JOURNAL OF ASIAN AND AFRICAN STUDIES

COVID-19 Hard Lockdown in South Africa: Lessons for Climate Stakeholders Pursuing SDG 13

Journal:	*Journal of Asian and African Studies*
Manuscript ID	JAS-21-0487
Manuscript Type:	Original Research Article
Keywords:	COVID-19, Climate change framing, Green growth, Credible messengers, SDG 13
Abstract:	As a result of South Africa recording its first COVID-19 index case in March 2020, the country imposed one of the strictest lockdowns globally. The lockdown unearthed vital lessons that climate practitioners both in South Africa – the largest emitter of greenhouse gases on the African continent – and globally can draw from to facilitate the achievement of the thirteenth Sustainable Development Goal (SDG 13). Drawing on secondary data analysis of media reports regarding South Africa's strategy to tackle the pandemic, with particular emphasis on the hard lockdown, three themes emerged. These were rephrased to align appropriately with the discourse on climate change. These include changing the distant framing narrative of climate change, prioritising green growth and utilising credible messengers. Each theme is discussed critically in terms of how it will aid climate policy developers and practitioners in facilitating the attainment of SDG 13.

COVID-19 Hard Lockdown in South Africa: Lessons for Climate Stakeholders Pursuing SDG 13

Abstract

As a result of South Africa recording its first COVID-19 index case in March 2020, the country imposed one of the strictest lockdowns globally. The lockdown unearthed vital lessons that climate practitioners both in South Africa – the largest emitter of greenhouse gases on the African continent – and globally can draw from to facilitate the achievement of the thirteenth Sustainable Development Goal (SDG 13). Drawing on secondary data analysis of media reports regarding South Africa's strategy to tackle the pandemic, with particular emphasis on the hard lockdown, three themes emerged. These were rephrased to align appropriately with the discourse on climate change. These include changing the distant framing narrative of climate change, prioritising green growth and utilising credible messengers. Each theme is discussed critically in terms of how it will aid climate policy developers and practitioners in facilitating the attainment of SDG 13.

Keywords: COVID-19, climate change framing, green growth, credible messengers, systems thinking, SDG 13.

1. Introduction

The emergence of the novel coronavirus (COVID-19) in December 2019 abruptly disrupted human activities and posed an enormous threat to the health and wellbeing of millions around the globe. The virus wreaked havoc both in Europe and the United States of America. By the end of December 2020, approximately 600, 000 (Stewart 2021) and 315, 000 (Gremillion 2020) deaths had been recorded in Europe and the United States of America, respectively. Although infections in Africa were nowhere near the aforementioned continents, South Africa started to see its COVID-19 case load surging immediately after its index case in March 2020. Within the first two months of the COVID-19 outbreak in South Africa, 32 683 cases were recorded along with 683 deaths. With the complexities and uncertainties surrounding COVID-19, and in an attempt to suppress the rising infection rate, South Africa's President – Cyril Ramaphosa – imposed a level five (total) lockdown nationally from 27 March 2020 for 35 days.

Some criticised the government's imposition of a hard lockdown, which they argued was implemented against the backdrop of grossly misleading COVID-19 mortality projections of approximately 351, 000 deaths (e.g. Smart et al. 2020). As at 21 June 2021, the nation's COVID-19 related deaths is 58, 795. From an economic standpoint, the costs of the lockdown were huge as Gross Domestic Product (GDP) plunged by 16.4% between the first and second quarter of 2020 (Smart et al. 2020). According to Smart et al. (2020, p.1), 'South Africa succumbed to international pressure rather than considering what was best for its own particular circumstances', a move which eventually resulted in over two million job losses (Cameron 2020). Notwithstanding, others like the Business for South Africa (B4SA) applauded the decision for a hard lockdown. As Alfa Shaban (2020) notes, since South Africa confirmed its COVID-19 index case on 5 March 2020, it became

a model for the African continent in many ways mainly due to its pro-activeness in attempting to contain the virus.

Considering how South Africa enforced hard lockdowns to supress infection rates, there is growing consensus that governments all over the world needs to tackle the climate crisis with the same zeal as they did with COVID-19 (UNICEF 2020; Geneva Environment Network 2021). This is crucial if we are to achieve the thirteenth Sustainable Development Goal (SDG) (climate action). SDG 13 is an urgent call to fortify resilience and adaptive capacity to climate-related hazards and natural disasters, among others, by 2030 (United Nations 2021). Global temperatures have reached 1.1˚C above pre-industrial levels due to increased Greenhouse Gas (GHG) emissions. As such, urgent action is needed to reduce GHG emissions and adapt to climate change (Louman et al. 2019), if South Africa is to achieve SDG 13. Yet, there are growing concerns that South Africa may not adequately attain SDG 13 (e.g. see Amusan and Olutola 2017). Reasons are underlined in the third section of the paper. Thus, this paper unearths the vital lessons from the hard lockdown imposed by the South African government to tackle COVID-19 in 2020, which climate policy developers and practitioners both in South Africa – the largest emitter of GHG on the African continent (Ayompe et al. 2021) – and globally can draw vital lessons from to facilitate the attainment of SDG 13. As Klenert et al. (2020, p. 752) acknowledge, 'learning from policy actions during the COVID-19 crisis could enhance efforts in fighting global climate change'.

2. Snapshot of climate crisis in South Africa

Scientific consensus indicates that climate change is now a lived reality globally (Bandara and Cai 2014; Lieske et al. 2014). While developed countries, through their uncontrolled GHG emissions in the past, are mainly responsible for the current global climate crisis, they are the least affected. This is partly due to their enormous adaptive capacity and mitigation measures (Amusan and

Olutola 2017). In sharp contrast, developing countries, despite contributing less to anthropogenic-induced climate change, bear the brunt of its adverse effects. Undoubtedly, Africa is a continent that has been overwhelmingly impacted by climate change. Its vulnerability stems from weak institutional capacity, low adaptive capacity, extreme poverty and an overwhelming dependence on rain-fed agriculture (Binns et al. 2012; Perez et al. 2015). While African countries have contributed the least to global GHG emissions, South Africa is the highest emitter on the continent (Figure 1). No less than 80% of electricity provided by ESKOM – South Africa's power generating company – is fuelled by coal (Fisher 2014). Coal is a significant contributor to GHG emissions with devastating environmental consequences (Rosenbaum 2011). In fact, South Africa is the seventh largest coal producer globally. Thus, failure to overturn its carbon dioxide (CO_2) (a product of coal combustion) emission trend will catalyse the occurrence of climate change in the immediate future, which would place both households' livelihood and the ability for future generations to flourish sustainably in a precarious position. Already, the negative impact of climate change in South Africa is palpable in both the agricultural (Tibesigwa et al. 2015; Ebhuoma et al. 2020), mining (Chavalala 2017), manufacturing (Nzuza 2021) and tourism (Hoogendoorn and Fitchett 2018) sectors, which constitute the lifeblood of the nation's economy.

It is noteworthy to mention that future climate change for South Africa under the current state of affairs may worsen existing challenges for key sectors of the economy. Jury (2019) analysed outputs from the 25-model CMIP5 ensemble-average with Representative Concentration Pathway (RCP) 6 GHG concentration (van Vuuren et al. 2011) in the period 1980-2050. Previous observations in the period 1980-2016 and model-simulations up to 2050 suggest that mean annual temperatures will increase from 0.02°C/yr to 0.03°C/yr. 'Poleward expansion of the sub-tropical ridge and attendant southeasterly flow is expected to accentuate the pre-existing moist-east/dry-

west climate of South Africa. Although rainfall shows little overall trend, drier conditions near Cape Town, reduced run-off into the Vaal River, and increased flood frequency over Kwa-Zulu Natal are projected. Cycles of drought and flood are expected to continue and may overshadow the gradual effects of climate change' (Jury 2019, p. 6). The implication for food production and other vital sectors of the economy will be huge, albeit its adverse impact may vary across provinces.

Insert Figure 1 here

For example, approximately R100 billion that the South African tourism sector have contributed to the GDP annually before the emergence of COVID-19 (see Fitchett and Hoorgendor 2016) will likely be compromised. To buttress this point, job losses in the Caribbean tourism sector have been tied to climate change (International Labour Organisation 2014), a scenario likely to play out in South Africa unless improved capacity for effective mitigation and adaptation is implemented. Also, job losses are expected to occur in the mining sector by 2030 (World Wide Fund (WWF) 2018). Furthermore, if climate modellers' findings on South Africa's future climate scenarios is anything to go by, the impact on maize production – the major grain crop cultivated in South Africa – will be devastating. Mbokodo et el. (2020) used an ensemble of Regional Climate Models (RCMs) obtained from the Conformal Cubic Atmospheric Model (CCAM), with simulations performed under the Representative Concentration Pathway (RCP) 4.5 (moderate GHG concentration) and 8.5 (high GHG concentration) emission scenarios, while using 1983–2012 as the historical baseline to project future changes in temperature. In a high GHG concentration scenario, they found that the 30-year period average maximum temperatures may rise by as much as 6˚C across much of the interior of South Africa by 2070–2099 (Mbokodo et el. 2020). With the

optimal temperature for maize growth in South Africa fluctuating between 20˚C and 30˚C (du Plessis 2003), such projected temperature increase will severely compromise maize production. However, not all future climate change impact will be negative. For instance, Mabhaudhi et al. (2018) obtained data from five global circulation models (GCMs), while the CO_2 file selected was for A2 scenario to simulate yields of Bambara groundnut (*Vigna subterranea*) under futures of low and erratic rainfall as well as increased episodes of drought. Results showed that crop yield is expected to increase by ~9% from 1995–2025 and ~15% from 2030–2060 (Mabhaudhi et al. 2018). The drawback, however, is that it is groundnut is a minor crop in South Africa. In 2019/2020, the total production of groundnut was 54.39 thousand metric tons (Galal 2021a). Within the same timeframe, the total amount of maize production was 14. 6 million metric tons (Galal 2021b).

In light of the above, it is understandable that the nation is taking measures to reduce its CO_2 emissions. The South African government has pledged to transition the nation's power supply from coal to clean energy sources and is pursing avenues to galvanise investment worth between R400 billion (US$40 billion) and R1 trillion (US$100 billion) to build new nuclear power plants (Nkosi and Dikgang 2018). These plants are expected to generate 2,500 megawatts of power. However, to facilitate the attainment of indicator 13.2.2 (total GHG emissions per year) of SDG 13, lifestyle changes would be required, especially among the middle and upper-class citizens who contribute the most to GHG emissions at the household level (Grunewald et al. 2017).

3. Pursuance of SDG 13 in South Africa

SDG 13 (Table 1) is a clarion call for the world to take urgent steps to combat climate change and its impacts. As Mthembu and Godwell (2021) acknowledge, climate change and sustainable development are two fundamental issues of the 21st century that cannot be addressed without urgent collective action. South Africa, like most countries in Africa has aligned the SDGs with its

development plans. Africa's SDG Index Report of 2020 specifically highlights both SDG 13 and SDG 12 (responsible consumption and production) as SDGs that have made considerable progress in the continent. The actualisation of SDG 13 will have a positive ripple effects on catalysing the achievements of other SDGs including 1, 2, 6, 14 and 15 respectively (Reed et al. 2015). Approximately 81% of African countries appear to be on course to meet SDG 13, 'with South Africa ranked 9th in the African Index and 110 in the Global index respectively' (Mthembu and Godwell 2021 p. 3). This can be mainly attributed to the various strategies, policies and planning interventions rolled out within key sectors of the economy to reduce the rise in GHG emissions to achieve meaningful reductions (see also Arndt et al. 2012). These include, among others, Integrated Resource Plan (IRP), Energy Efficiency Strategy (EES), Industrial Policy Action Plan (IPAP), Green Transport Strategy (GTS) and Climate Change Adaptation and Mitigation Plan (CCAMP) for the South African agricultural and forestry sectors.

Insert Table I here

A number of Independent Power Producers (IPPs) have inundated the electricity market for the sole purpose of renewable energy production (Jain and Jain 2017). The primary contributor to the growth in the contribution of renewables is the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Due to South Africa's geographical location and size, multiple renewable energy resources are available. South Africa's long coastline provides favourable conditions for wind power, while the semi-arid climate and flat terrain in some regions, receive high irradiation, making it ideal for solar power. Also the Department of Environmental Affairs (DEA) has collaborated with various players at subnational, local and city levels and has undertaken vulnerability assessments across the nine provinces to determine climate risks with a

view to develop appropriate responses. Furthermore, the provincial response plans for all the provinces have been developed to outline adaptation options, which are tailored to the provincial needs. DEA have supported 44 district municipalities in developing risk and vulnerability assessments as well as response plans through their local government support programme (Voluntary National Review 2019).

Despite these interventions and progress made in domesticating SDG 13, there are concerns that the nation may not achieve SDG 13, as earlier highlighted. The anticipated impacts climate variability is expected to exert on crucial sectors such as water, agriculture and biodiversity, which are necessary for economic advancement (van der Bank and Karsten 2020), coupled with the nation's limited capacity to cope with challenges posed by climate change (Ziervogel et al. 2014) may compromise the actualisation of SDG 13. Also, Amusan and Olutola (2017) assert that the millions of people whose households, livelihoods and businesses are powered by coal might be a major stumbling block, as making changes here may inherently mean that poverty will be exacerbated. Replacing coal with clean energy alternatives is capital intensive unless subsidised (Bridle et al. 2019). Another issue that could undermine the actualisation of SDG 13 is the notion that 'South African policies on climate change is driven more by international pressures and expectations rather than domestic awareness and activism' (Mthembu and Nhamo 2021, p. 6–7). Put simply, the country is more interested in putting out the persona of one as a responsible citizen who makes its fair contribution to the global agenda. According to Symons (2014), this may be a deliberate anti-political strategy – the political tactics of ignoring politics – as it pays little attention to the highly charged realities that make local people vulnerable to climate change in a specific geographical location. This is perhaps why Llorah (2008) admonished against relying heavily on

foreign aid, as donors may use their financial powers to unduly influence the acceptance of policies for recipient African countries that may be unfavourable for development.

4. Methodology

The qualitative approach in data collection is used to address the objective of this paper. The method adopted included critical discourse analysis. The specific events tracked included announcements regarding COVID-19 from South Africa's main television and online news stations, which included SABC news, ENCA news, news 24, and Newzroom Afrika, as they provided daily updates on the nation's COVID-19 cases in terms of infections, deaths and recoveries as well as the various 'family meetings' President Cyril Ramaphosa held to update South Africans on infection rates and measures taken to curb its spread. Also, these media outlets held series of live interviews and presentations with some of the leading health scientists and epidemiologists in South Africa as well as broadcasted regular updates from the Minister of Health, Dr Zweli Mkhize. Following preliminary analysis of proclamations and announcements by political figures and leading South African health scientists and epidemiologists, a picture began to emerge that resulted in the author categorising vital lessons from the strategy embarked upon to tackle COVID-19 before, during and after the announcement of the hard lockdown. This persuaded the author to conduct a critical analysis of proclamations, announcements and published online documents on issues about the hard lockdown imposed by the South African government, which may assist climate practitioners to actualise SDG 13. Following the analysis, three themes emerged. These three themes included everyone is vulnerable; public health and safety trump economic growth and soliciting the opinion of infectious diseases experts. Each of these themes was rephrased to align more appropriately with climate change discourse. Thus, the first theme was rephrased to changing the distant framing narrative of climate change. The second theme was

rephrased to prioritising green growth, while the third theme was rephrased to utilising credible messengers. Each of these themes is discussed in-depth in the next section.

5. Lessons from COVID-19 to address climate change

5.1. Changing the distant framing narrative

The first lesson from the hard lockdown imposed by the South African government to curb the spread of COVID-19 is recognising that everyone is susceptible. Not wanting to be caught unawares by the rapidly spreading virus globally, slowing local transmission was not deemed a matter worthy of intense debate by parliament and the COVID-19 task force. The ability to react swiftly in order to slow local transmission may have enormous ramifications for tackling climate change. South Africa is the 14th highest emitter of GHG globally, with emissions in 2015 at 460 million metric tons (MtCO2e) (McSweeney and Timperley 2018). While measures are being taken to curb industrial GHGs emissions, households can contribute to reducing GHGs through the adoption of pro-environmental behaviour. Polls show that 45% of South African citizens are not particularly perturbed by climate change (Pew Research Center 2015). Similarly, a study conducted among young Africans (18 – 24) in 14 countries including South Africa show that, against the backdrop of surging climate change threats from worsening storms to growing water shortages, unemployment, corruption and political instability were pinpointed as the most pressing issues facing them (Harrisberg 2020). This is deeply concerning as it might dampen households ability to adopt behavioural changes, necessary to reduce GHG emissions.

Pro-environmental behaviour is crucial to curbing GHG emissions (Steg 2018; Niamir et al. 2020), an issue which requires the active buy-in of the general population. While South Africa's energy sector is main driver of GHG emissions as it contributes almost 80% in emissions, of which 50% are attributed to electricity generation and liquid fuels (IRP 2019), studies show that households

are responsible for 72% of the global GHG emissions (Hertwich and Peters 2009; Baiocchi et al. 2010). Households high CO_2 level emissions stems from mobility (e.g. travelling on holidays and driving to work), food (high consumption of red meat and dairy) and housing (heating), a key attribute of those of developed countries (Dubois et al. 2019). Yet, South Africa may not entirely spared from this reality, being the nation with the second highest per capita wealth in Africa behind Mauritius (Campbell 2019). Therefore, it can be argued that some of its citizenry's – middle and upper classes – lifestyle behaviour might mirror those in developed countries. Thus, substantial reduction in household GHG emissions may be desperately needed to fast track the attainment SDG 13. The question then becomes how should climate practitioners in South Africa foster pro-environmental behaviour, especially among the 45% of its citizenry who are minimally bothered by climate change?

While the jury is still out on this issue that is a worrisome trend not just in South Africa but globally (Scannell and Gifford 2013; Capstick and Pidgeon 2014), framing climate change messages to make it personally relevant to specific groups is deemed essential to checkmating the barriers to behavioural changes that are needed to curb unsustainable and carbon-intensive lifestyles (e.g., Gifford and Comeau 2011; Howarth 2017). 'Message framing refers to communication in words, images and phrases to relay information about an issue or event. Frames can be used to define problems, suggest who is responsible or guilty, and what the most effective solution might be' (Gifford and Comeau 2011, p. 1301). Message framing can reduce ambiguity and complexities that shrouds the dismissive and doubtful people's understanding of how vulnerable they are to climate change (Dickinson et al. 2013). This, in turn, could catalyse the adoption of pro-environmental behaviour and accelerate the actualisation of SDG 13.

Several guidelines for framing climate change messages in ways that can trigger climate action have emerged. For example, the literature shows that framing climate change in a way that showcases how it can alter social cohesion (Uzzell et al. 2002) and norms (Farrow et al. 2017) among groups of people with shared identity can facilitate the adoption of pro-environmental behaviours. Also, there is growing consensus that framing climate change in terms of visualising the potential negative consequences for people's welfare and how it could adversely affect the environment they are emotionally attached to can trigger behavioural changes geared towards climate change mitigation (e.g. Lieske et al. 2014). In other words, framing needs to be tailored to things the end-users hold in high esteem to stand any chance of scaling up pro-environmental behaviour. However, the literature which informs this theorisation have all emerged from developed countries. Thus, similar studies are desperately needed in Africa because context might influence how climate change framing strategies will trigger pro-environmental behaviours. Nonetheless, the aforementioned implies that policy practitioners must refrain from institutionalising a unitary approach to framing climate change messages nationwide. A one-size-fits-all approach may not suffice for different groups. The onus, therefore, is on practitioners to demystify what specific groups hold valuable and priceless and frame climate change messages accordingly. Admittedly, it may not be an easy feat for practitioners to frame climate change messages in personalised formats to different groups. Yet, the fact that everyone will be disproportionately affected by climate change – as is the case with COVID-19 vis-as-viz infections travel bans, and movement restrictions – inherently means that climate practitioners must be committed to framing climate change to various groups with differential interests to make it personally relevant.

5.2. *Prioritising green growth*

Another crucial lesson to be drawn from South Africa's hard lockdown is the bold initiative to prioritise public health and safety over economic growth in a nation where the unemployment rate is currently at 32.6% (Naidoo and Wilson 2021). Perhaps by 'thinking long-term', the government may have realised that short-term economic gains, courtesy of leaving the economy to continue operating at full throttle, may have been quickly reversed, if not worsened, by the deadly virus. Thus, it is essential for climate practitioners to advance the agenda with government officials of prioritising and enforcing policies geared towards ensuring sustainable green growth in order not to compromise the welfare and flourishing of future generations. CO_2 emissions particularly from the energy, manufacturing, transportation and construction firms have cumulatively contributed 95% to the nation's GHG (Ganda and Milondzo 2018). South Africa's high CO_2 emission is fuelled by its unquenchable desire to pursue economic development heavily underpinned by high energy demand mainly derived from coal. Between 1994 and 2011, the South African economy witnessed exponential growth amounting to US$400 billion before regressing to US$385 billion in 2019, the resultant effect of protracted sluggish growth due to worldwide economic downturn (Mthembu and Nhamo 2021). Winkler and Marquard (2009) warned that South Africa must refrain from pursuing economic development that could potentially lock-in its economy into energy intensive industries, and recommend progressively diversifying the energy mix. In this light, the guidelines in the various policies and programmes rolled out i.e. IRP, EES, IPAP and GTS must be adhered to strictly to scale up both the actualisation of SDG 13 and the sustainable flourishing of future generations.

The populist ideology advances the notion that South Africa, like other developing countries, must emit large amounts of GHG to achieve economic prosperity. This claim is, in part, buttressed by

the fact that companies would incur financial losses by adopting green investment initiatives (Salahuddin et al. 2016), dissuading companies' transition to sustainable practices. However, green growth in a manner that not only attains economic prosperity to combat the high unemployment rate as well as in a manner that will not jeopardize future generations' ability to obtain a sustainable livelihood, is feasible. Consequently, the literature suggests that some South Africa companies that have integrated measures aimed at reducing CO_2 emissions have been able to increase profitability (Ganda and Milondzo 2018). Perhaps, evidence such as this may have fortified the call to embrace carbon tax, officially institutionalised in 2016. Prior to its official introduction, Alton et al. (2014), in their analysis which applied a computable general equilibrium model, revealed that carbon tax of approximately US$3 per ton in 2012 rising linearly to US$30 per ton by 2022 will bring emissions down to the Paris Agreement levels. Others, however, cast doubt on the ability of the carbon tax to help South Africa to achieve its CO_2 emission targets. Ndebele (2016) highlighted that embracing carbon tax in South Africa will have adverse indirect consequences for the nation's socio-economic agenda. Also, Raux et al. (2015) assert that carbon tax provides a legitimate avenue for businesses with enormous financial capital to emit more by buying carbon from companies that emit below their approved targets.

In a parallel vein, Swyngedouw (2013) argued that the commodification of CO_2 – mainly through the Kyoto protocol and other off-setting schemes – has catalysed a fast growing derivatives market. In Europe, for example, trade in CO_2 grew from zero in 2005 to pass the 3 billion tons mark in June 2010; of which 585,296 contracts were traded in the same month, with prices fluctuating from over 30 Euro to less than 10 Euro per ton (Swyngedouw 2013). These windows of opportunity allow the atmosphere to be included into the commodified logic of capital circulation and neoliberal prescriptions. It also ensures that economic growth and energy consumption will

continue on their relentless path (Swyngedouw 2013). This is related to several authors' viewpoint that there is an imminent need to reintroduce politics in climate change discourse (Symons 2014; Hope 2020), precisely because 'the climate change bandwagon has decidedly gone off course in recent years' (Swyngedouw 2013, p. 1). Some scholars (e.g. Kosoy and Corbera 2010) have debunked the claim that carbon commodification can deliver development. The scholars further question the rationale behind incorporating natural assets into economic systems, which raises the issue of equitable wealth distribution accrued from such schemes.

It is noteworthy to mention that a lack of willpower and effective monitoring from government officials to microscopically measure CO_2 emissions may be contributory factors likely to undermine the carbon tax initiative, as some South African companies and provinces may under report their CO_2 emissions as it has been observed in the United States (see Gurney et al. 2021). Despite these concerns, the Nordic countries (Finland, Sweden and Denmark) have shown that carbon tax, if effectively implemented in harmonisation with other policy initiatives, can achieve its desired goal (Winkler and Marquard 2011). Thus, it may be worthwhile for climate practitioners to draw valuable lessons from the aforementioned countries as a useful framework to achieving the goal of reducing GHG emissions in South Africa to fast track the actualisation of SDG 13.

5.3. Credible messengers

The participation of climate experts in activism marches against uncontrolled GHG emissions (e.g. Russell 2015; Green 2020) can be a catalyst to galvanise organisations to adopt changes necessary to reduce their emissions. This was the case with the COVID-19 hard lockdown in South Africa where 20 of the 45 member ministerial advisory committee advising the government on how to tackle COVID-19 were professors from various scientific fields including health, infectious diseases, and epidemiology. Credible voices can be a powerful ingredient in shaping public trust

in science (e.g. Joubert 2020). This underscores a vital lesson for South Africa, a country plagued by politicking and where partisanship often supersedes expertise when deciding who should hold public office. While South Africa must be applauded for heavily relying on the expertise of distinguished Professors like Francois Engelbrecht and Colleen Vogel to spearhead its climate negotiations, non-climate experts have, in some occasions, represented the country climate negotiations. Although, together with climate experts, non-climate experts have successfully represented the country in crucial climate negotiations (e.g. the 25th Conference of the Parties (COP 25)), a team comprising more climate experts may be more beneficial. Otherwise, in the near future, there is a possibility that such acts could trigger a wave of criticism against the South African government due to it adopting what some authors (e.g. Amusan and Olutola 2017) categorise as ambitious CO_2 reduction targets like the Paris agreement, especially if the country fails to meet the target. This viewpoint is buttressed by the Climate Action Tracker (CAT). CAT (2015) showed that, despite updating the commitment to reduce GHGs Business-As-Usual (BAU) emission to 42% by 2025 (Masters 2009), the nation's commitment to the 2°C above pre-industrial levels has been inadequate.

Climate scientists provide more accurate data regarding the climate crisis and state precisely the measures and lifestyle changes individuals must adopt to mitigate climate change than activists and politicians not deeply knowledgeable on climate science (Pidgeon 2012; Corner et al. 2015). This is what was observed during South Africa's COVID-19 updates during the hard lockdown. Despite anecdotal evidence suggesting that they were criticised for giving too much televised interviews instead of investing more time conducting research to find COVID-19 cures and vaccines, Professor Salim Abdool Karim – the leader of the COVID ministerial advisory committee – providing regular televised updates on the COVID-19 state of affairs, including

precautionary measures to be adopted by South African citizens. 'Data from Pear Africa, a South African media monitoring company, show that Abdool Karim featured in 545 print, broadcast and online media items during April 2020' (Joubert 2020, p. 1). Similar scenarios played out in various countries, turning a few leading scientists into highly visible public figures. In the United States of America, it was Anthony Fauci; in Italy it was Roberto Burioni; in Germany it was Christian Drosten, while in Sweden it was Anders Tegnell (Joubert 2020). This observation has implications for the advancement of public credibility in science and scientific leadership in times of crisis as a source of credible information. The use of credible messengers (e.g. climate scientists) have been shown to facilitate people's understanding of complex scientific processes such as climate change (Howarth et al. 2020). In turn, this makes them instrumental to catalysing behavioural changes necessary to reduce CO_2 emissions, which in turn could facilitate the actualisation of SDG 13 (Figure 2).

Insert Figure 2

A trend that is increasingly gaining momentum to advance the discourse on the reduction of GHG emissions is the use of celebrities (Anderson 2011; Doyle et al. 2017). On the one hand, while celebrities have become what Boykoff et al. (2018) describes as 'charismatic megafauna' for climate awareness by successfully bringing climate change into our living rooms and lived environments from distant locations, their role in climate change campaigning can be a distraction for the public as it overshadows crucial issues (Weiskel 2005). On the other hand, it can be argued that celebrities often have some influence over policy makers or politicians which can benefit climate scientists. For example, it is common to find celebrities assisting with political events with politicians they support. Hence, celebrities can be a bridge between policy makers and climate scientists. Thus, celebrities need to be understood as part of the burgeoning influence of non-

nation-state actors (NNSAs), a phrase used to capture a range of voices and interests including carbon-based industries, businesses, and non-governmental organisations, who can use climate advocacy as a platform to reconfigure their influence (Boykoff et al. 2018). Moreover, given the astronomical numbers of online followers that celebrities may attract, collaborating with climate scientists may be an effective way to ensuring that the details of the science regarding GHGs are not missed or misconstrued.

6. Conclusion

Due to the rapid rate at which the deadly COVID-19 virus began to spread globally coupled with South Africa recording its index case in March 2020, the government implemented a hard lockdown, from 27 March to 31 May 2020, to curb its spread. Considering the way South Africa enforced its hard lockdown to claw back infection rates, there is growing consensus that the world's governments need to tackle the climate crisis with the same zeal that they applied to tackle COVID-19. By drawing on key lessons from South Africa's hard lockdown, this paper provides valuable insights which may be useful for climate policy developers and practitioners, both in South Africa and globally, to adequately meet both SDG 13. Following secondary data analysis, three themes emerged, which include changing the distant framing narrative of climate change; prioritising green growth and utilising credible messengers to communicate climate change. A vital takeaway for climate practitioners pursuing SDG 13 is the need to tailor climate messages to ensure people can easily identify how they will be impacted by climate change is crucial to facilitate behavioural changes, which is necessary to reduce both industrial and households CO_2 emissions. Further, utilising credible messengers to convey the message, as it was seen in the COVID-19 case, will make people trust the science of climate change and adopt the necessary behavioural changes. Also, contrary to the populist ideology that South Africa, like other

developing countries must emit astronomical GHG emissions to grow their economy, the way South Africa enforced its hard lockdown show that it is possible to prioritise green growth while pursuing national economic development. With climate projections for South Africa suggesting that rising temperatures and erratic rainfall patterns will become the norm in the near future, the need to enforce green growth to reduce GHG emissions to stand any chance of achieving SDG 13 is necessary. This is mainly due to the growing concerns that South Africa may not achieve SDG 13 against the backdrop of Africa's SDG Index Report of 2020 highlighting that South Africa appears to be on course to achieve its target. This paper thus provides actionable knowledge and insights that are well within the ability of policy-makers to act upon.

References

Alfa Shaban AR. 2020. *South Africa crosses 400,000 mark; schools closed amid virus 'storm'*. Available online: https://www.africanews.com/2020/07/24/south-africa-coronavirus-daily-updates-on-covid-19//

Alton T, Arndt C, Davies R, Hartley F, Makrelov K, Thurlow J, Ubogu D. 2014. Introducing carbon taxes in South Africa. *Appl Energy.* 116:344–354.

Amusan L, Olutola O. 2017. Paris agreement (PA) on climate change and South Africa coal-energy complex: Issues at stake. *Afr Rev.* 9:43-57.

Anderson A. 2011. Sources, media, and modes of climate change communication: The role of celebrities. *Wiley Interdiscip Rev Clim Change.* 2:535–546.

Arndt C, Chinowsky P, Robinson S, Strzepek K, Tarp E, Thurlow J. 2020. Economic development under climate change. *Rev Dev Econ.* 16:369–377.

Ayompe LM, Davis SJ, Egoh NB. 2021. Trends and drivers of African fossil fuel CO_2 emissions 1990-2017. *Environ Res Lett.* 15:124039. https://doi.org/10.1088/1748-9326/abc64f.

Baiocchi G, Minx J, Hubacek K. 2010. The impact of social factors and consumer behaviour on carbon dioxide emissions in the United Kingdom. *J Ind Ecol.* 14(1):50– 72.

Bandara JS, Cai Y. 2014. The impact of climate change on food crop productivity, food prices and food security in South Asia. *Econ Anal Policy.* 44:451–465.

Binns T, Dixon A, Nel E. 2012. *Africa: Diversity and development*. Routledge publishers.

Bridle R, Sharma S, Mostafa M, Geddes A. 2019. *Fossil fuel to clean energy subsidy swaps: How to pay for an energy revolution*. A report prepared for International Institute for Sustainable Development (IISD). Available online: https://www.iisd.org/system/files/publications/fossil-fuel-clean-energy-subsidy-swap.pdf.

Cameron J. 2020. *'Please don't put South Africa back in hard lockdown, it will devastate SA' – B4SA begs Ramaphosa.* Available online: https://www.biznews.com/sa-investing/2020/11/10/hard-lockdown-2

Campbell J. 2019. *Rich people and wealth in Africa*. Council on Foreign Relations (CFR)

publication. https://www.cfr.org/blog/rich-people-and-wealth-africa. Accessed 17 June 2019.

Capstick SB, Pidgeon NF. 2014. What is climate change scepticism? Examination of the concept using a mixed methods study of the UK public. *Glob Environ Change.* 24, 389 –401.

Chavalala B. 2017. *An assessment of South Africa's coal mining sector response to climate change adaptation demands*. Unpublished PhD thesis. http://uir.unisa.ac.za/bitstream/handle/10500/22834/thesis_Chavalala_B.pdf?sequence=1&isAllowed=y. Accessed 22 June 2021.

Climate Action Tracker (CAT). 2015. *South Africa*. Available online: https://climateactiontracker.org/countries/south-africa/.

Corner , Roberts O, Chiari S, Völler S, Mayrhuber ES, Mandl S, Monson K. 2015. How do young people engage with climate change? The role of knowledge, values, message framing, and trusted communicators. *Wiley Interdiscip Rev Clim Change.* 6 (5):523-534.

Dickinson JL, Crain R, Yalowitz S, Cherry TM. 2013. How framing climate change influences citizen scientists' intentions to do something about it. *J Environ Educ.* 44(3), 145-158.

Doyle J, Nathan F, Goodman MK. 2017. Celebrity, climate change politics and the promise of emotional witness. In: Nisbet M. (ed.) *Oxford research encyclopedia of climate science*. Oxford: University of Oxford Press. Epub ahead of print 2017. DOI: 10.1093/acrefore/9780190228620.013.596.

Dubois G, Sovacool, B, Aall C, Nilsson M, Barbier C, Herrmann A, … Sauerborn R. 2019. It starts at home? Climate policies targeting household consumption and behavioral decisions are key to low- Behaviour change, public engagement and Net Zero 73 carbon futures. *Energy Res Soc Sci.* 52, 144–158. https://doi.org/10.1016/j.erss.2019.02.001.

du Plessis J. 2003. *Maize production*. https://www.arc.agric.za/arc-gci/Fact%20Sheets%20Library/Maize%20Production.pdf. Accessed: 15 June 2021.

Ebhuoma E, Simatele D. 2019. 'We know our terrain': Indigenous knowledge preferred to scientific systems of weather forecasting in the Delta State of Nigeria. *Clim Dev.* 11(2), 112–122.

Ebhuoma EE, Donkor FK, Ebhuoma OO, Leonard L, Tantoh HB. 2020. Subsistence farmers' differential vulnerability to drought in Mpumalanga province, South Africa: Under the political ecology spotlight. *Cogent Soc Sci.* 6:1, 1792155.

Engelbrecht F. 2016. *Projections of future climate change over Africa*. Available online at http://www.sasa.org.za/Files/ Engelbrecht F What can we expect from the weather SASIAA 2016.pdf.

Farrow K, Grolleau G, Ibanez L. 2017. Social norms and pro-environmental behavior: A review of the evidence. *Ecol Econ.* 1-13.

Fisher N. 2014. Balancing SA's energy poverty and climate change commitments. Cornerstone, 2(2), 36–38. https://www.worldcoal.org/balancing-south-africasenergy-poverty-and-climate-change-commitments. From: Amusan, L., and Olutola, O. 2017. Paris agreement (PA) on climate change and SA's coal-energy complex: Issues at stake. *Afr Rev.* 9: 43-57.

Galal S. 2021a. *Groundnuts production in South Africa by province in 2019/2020*. Available online at https://www.statista.com/statistics/1136594/groundnuts-production-in-south-africa-by-province/

Galal S. 2021b. *Maize production in South Africa by province in 2019/2020*. Available online at https://www.statista.com/statistics/1135488/maize-production-in-south-africa-by-province/

Ganda F, Milondzo K. 2018. The impact of carbon emissions on corporate financial performance: evidence from South African firms. *Sustainability.* 10(7). https://doi.org/10.3390/su10072398.

Geneva Environment Network. 2021. *Covid-19 and the environment*. Available online: https://www.genevaenvironmentnetwork.org/resources/updates/updates-on-covid-19-and-the-environment/.

Gifford R, Comeau L. 2011. Message framing influences perceived climate change competence, engagement, and behavioural intentions. *Glob Environ Change.* 21: 1301–1307.

Gremillion N. 2020. *Number of coronavirus cases, deaths in Louisiana*. Available online: https://www.wafb.com/2020/12/31/thursday-december-number-coronavirus-cases-deaths-louisiana/.

Grunewald N, Klasen S, Martınez-Zarzoso, I, Muris C. 2017. The trade-off between income inequality and carbon dioxide emissions. *Ecol Econ.* 142, 249–256.

Gurney KR, Liang, J., Roest, G., Song, Y., Mueller, K., and Lauvaux, T. 2021. Under-reporting of greenhouse gas emissions in U.S. cities. *Nat Commun.* 12: 553. https://doi.org/10.1038/s41467-020-20871-0.

Harrisberg K. 2020. *Top worry for young Africans? Jobs and corruption - but green anxieties grow*. Available online at https://www.reuters.com/paper/us-africa-climate-change-environment-trf-idUSKBN20E1XP.

Hertwich EG, Peters GP. 2009. Carbon footprint of nations: A global, trade-linked analysis. *Environ Sci Technol.* 43: 6414–6420.

Hoogendoorn G, Fitchett JM. 2018. Perspectives on second homes, climate change and tourism in South Africa. *Afr J Hosp.* 7(2). Available online: https://www.ajhtl.com/uploads/7/1/6/3/7163688/artricle_46_vol7_2__2018.pdf.

Hope J. 2020. The anti-politics of sustainable development: Environmental critique from assemblage thinking in Bolivia. *Trans Inst Br Geogr.* 46:208–222.

Howarth C. 2017. Informing decision making on climate change and low carbon futures: Framing narratives around the United Kingdom's fifth carbon budget. *Energy Res Soc Sci.* 31: 295–302.

Howarth C, Parsons L, Thew H. 2020. Effectively communicating climate science beyond academia: harnessing the heterogeneity of climate knowledge. *One Earth.* 2, 320–324.

ntegrated Resource Plan (IRP). 2019. Available online: http://www.energy.gov.za/IRP/2019/IRP2019.pdf. Accessed on 22 October 2019.

International Labour Organisation. 2014. *Climate change and employment: Challenges and opportunities in the Caribbean*. Available online: https://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/---sro-port_of_spain/documents/meetingdocument/wcms_312150.pdf.

Jain S, Jain PK. 2017. The rise of renewable energy implementation in South Africa. World

Engineers Summit - Applied Energy Symposium & Forum: Low Carbon Cities & Urban Energy Joint Conference, WES-CUE 2017, 19-21 July 2017, Singapore. *Energy Procedia.* 143: 721-726.

Joubert M. 2020. From top scientist to science media star during COVID-19 – South Africa's Salim Abdool Karim. *S Afri J Sci.* 116(7/8), Art. #8450, 4 pages. https://doi. org/10.17159/sajs.2020/8450.

Jury MR. 2019. *South Africa's future climate: trends and projections*. Available online: https://www.researchgate.net/publication/328078513_South_Africa's_Future_Climate_Trends_and_Projections_Contemporary_Changes_and_New_Directions. Accessed 21 June 2021.

Klenert D, Funke F, Mattauch L, O'Callaghan B. 2020. Five lessons from COVID-19 for advancing climate change mitigation. *Environ Resour Econ.* 76: 751–778.

Kosoy N, Corbera E. 2010. Payments for ecosystem services as commodity fetishism. *Ecol Econ.* 69: 1228–1236.

Lieske DJ, Wade T, Roness LA. 2014. Climate change awareness and strategies for communicating the risk of coastal flooding: A Canadian Maritime case example. *Estuar Coast Shelf Sci.* 140, 83–94.

Llorah R. 2008. Trade, aid, and national development in Africa. *Dev South Afr.* 25, 83–98.

Louman B, Keenan RJ, Kleinschmit, D, Atmadja S, Sitoe AA, Nhantumbo I, Velozo RDC, Morales JP. 2019. SDG 13: climate action – impacts on forests and people. In: Colfer PCJ, Winkel G, Galloway G, Pacheco P, Katila P, de Jong W. (Eds.). *Sustainable development goals: their impacts on forests and people.* Cambridge University Press, Cambridge.

Mabhaudhi T, Chibarabada TP, Chimonyo VGP, Modi AT. 2018. Modelling climate change impact: A case of bambara groundnut (*Vigna subterranea*). *Phys Chem Earth.* 105: 25–31.

Masters L. 2009. *The road to Copenhagen: Climate change, energy and South Africa's foreign policy*. Occasional Paper No. 47. Johannesburg: South African Institute of International Affairs.

Mbokodo I, Bopape M, Chikoore H, Engelbrecht F, Nethengwe N. 2020. Heatwaves in the future

warmer climate of South Africa. *Atmosphere*. 11, 712; doi:10.3390/atmos11070712.

Mcsweeney R, Timperley J. 2018. *The carbon brief profile: South Africa*. Available online: https://www.carbonbrief.org/the-carbon-brief-profile-south-africa.

Mthembu D, Nhamo G. 2021. Landing the climate SDG into South Africa's development trajectory: mitigation policies, strategies and institutional setup. *Sustainability.* 13, 2991. https://doi.org/ 10.3390/su13052991.

Naidoo P, Wilson L. 2021. *South Africa unemployment at new high as building, trade cut jobs*. https://www.bloomberg.com/news/papers/2021-06-01/south-african-unemployment-rises-to-new-high-in-first-quarter. Accessed: 20 June 2021.

Ndebele Z. 2016. *Taxing economic "bads": the case for a carbon tax in South Africa*. Master of Laws in Taxation in the College of Law and Management Studies, Howard College Campus, University of KwaZulu- Natal. https://ukzn-dspace.ukzn.ac.za/bitstream/handle/10413/15025/Ndebele_Zandile_2017.pdf?sequence=1&isAllowed=y. Accessed: 5 February 2021.

Niamir L, Ivanova O, Filatova T, Voynov A, Bressers H. 2020. Demand-side solutions for climate change mitigation: bottom-up factors for changing household energy behavior in the Netherlands and Spain. *Energy Res Soc Sci.* 62. 101356. https://doi.org/10.1016/j.erss.2019.101356.

Nkosi N, Dikgang J. 2018. South African attitudes about nuclear power: The case of the nuclear energy expansion. *ERSA Working Paper* 726:1-19.

Nzuza ZW. 2021. Effect of climate change on the manufacturing sector. In Olarewaju, OM, Ganiyu IO. (Eds). *Handbook of Research on Climate Change and the Sustainable Financial Sector*. IGI Global publishers, Pennsylvania, USA.

Perez C, Jones EM, Kristjanson P, Cramer L, Thornton PK, Förch W, Barahona C. 2015. How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Glob Environ Change.* 34, 95–107.

Pew Research Center (2015). *Global concern about climate change, broad support for limiting emissions*. Available online: https://www.pewresearch.org/global/2015/11/05/1-concern-

about-climate-change-and-its-consequences/.

Raux C, Croissant Y, Pons D. 2015. Would personal carbon trading reduce travel emissions more effectively than a carbon tax? *Transp Res D*. 35, 72–83.

Reed J, van Vianen J, Sunderland T. 2015. *From global complexity to local reality: Aligning implementation pathways for the Sustainable Development Goals and landscape approaches* (vol. 129). Bogor, Indonesia: CIFOR.

Rosenbaum WA. 2011. *Environmental politics and policy* (8th ed.). Washington, DC: SAGE/CQ Press.

Salahuddin, M, Alam K, Ozturk I. 2016. The effects of Internet usage and economic growth on CO2 emissions in OECD countries: A panel investigation. *Renew Sustain Energy Rev.* 62: 1226–1235.

Scannell L, Gifford R. 2013. Personally relevant climate change: the role of place attachment and local versus global message framing in engagement. *Environ Behav* 45:60–85.

Smart BTH, Broadbent A, Combrink H. 2020. Lockdown didn't work in South Africa: why it shouldn't happen again. Available online: https://theconversation.com/lockdown-didnt-work-in-south-africa-why-it-shouldnt-happen-again-147682.

Steg L. 2018. Limiting climate change requires research on climate action. *Nat Clim Change.* 8(9): 759-761.

Stewart C. 2021. *Cumulative number of coronavirus (COVID-19) deaths in Europe.* Available online: https://www.statista.com/statistics/1108496/coronavirus-mortality-in-europe/.

Swyngedouw E. 2013. The non-political politics of climate change. *ACME.* 12(1), 1-8.

Symons K. 2014. Anti-politics, apocalypse and adaptation in Kenya's national climate change response strategy. *Scott Geogr J.* 130(4), 266–278.

Tibesigwa B, Visser M, Turpie J. 2015. The impact of climate change on net revenue and food adequacy of subsistence farming households in South Africa. *Environ Dev Econ.* 20(3): 327–353.

UNICEF 2020. *Lessons from the COVID-19 pandemic for tackling the climate crisis.*

https://www.unicef.org/stories/lessons-covid-19-pandemic-tackling-climate-crisis. Accessed: 25 January 2021.

United Nations Statictics Division. 2021. *SDG Indicators metadata repository*. https://unstats.un.org/sdgs/metadata/?Text=&Goal=13&Target=. Accessed 9 June 2021.

Uzzell D, Pol E, Badenas D. 2002. Place identification, social cohesion and environmental sustainability. *Environ Behav.* 34(1): 26-53.

van der Bank J, Karsten J. 2020. Climate change and South Africa: A critical analysis of the earthlife Africa Johannesburg and another v Minister of Energy and Others 65662/16 (2017) Case and the Drive for Concrete Climate Practices Case and the Drive for Concrete Climate Practices. *Air, Soil Water Res.* 13, 1–11.

vanVuuren, D.P., Edmonds, J., Kainuma, M., Riahi, K., Thomson, A., Hibbard, K.,…. Rose, S.K. 2011. The representative concentration pathways: an overview. *Clim Change.* 109: 5-31.

Voluntary National Review Report. 2019. *South Africa's implementation of the 2030 agenda for sustainable development. Solving complex challenges together*. Available online: https://sustainabledevelopment.un.org/content/documents/23402SOUTH_AFRICA_RSA_Voluntary_National_Review_Report_Final__14_June_2019.pdf.

Weiskel TC. 2005. From sidekick to sideshow—celebrity, entertainment, and the politics of distraction. *Am Behav Sci.* 49(3), 393–409.

Winkler H, Marquand A. 2009. Changing development paths: From an energy-intensive to low-carbon economy in South Africa. *Clim Dev.* 1, 47–65.

Winkler H, Marquard A. 2011. Analysis of the economic implications of a carbon tax. *J Energy South Afr.* 55(1), 55–68.

World Wide Fund (WWF). 2018. *Planning for employment effects of climate change in the mining sector*. Available online: https://wwfafrica.awsassets.panda.org/downloads/wwf_2018_planning_for_employment_effects_of_cc_in_mining_sector.pdf?26461/Planning-for-employment-effects-of-climate-change-in-the-mining-sector.

Ziervogel G, New M, Garderen EA, Van Midgley G, Taylor A, Hamann R, Stuart-hill S. 2014. Climate change impacts and adaptation in South Africa. *Wiley Interdiscip. Rev. Clim. Change.* 5, 605–620.

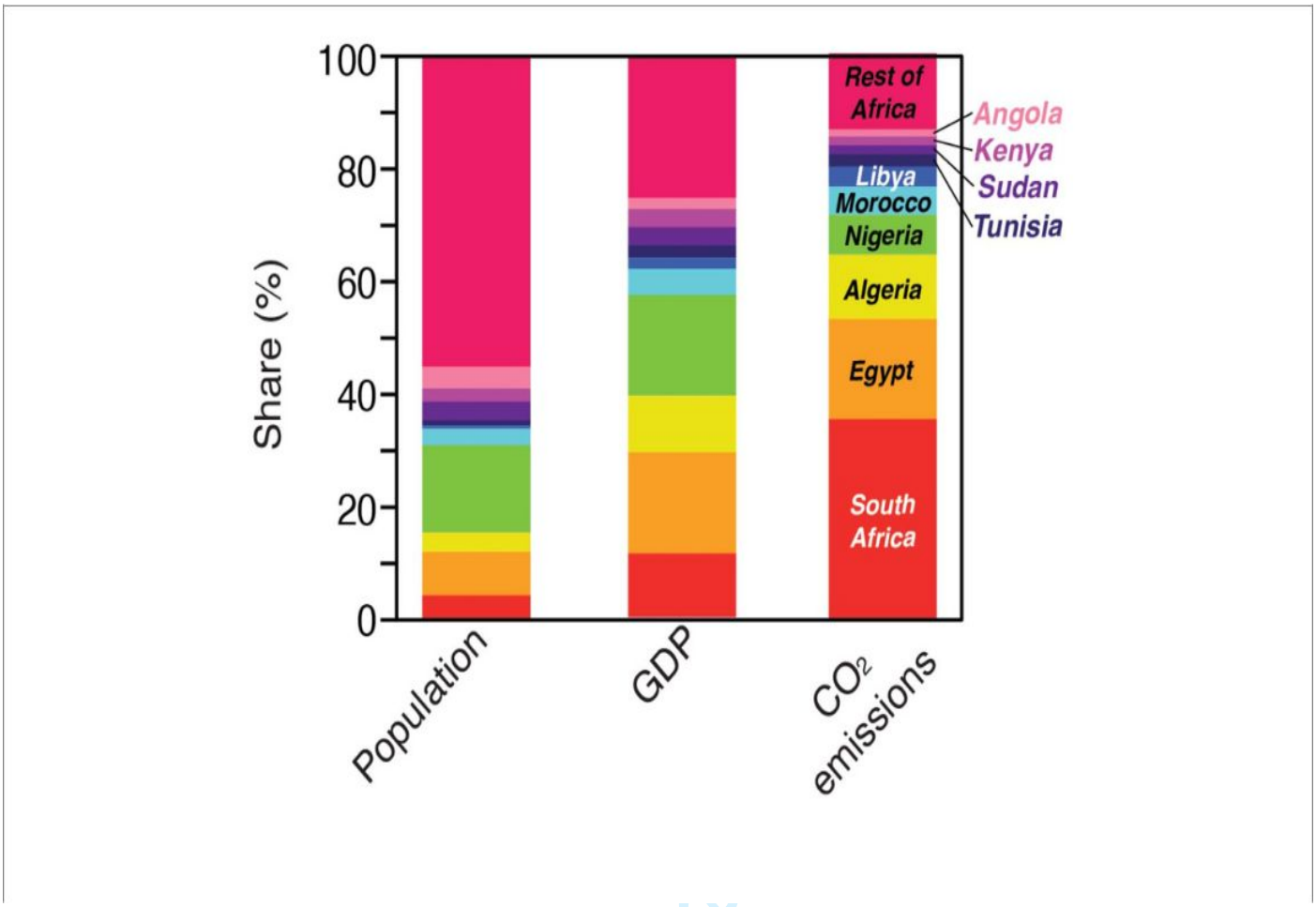

Figure 1: Shares of population, GDP and emissions of African countries in 2017. *Source*: Adopted from Ayompe et al. (2021).

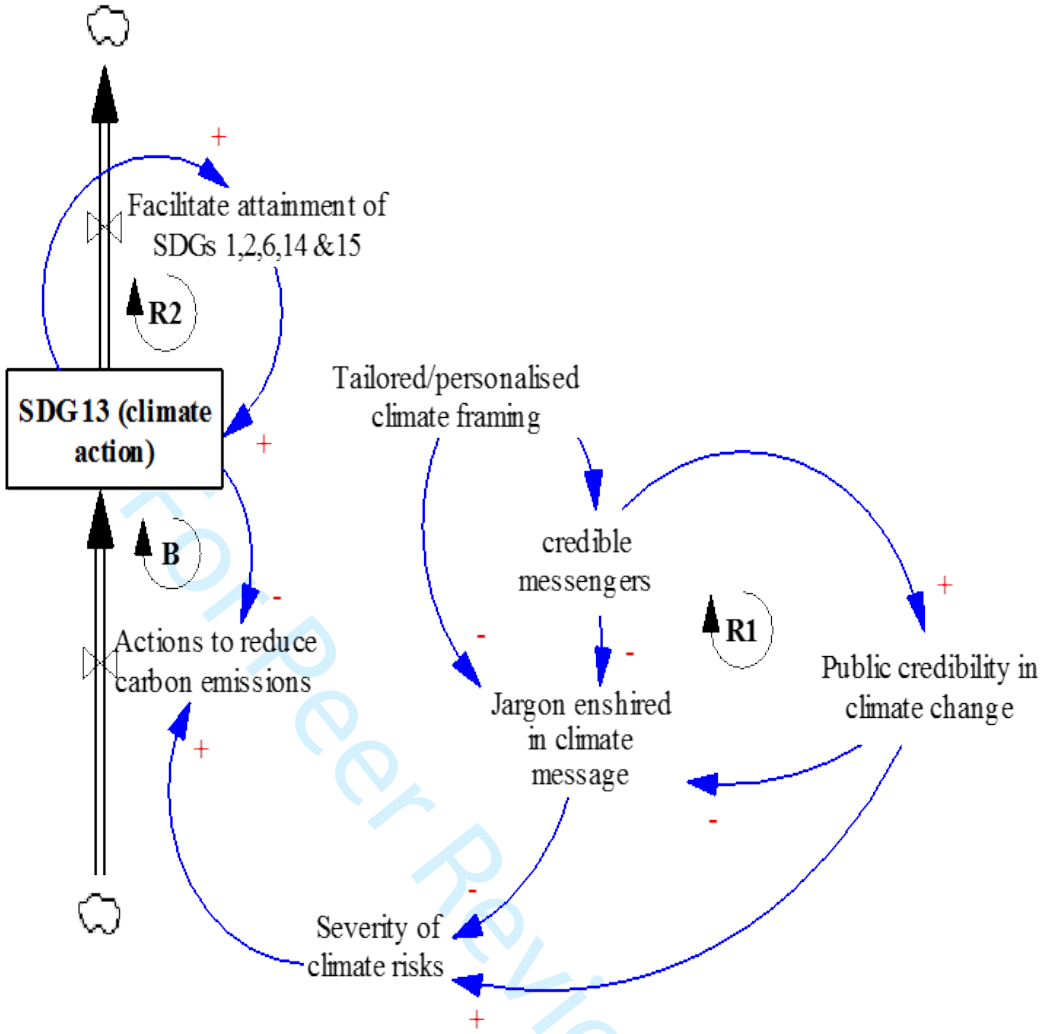

Figure 2: Illustration of how tailored climate framing and credible messengers can facilitate the actualisation of SDG 13. (B = balancing feedback loop; R = reinforcing feedback loop). N.B. + sign indicates variables move in similar direction, while – sign indicates variables move in opposite direction.

Table I: SDG 13 targets and specific indicators

SDG targets	SDG indicators
Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	**Indicator 13.1.1**: Number of deaths, missing persons and directly affected persons attributed to disasters per 100, 000 population **Indicator 13.1.2**: Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030 **Indicator 13.1.3**: Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
Target 13.2: Integrate climate change measures into national policies, strategies and planning	**Indicator 13.2.1:** Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change **Indicator 13.2.2:** Total greenhouse gas emissions per year
Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change	**Indicator 13.3.1:** Extent to which (i) global citizenship education and (ii) education for sustainable development are

mitigation, adaptation, impact reduction and early warning	mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment
Target 13.a: Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilising jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalisation as soon as possible	**Indicator 13.a.1:** Amounts provided and mobilised in United States dollars per year in relation to the continued existing collective mobilisation goal of the $100 billion commitment through to 2025
Target 13.b: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalised communities	**Indicator 13.b.1:** Number of least developed countries and small island developing States with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change