentation to Congress (see

Hansen, 1988) and Thatcher's speech to the British Royal Society (see Margaret Thatcher Foundation, 1988). However, reporting on global warming or climate change, as a later term, did not show any seriousness in these newspapers until the mid-1990s. The two newspapers reported extensively on drought and other environmental issues, before the mid-1990s, but mention of global warming or climate change was in short supply. This could be due to the fact that there was little communication on the subject coming from key stakeholders in the country. As afore discussed, local scientists were not conducting much global warming research and concentrated on investigating drought spells rarely linking them to climate change. The above factors, which also reveal that there were few climate change-related activities in South Africa, explain the fact that reporting on the subject in the country was dominated by news stories sourced from foreign news agencies, although this cannot be taken as a valid reason for media to concentrate of climate issues in other countries.

When international efforts to address climate change gathered pace in the 1990s, from events such as COP1 in 1995, climate change communication in the country tended to increase, as illustrated in data from the *Mail & Guardian* (see Figure 23) and *Business Day* (see Figure 29). However, in spite of the issue of global warming and consequent climate change being firmly on the international public policy agenda, during this period, key South African stakeholders, such as policymakers and the corporate sector, do not appear to approach the issue with any urgency, especially from a communication point of view. The government/policymakers are found wanting when it comes to coming up with climate policies and communicate them in such a way that behaviour change among individuals could be encouraged. The two policy positions the government has adopted to tackle the climate crisis appear to have had very little chance to encourage behaviour change to reduce GHG emissions. The first has been the demand that western nations should finance measures to address climate change in the country because they have been the major polluters and that South Africa and other developing nations would not afford the transition away from polluting fossil fuels. This position could not encourage any action to address the climate crisis from individuals or corporate entities. It effectively meant nothing should be done to address climate change until such funding was secured. It is a hopeless position from the point of view of communicating climate change to generate public response.

The second most known government position was to introduce a carbon tax to force polluting companies to reduce GHG emissions. This policy effectively leaves individuals out of the fight against climate change. Even more concerning, is the fact that it suggests that companies that can afford the tax can continue to pollute. As it is common knowledge, businesses pass on all their costs to consumers. In this case, it means the cost of the carbon tax would simply be passed on to consumers and corporate entities would feel no pain and would happily continue to pollute. This policy too, could not have helped to address the climate crisis and it is poor communication.

Government has much work to do when it comes to climate change communication. The fact that there are no terms in indigenous languages to characterise climate change (see BBC, 2010), is a huge dent in communicating the climate crisis to the country's population whose majority only understand indigenous languages. Government communication of climate change has to be tailor-made to encourage behaviour change instead of confusing messages that defend certain interests. Positive communication from government will not only educate the South African society on the crisis, but will also encourage action from all stakeholders, including the corporate sector, which has so far adopted the 'delaynist' approach. This approach produces the same outcomes as its 'denialist' cousin in that, effectively, both culminate with no action being taken to address the climate crisis. It' s also obstructionism. Naturally, business could not have been expected to take the lead in addressing climate change when government had said nothing could be done until there was funding from developing countries.

Corporate entities have largely been on the side of the debate that has suggested that efforts to address the climate crisis would be detrimental to the economy, jobs and livelihoods. The sector's communication has been premised on this stance, which has also been supported by the government. Needless to restate, this communication is in defence of profits and against efforts to address the climate crisis. However, there are now indications that some of the country's leading polluters are willing to embrace efforts to reduce CO_2 emissions. As has been pointed out in this PhD thesis, Eskom and Sasol – the country's leading emitters of GHG – have since announced plans to cut emissions in their business activities. This is a welcome development that could fast track South Africa's efforts to address the climate crisis. On the other hand, some businesses now seem to be

embracing the message of cutting GHG emissions by investing in green technologies to accrue the inherent economic benefits. This is a welcome development, albeit inspired by the opportunity to make money.

The scientific and the academic communities have distinguished themselves by effortlessly studying global warming and the consequent climate change. It appears, though, that their work is not thoroughly communicated as they depend largely on the goodwill of the media to editorialise scientific reports. This points to the need for added efforts from these communities to ensure that their findings reach the general public. This is clearly a function of poor communication on the subject, in spite of the fact that scientists have undertaken much work that should have improved societal knowledge.

NGOs have tended to excel in their communication of climate change through their activism and public relations activities. NGOs appear to have communicated most of the positive messages that encouraged action to address the climate crisis. They are largely reported as having placed enormous pressure on both government and the corporate sector to adopt policies to tackle climate change. However, the data reveal that this sector largely communicates at top elite levels, addressing policy issues, but working less with grassroots level communities. Climate change action will succeed when local communities are involved in mitigation and adaptation. While international and local polices set the tone in terms of response, action will be taken by local communities. NGOs are better placed to engage local communities and mobilise them to action.

The media, as a vehicle of communication from other stakeholders and a communicator of its own messages, was found to have played a key role in communicating the climate crisis to South Africans, albeit with some gaps. The three publications whose coverage of climate change was analysed, were found to rely heavily on news items from foreign media. Needless to restate, this kind of reporting creates the impression among audiences that climate change is not of concern to the country. The *Mail & Guardian*, however, had created a welcome way of mixing local and international content in single articles. They would start an article with a foreign angle – sometimes from a foreign news network – and later bring in a local angle that would report on similar issues. This brings in the ‘glocal’ concept of which Evans et al. (2018) argued it was important in climate change communication, because the climate crisis is both global and local. The findings

suggest that media has something to work on in their coverage of climate change, namely their agenda-setting. Their reliance on problem indicators such as events, climate disasters and announcements of scientific findings, leaves the story of the daily climate change experiences of grassroots communities unreported. This is not conducive to public understanding and to encouraging action.

In summary, the communication of climate change in South Africa remains a challenge. The country remains behind all comparable countries when it comes to communicating the climate crisis. The government communication of the crisis is clearly lacking; the corporate sector has barely included climate change communication in its corporate communication strategies; scientists communicate sparsely, relying on the goodwill of the media to editorialise its scientific reports; scholarship on the subject of climate change communication remains subdued; NGOs largely communicate top end policy discussions and work less in local communities; and the media misses the story of experiences of local communities in favour of international news and content from events and climate disasters. This combination of approaches to communicating climate change to South Africans will make it difficult for individuals and communities to change their behaviour in response to the climate crisis.

CHAPTER X: STUDY LIMITATIONS

In research, limitations refer to characteristics of design or methodology that influenced the application of the results of the study. The limitations can constrain the generalisability and utility of findings. Limitations of any particular study also concern potential weaknesses that are usually out of the researcher's control, and are closely associated with the chosen research design, statistical model constraints and funding constraints, among other factors (Theofanidis & Fountouk, 2018). In this PhD study, the main limitation was the number of publications that were used to obtain the analysed articles. Three national publications were chosen for the reasons that have already been outlined (see Chapter 6.2), but there is not claim being made that these were the only ones that could help answer the research questions or help the study achieve its objectives. The study chose the method of analysing media coverage of climate change to establish the communication on the subject by various stakeholders. It is admitted that other methods could have been used, perhaps achieving different results. The study relied on the candidate's coding of the selected articles. A second coder might have arrived at different findings.

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