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# Climate change adaptation and disaster risk reduction in South Africa's local municipal plans

Climate change adaptation (CCA) and disaster risk reduction (DRR) agendas converge in their priorities to reduce social vulnerability and enhance resilience in the face of climate change. However, they are often treated separately in practice and in local government plans. In South Africa, while municipalities are legally mandated to develop Integrated Development Plans (IDPs) and Disaster Management Plans (DMPs), this is not the case for CCA. In this study, we assessed the engagement with, and linkages between, CCA and DRR in 20 local municipalities from contrasting socio-economic contexts in the Eastern Cape Province of South Africa by conducting an analysis of their IDPs, DMPs and any plans or strategies pertaining to CCA. Our results show that none of the municipalities had separate CCA strategies, with only two municipalities complying with the mandate to have DMPs. While municipalities mostly included CCA- and DRR-related activities in their IDPs, there were no explicit linkages made between the two approaches. Apparent was the prioritisation of bolstering infrastructure with little attention towards addressing social vulnerability and building resilience. Overall, little has been done to prioritise or link CCA and DRR at the local government level, especially in the context of addressing social vulnerability and building resilience. These findings suggest the need for South Africa to implement and promulgate legal instruments, policies and resources to capacitate local municipalities in mainstreaming and integrating CCA and DRR.

**Significance:**

- This study highlights that, while CCA and DRR converge in theoretical frameworks and international and national policies, little has been done to link the two at the local government level in South Africa.
- Overall, findings indicate that social vulnerability reduction and resilience building are still not recognised as important aspects of CCA and DRR.
- Local municipalities prioritise technical solutions and infrastructure maintenance, with little attention to development and structural causes of vulnerability.
- Support, in terms of resources, is needed to capacitate local municipalities in (1) linking CCA and DRR and (2) reducing social vulnerability and building resilience.

## Introduction

In tackling the impacts of climate change, a coherent integration of climate change adaptation (CCA) and disaster risk reduction (DRR) into a combined approach is essential.<sup>1,9</sup> CCA refers to the development of strategies that enable the anticipation of climate change effects, the implementation of practices that prevent damage from such effects, and adjustments in ways of life to deal with or take advantage of the effects of climate change.<sup>3,10</sup> DRR and disaster management form two related, but distinct, components that contribute to better preparation for disasters.<sup>1,3</sup> Disaster management refers to the processes established to design, implement and evaluate various strategies, policies and measures that will serve as tools for promoting practices that focus on disaster preparedness, response and recovery at different levels.<sup>10,11</sup> It is centred on the phase when the disaster threat becomes evident.<sup>1</sup> In contrast, DRR focuses on the development of policies, strategies and practices that aim to anticipate and minimise disaster risks, and reduce existing exposure and vulnerability, while improving resilience to prevent and adapt to the impacts of extreme events within a sustainable development context.<sup>10,11</sup>

Both CCA and DRR share similar goals oriented towards reducing exposure and underlying vulnerability to climate-related risks, as well as increasing the resilience of assets and affected people, although often treated separately in practice and policy.<sup>1-4,7,12,13</sup> Resilience focuses on the ability of a group or community to withstand and recover from external shocks and stressors, from the impacts of climate change, as well as from economic, social, and political neglect and upheaval.<sup>11,14</sup> In the context of DRR and CCA, the enhancement of resilience should be based on the reduction of exposure and vulnerability and on building adaptive capacity.<sup>3,12</sup> Examples include effective communication between government and the public, increased community cohesion, and better understanding of disaster risks.<sup>3,12</sup> In contrast, a system or person is deemed vulnerable when there is a propensity to be affected.<sup>10,11</sup> Vulnerability is defined as the characteristics that influence the capacity of people to prepare for, cope with, resist, and recover from the impact of extreme climate events and other impacts.<sup>11,15</sup> It is strongly influenced by underlying structural issues such as poverty and inequality, lack of access to insurance, marginalisation and poor housing quality (termed social vulnerability).<sup>10,13</sup>

In recognition of the commonalities between CCA and DRR, there is a growing advocacy for the need to integrate these two measures in policy and practice.<sup>3,16-19</sup> This integration can result in practical benefits such as optimising resource use, knowledge sharing, and increased access to a broader range of expertise in efforts to reduce vulnerability and build resilience.<sup>20</sup> Moreover, because climate-related risks are complex and intractable, cutting across boundaries of separate departments, agencies, authorities and jurisdictions<sup>16,17</sup>, integrating CCA and DRR requires establishing institutional linkages, thereby providing avenues to converge policies, planning, and programmes<sup>21</sup>.

In South Africa, evidence for climate extreme events is well documented.<sup>22-26</sup> Vulnerability and exposure to these events is underpinned by different socio-economic contexts created through apartheid policies, which residentially segregated people based on race.<sup>27</sup> In provinces such as the Eastern Cape, these policies created less-serviced and systematically neglected homelands to which black South Africans were forcefully moved, and whites-only towns and private farmlands, which were well serviced.<sup>28,29</sup> Despite the formal end of the apartheid government, the present-day landscape of South Africa is still largely shaped by the consequences of apartheid policies.<sup>27,30,31</sup>

As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), South Africa has made efforts to develop and implement, as well as update policies, measures and programmes to address climate change and extreme events.<sup>32</sup> Municipalities – which are entities that deal with the planning and implementation of, in the context of this study, CCA, DRR and mitigation strategies and actions suitable for a given geographical and social context<sup>22,33,34</sup> – are under a legal mandate to develop Integrated Development Plans (IDPs) and make updated versions of these documents available in public platforms for viewing<sup>35</sup>. The IDPs are planning tools developed to identify and address development issues, and are reviewed every 5 years.<sup>36</sup> Moreover, municipalities are legally mandated to develop Disaster Management Plans (DMPs).<sup>37,38</sup> However, whether and how climate change responses have been included in the IDPs of rural municipalities in South Africa has been little explored. Similarly, limited work has been done on the extent and content of DMPs for such municipalities. This is also the case when it comes to the integration of CCA and DRR, particularly in terms of reducing social vulnerability and building resilience.

We assessed the engagement of 20 South African local municipalities with CCA and DRR across two different socio-economic contexts. We explored how municipalities in the former ‘white’ parts of the Eastern Cape Province and those in the former ‘homelands’ engaged with CCA and DRR, and integration thereof, and where they placed emphasis in terms of reducing social vulnerability and building resilience to climate change. We undertook a thematic analysis of publicly available IDPs

(from municipal websites) to answer the following broad questions: (1) Do municipalities have DMPs or CCA strategies, and if so, what actions are mentioned in these? (2) Do municipal IDPs contain sections on CCA and DRR? (3) What types of CCA and DRR actions are mentioned in each of the relevant sections in the IDPs, and how do these relate to social vulnerability reduction and resilience building? And lastly, (4) is there any reference to the linkages between CCA and DRR in the documents?

## South Africa’s instruments for addressing climate change and extreme events

For DRR, South Africa has a legal mandate for the management of disasters as outlined in the South African constitution.<sup>39</sup> Specifically, the constitution legally mandates South African municipalities to develop and implement DMPs.<sup>39</sup> Other instruments include the *Disaster Management Act No. 57 of 2002*<sup>38</sup>, the *Disaster Management Amendment Act No. 16 of 2015 (DMAA)*<sup>37</sup> and, at the local level, the *Municipal Systems Act No. 32 of 2000*<sup>35</sup> (Supplementary figure 1A).

The country presently has no legal mandate for local governments to have separate CCA strategies or plans. However, the Climate Change Bill<sup>40</sup>, the National Climate Change Response White Paper (NCCRWP)<sup>32</sup> and the National Climate Change Adaptation Strategy (NCCAS)<sup>41</sup> encourage the inclusion of CCA in IDPs (Supplementary figure 1B). While many better resourced city and district municipalities have developed separate CCA strategies or plans, little attention has been given to this amongst local municipalities.<sup>23</sup> Using the NCCAS, the Department of Environmental Affairs (DEA) states that a unified CCA strategy will encourage the synergising of CCA efforts at all government levels (national, provincial, and local), while presenting an opportunity for collaboration between different sectors.<sup>42</sup>

## Study area context

The study was conducted in 2017 in the Eastern Cape Province of South Africa (Figure 1) – the fourth most highly populated province in the country with approximately 7 230 204 people according to the latest census of



**Figure 1:** Map of the Eastern Cape Province showing the local municipalities for which documents were analysed in this study. Black and white circles represent local municipalities in former ‘white’ South Africa and former ‘homeland’ areas, respectively. Sarah Baartman, Amathole, Chris Hani, Joe Gqabi, OR Tambo and Alfred Nzo are district municipalities, and Nelson Mandela Bay and Buffalo City are metropolitan municipalities. (Map adapted from Htonl<sup>45</sup> under a CC-BY-SA licence.)

2022.<sup>43</sup> The Province is characterised by high vulnerability to climate change and disasters due to high poverty and unemployment rates. For example, only 62.5% of the population between the ages of 15 and 64 is economically active.<sup>43</sup> There is a major dependence on agriculture and natural resources for livelihoods and economic activity.<sup>28,44</sup>

The Province is expected to experience high temperature increases in the northwestern part and lower increases along the coastal areas.<sup>46</sup> These increases in temperatures will result in higher evaporation rates which will increase the frequency and intensity of droughts.<sup>46-48</sup> In the eastern parts, precipitation levels are expected to be higher, resulting in increased frequency and intensity of floods and storms.<sup>47</sup> Overall, the Province faces major threats in existing commercial and subsistence farming areas, social services and food security.<sup>46</sup>

The Province has 39 municipalities (2 metropolitan, 6 district and 31 local municipalities).<sup>49</sup> The metropolitan municipalities are self-standing and operate under exclusive authority as they are usually more equipped with resources to perform their duties.<sup>36</sup> Conversely, district and local municipalities share power and functions, and hence, operate on a broad scale.<sup>36</sup> Importantly, local municipalities are meant to be in direct communication with local communities<sup>22,33,34</sup> and, therefore, need to address the issues of vulnerability and resilience directly.

For this study, to understand if climate response actions reflected the socio-economic context of the different municipalities, we divided the Province into two main parts.<sup>29</sup> The first, eastern, part consists primarily of the former homelands to which black South Africans were forcefully moved during apartheid.<sup>28</sup> These areas, characterised by communal tenure systems, were systematically neglected and underdeveloped with respect to housing, electricity, sanitation, social services (such as education and health), recreational spaces and economic opportunities.<sup>50</sup> While the homelands were re-incorporated into South Africa in 1994, the legacies of past neglect are still visible in the Eastern Cape today.<sup>27,30,31</sup> The second, western, part of the Province falls within the former white areas and consists mainly of well-serviced towns and private farmland.<sup>29</sup> Given these disparities, municipalities in the former homelands are battling to deliver services and development, which increases the vulnerability of residents to climate extreme events compared to those in former white South African towns.<sup>29</sup>

## Approach and methods

Our method followed a four-step procedure outlined in Figure 2. First, we randomly selected 20 out of the 31 local municipalities: 10 in the previous homelands and 10 in the former white part of the Province.

Second, we visited each municipality’s website and downloaded their most recent documents, particularly IDPs and any other plans relating to disasters and CCA. The number of municipalities that had either one, both or neither of the two document types was recorded. Third, the documents were read page by page for information relating to CCA, DRR, social vulnerability reduction and resilience building. Finally, a thematic analysis of the actions in municipal documents was carried out based on prior developed themes from the literature (Supplementary table 1).

## Results

### *Do municipalities have DMPs and CCA strategies or plans?*

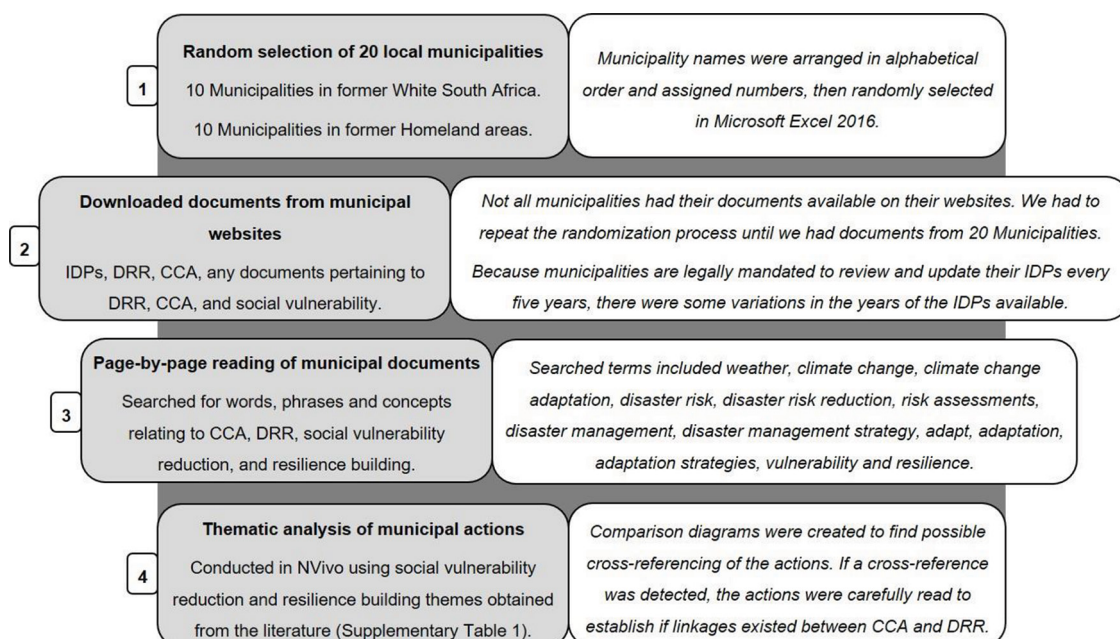
While all municipalities included in this study had IDPs, none had a separate CCA strategy. Only two municipalities had developed a DMP; one from a former homeland area (King Sabata Dalindyebo Local Municipality), and the other from former white South Africa (Kouga Local Municipality).

Most of the 10 DRR-related actions mentioned across the two DMPs were related to bolstering infrastructure against damage (Figure 3). These included enforcing building codes to ensure buildings can withstand severe weather conditions; maintenance of electrical and civil engineering services such as sewage networks; maintenance and improvement of roads and bridges; and making provisions for uninterrupted electricity supply. Other actions mentioned were capacity building, disaster relief funds, educational programmes, and awareness raising campaigns, as well as providing financial support for smallholder farmers. Such actions, we argue, can equip communities to be better prepared for and to recover from disasters and thus help address social vulnerability. The latter actions were mostly mentioned in the DMP from a municipality in a former homeland area.

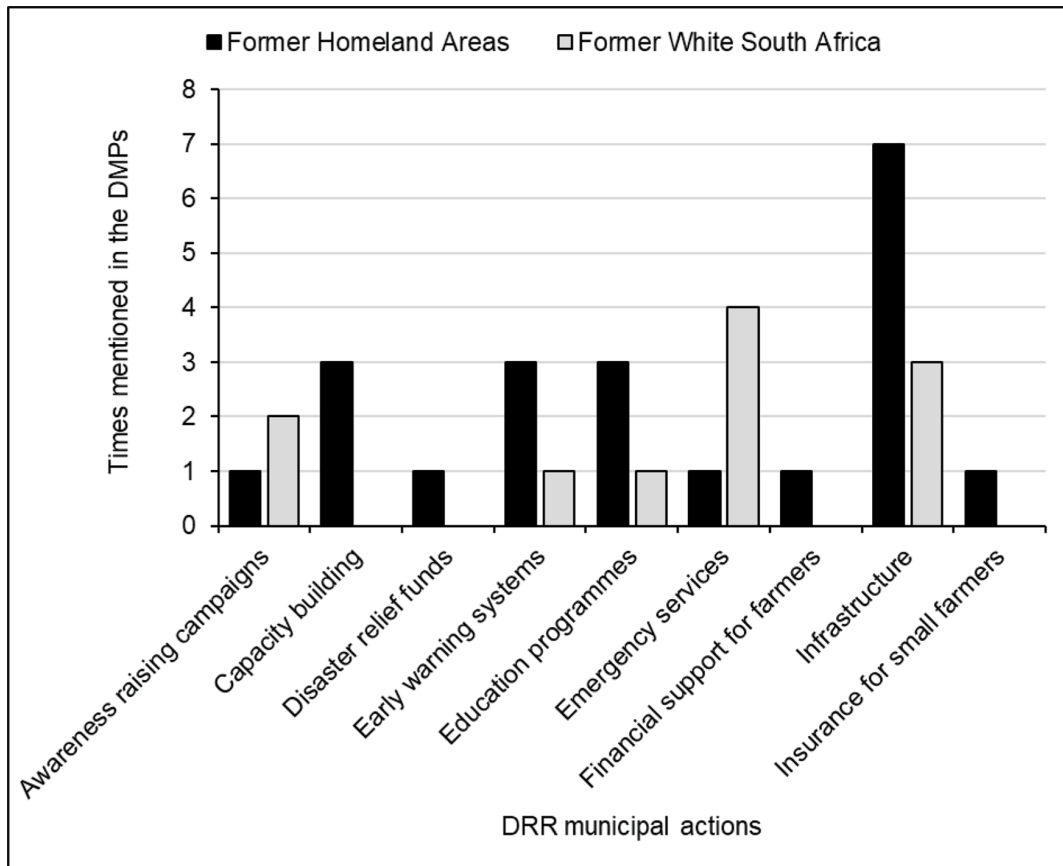
### *Mainstreaming of CCA and DRR in municipal IDPs*

#### *Are CCA and DRR mentioned in municipal IDPs and how often?*

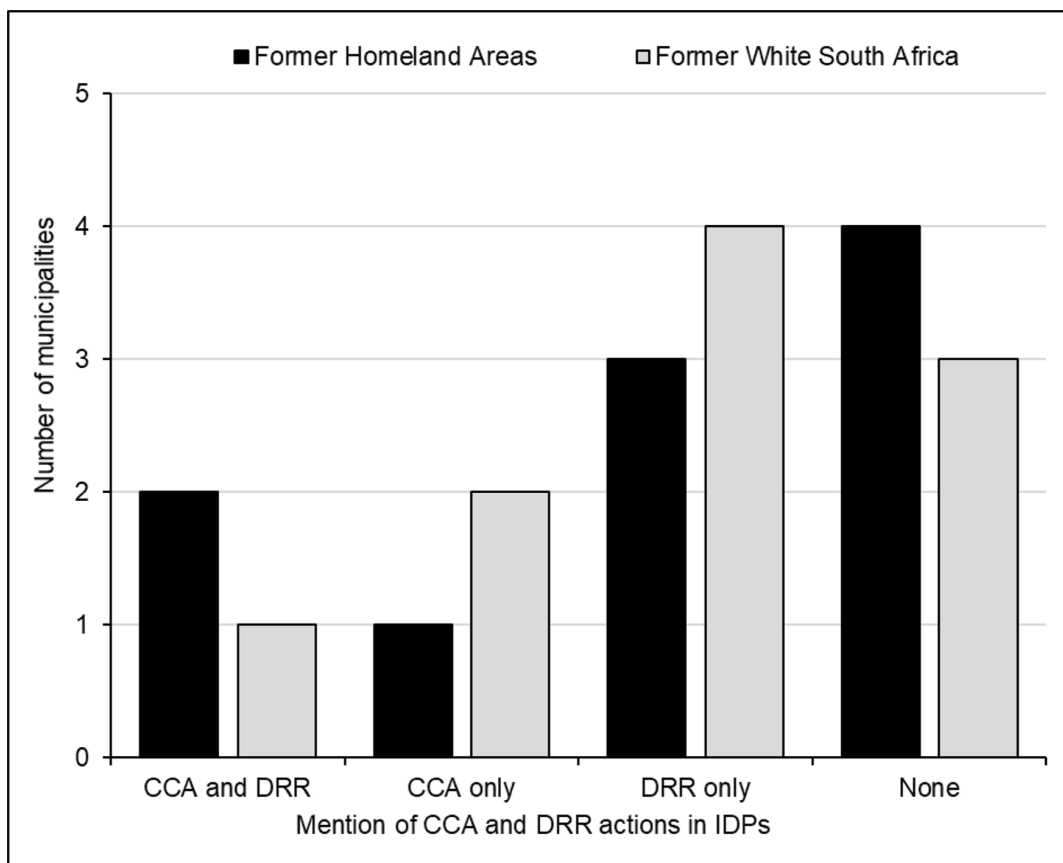
Overall, 13 municipalities mentioned actions related to either both CCA and DRR, CCA only or DRR only in their IDPs (Figure 4). Of these municipalities, more mentioned DRR- (7) than CCA-related (3) actions and only 3 mentioned both CCA and DRR actions. The remaining seven municipalities, including the two that had DMPs, did not mention any CCA- or DRR-related actions in their IDPs. The mention of climate change was mostly about effects thereof, with no discussion of the



**Figure 2:** Data collection and analysis procedure with explanatory notes for each step.



**Figure 3:** Types of disaster risk reduction (DRR) actions mentioned in municipal Disaster Management Plans (DMPs).



**Figure 4:** Mention of climate change adaptation (CCA) and disaster risk reduction (DRR) actions in municipal Integrated Development Plans (IDPs).



interventions and actions needed to adapt to the risks identified. For three municipalities, two in the former homelands and the other in former white South Africa, reference was made to plans for developing a climate change strategy:

*The municipality will develop a climate change strategy on the completion of the District Climate Change Strategy.* (Intsika Yethu Local Municipality)<sup>51</sup>(p.109)

*...the municipality will have to develop a climate change strategy which is currently not there.* (Ndlambe Local Municipality)<sup>52</sup>(p.45)

*The Mbizana Local Municipality is currently developing a Climate Change Strategy which will be included in the IDP.* (Mbizana Local Municipality)<sup>53</sup>(p.84)

One municipality in a former homeland (Engcobo Local Municipality) asserted that they use their district municipality's environmental plan and the provincial climate change strategy for climate change related issues.<sup>54</sup>

### What types of CCA actions are mentioned in the IDPs?

Similar to the DMPs, most of the five CCA-related actions mentioned in the IDPs were technical and mainly related to making infrastructure more resilient (Figure 5). These actions included the insulation of houses against rising temperatures, installation of rainwater tanks, and maintenance of roads and bridges. The two former actions also provide health benefits, through reducing the impacts of heat waves and water contamination during flood events. Therefore, these actions can contribute to the resilience of communities. In terms of social vulnerability, actions that build adaptive capacity such as economic development, collaboration and participation, and capacity building were mentioned only by municipalities in former homelands. For example, one municipality mentioned economic development and promotion of drought-resistant crops as a plan for CCA:

*...proactive role in local economic development thus means that drought resistant crops may need to be investigated in mitigation of the potential effects of climate change.* (Intsika Yethu Local Municipality).<sup>51</sup>(p.109)

Although vulnerability assessments have the potential to identify the most vulnerable communities and should be the basis of any adaptation strategy, only one municipality in the former white South Africa part of the province (Dr Beyers Naudé Local Municipality) mentioned a need for these, but with no elaboration on the type of vulnerability that would be assessed.

### What types of DRR actions are mentioned in the IDPs?

Amongst the various DRR-related actions mentioned in IDPs, awareness raising campaigns were the most mentioned at six times, particularly by municipalities in the former homeland areas (Figure 6). Actions towards reducing social vulnerability such as capacity building, collaboration and participation, and community engagement were mentioned only by municipalities serving former white South Africa. In comparison to the DRR actions in DMPs, IDPs did not make mention of actions relating to infrastructure. However, two municipalities in the former homelands (Senqu Local Municipality and Engcobo Local Municipality) mentioned the need to avoid settlement of communities in low-lying and flood-prone areas. This, along with actions such as early warning systems, can help bolster the resilience of communities. The reference to emergency services was mainly about being prepared for disasters when they occur.

### Are there linkages between CCA and DRR actions?

Of the IDPs and two DMPs reviewed, none of the municipalities made explicit links between CCA and DRR in terms of their dual goals of reducing social vulnerability and building resilience to extreme events. However, of the three that had both CCA and DRR actions in their IDPs, one municipality in the former homeland area of the province highlighted the importance of awareness raising campaigns for tackling both CCA and DRR.

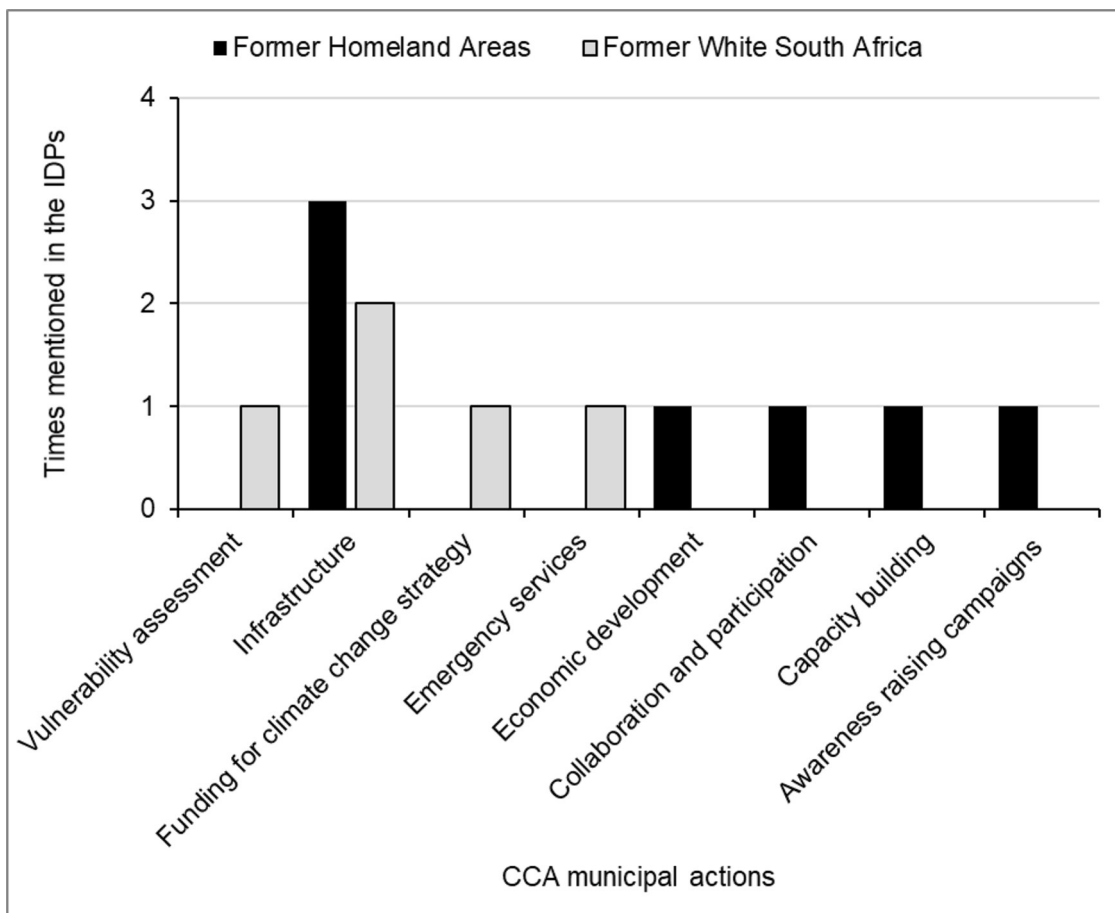
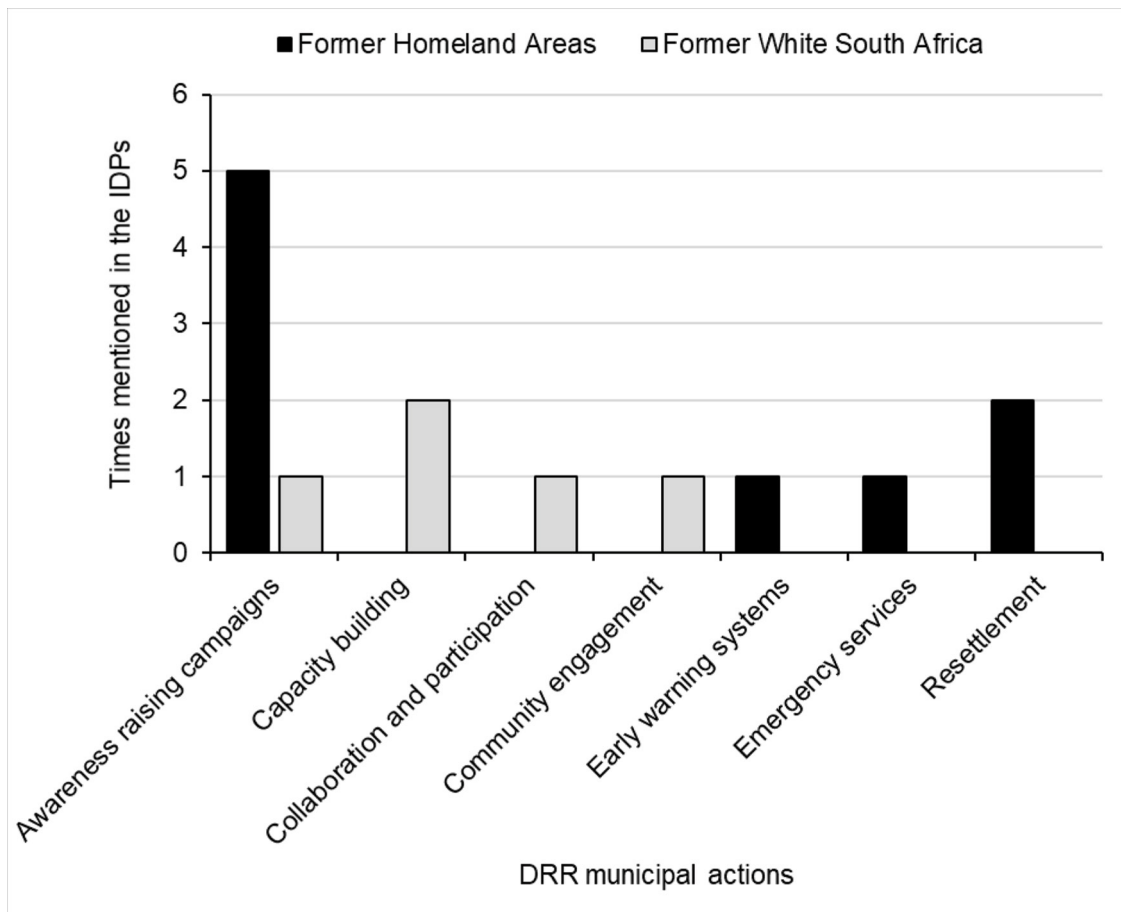


Figure 5: Types of climate change adaptation (CCA) actions in municipal Integrated Development Plans (IDPs).



**Figure 6:** Types of disaster risk reduction (DRR) actions in municipal Integrated Development Plans (IDPs).

...number of disaster awareness campaign [sic] conducted. The municipality does conduct disaster awareness campaigns yearly. (Engcobo Local Municipality).<sup>54(p.137)</sup>

...include developing educational posters to raise awareness about climate change both with staff and scholars throughout the area. Awareness campaigns will assist both with mitigation and adaptation to a phenomenon which will affect us and generations to come. (Engcobo Local Municipality).<sup>54(p.34)</sup>

## Discussion

In the face of climate change and resulting extreme events, there is a recognition of the importance of integrating CCA and DRR in government planning to address social vulnerability and build resilience to climate risks.<sup>3,6,7</sup> We sought to explore whether and how this integration is mainstreamed in local municipal plans in the Eastern Cape Province of South Africa. Overall, our findings indicate that, regardless of the different socio-economic contexts, little has been done to integrate CCA and DRR in local government planning in the province, particularly in addressing social vulnerability and building resilience.

We found that only 2 of the 20 local municipalities included in this study had developed and published their DMPs. This is despite the fact that municipalities servicing former white South Africa areas may be better capacitated with resources to develop and implement DMPs, while those from the previously disadvantaged homeland areas are still catching up in terms of resources and capacity. Nevertheless, the lack of DMPs in both socio-economic contexts is a cause for concern, particularly because the DMAA<sup>37</sup> legally binds South African municipalities to develop and coordinate DMPs while implementing the disaster management function. Therefore, these results suggest a broad lack of compliance with the legal

mandate for addressing climate-induced extreme events and reducing disaster risk in South Africa. The fact that the *Disaster Management Act* was amended only in 2015 to include local municipal DMPs could arguably explain the cause for non-compliance with this legal mandate.

Regardless of the different socio-economic contexts, our results show that no municipality has developed and published their own CCA strategy or plan. This was not unexpected because South Africa has no legal requirement for these to be developed at the local municipal level. However, it does suggest that, regardless of the absence of a legal mandate, rural local municipalities may not have the motivation, resources and/or capacity to develop specific CCA strategies or plans, unlike at the metropolitan level.<sup>23</sup> Moreover, South Africa does not have a national audit to check and monitor CCA strategies. A study conducted in Zambia attributed the lack of CCA strategies at the local level to the lack of a clear CCA mandate.<sup>1</sup> Therefore, considering their results and the findings of the current study, it could be argued that the absence of a clear legal mandate for local governments to develop CCA strategies may, to a certain extent, be the reason for the lack of such strategies at the local municipal level. The South African government regards climate change as one of the principal threats to sustainable development and recognises that, if unmitigated, it could potentially delay the country's achievement of the Sustainable Development Goals.<sup>32,40</sup> However, the national government does not finance the development of local-level CCA strategies.<sup>33</sup> These strategies, therefore, are a luxury for municipalities that can afford to develop and implement them, sometimes with external development aid, which is usually the case for metropolitan municipalities.<sup>23</sup>

Despite the lack of CCA strategies and DMPs, most municipalities made an effort to include CCA- and DRR-related actions in their IDPs. Specifically, all but seven municipalities mentioned actions related to either both CCA and DRR, CCA only or DRR only in their IDPs. The most mentioned actions were those related to DRR and were about increasing

the resilience of infrastructure. However, it is concerning that more than a third of the municipalities did not have any plans or actions to address climate change, especially considering the increasing frequency of extreme events in South Africa. The lack of proactive DRR actions in some IDPs may be attributed to the recent shift away from disaster risk management towards DRR when dealing with disasters.<sup>55,56</sup> The poor engagement with climate risks is reflected in a similar study in the Limpopo Province of South Africa, which also found limited discussion of adaptation mechanisms in local municipal IDPs.<sup>22</sup> Overall, considering our results and those from the study in the Limpopo Province, it is evident that more work is needed at the local municipal level to mainstream CCA and DRR in the IDPs.

In terms of the types of actions for CCA and DRR, most municipalities prioritised securing infrastructural facilities and buildings while paying little attention to addressing underlying social vulnerability. However, there are some municipalities that have highlighted that they are making efforts to include capacity building, economic development, insurance, and financial incentives for farmers in the areas they serve – actions which help to address social vulnerability. These actions are essential because the repercussions of the apartheid government left former homelands under-capacitated, including smallholder farmers. Furthermore, we found more CCA actions addressing social vulnerability in the former homeland areas of the Province, while in former white South Africa, these were mainly linked to DRR actions, reflecting the context somewhat. For example, economic development, capacity building, collaboration and participation, and awareness raising campaigns were only mentioned by municipalities in former homelands in relation to CCA. On the other hand, municipalities from the former white South Africa areas mentioned capacity building, collaboration and participation, and community engagement only in relation to DRR. Overall, most of the CCA- and DRR-related actions found in the IDPs and DMPs have been found in other studies. In Zambia, it was found that capacity building and awareness raising in communities were mentioned as important actions for engaging with CCA.<sup>1</sup>

Finally, we found no evidence of CCA and DRR integration in the reviewed IDPs. This suggests that the necessity for linking these two approaches may not have been fully realised by various municipal departments. Consequently, these approaches are still treated separately by local municipalities, despite the call for integration due to their synergies in terms of addressing social vulnerability and building resilience to climate risk. Moreover, the DRR function may be split between, or planned and implemented by, different departments working separately within a municipality. These findings reflect those found in Nicaraguan policies and regulations where the integration of CCA and DRR was almost non-existent due to the lack of official instruments and policy.<sup>2</sup> Overall, it is clear that South Africa needs to promulgate legal instruments and policies to capacitate local municipalities in mainstreaming and integrating CCA and DRR in order to reduce social vulnerability and build resilience in the face of climate change and resulting extreme events.

While this study provides novel insights into the ways in which local rural municipalities in two different socio-economic contexts in the Eastern Cape Province deal with CCA and DRR, it is not without limitations. First, not all local municipalities from the Eastern Cape Province were included in the study due to a lack of relevant documents on their websites. Second, some of the municipal websites were outdated, which limited the information we could access. Third, because municipalities are legally mandated to review and update their IDPs every 5 years, there were some variations in the years of the IDPs available. Finally, we acknowledge that, in analysing documents obtained from municipal websites, such documents may not provide a complete reflection of municipal actions on the ground in terms of CCA and DRR, particularly when the documents are only reviewed and updated every 5 years.

## Conclusions

Using a social vulnerability reduction and resilience building lens, this study has provided an analysis of how 20 local municipalities from two contrasting socio-economic contexts in the Eastern Cape Province of South Africa engage with CCA and DRR in their plans and strategies.

Our results demonstrate that, regardless of the differences in socio-economic contexts, the mainstreaming of CCA and DRR integration in Eastern Cape local municipalities leaves a lot of space for improvement. Specifically, there is a need for the South African government to support and motivate local municipalities to develop their CCA strategies and DMPs, and improve the integration of CCA and DRR in their IDPs. An important focus of such plans and strategies should be actions that address the underlying developmental and structural causes of social vulnerability, especially in the former homelands, and how resilience could be enhanced in the face of climate risk. Importantly, the effective CCA and DRR integration requires an integrated and collaborative effort between all stakeholders, and government levels, and their agencies.<sup>5</sup> As such, for local municipal plans and strategies to be effective in integrating CCA and DRR, support in terms of resources and guidelines from the higher tiers of government and relevant stakeholders will be paramount.

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## Data availability

Not applicable.

## Declaration of AI use

No AI tools were used in this study.

## Authors' contributions

PM.: Data collection, data analysis. B.N.: Data collection, data analysis. S.S.: Conceptualisation. All authors contributed to the written manuscript and read and approved the final manuscript.

## Competing interests

We have no competing interests to declare.

## References

1. Pilli-Sihvola K, Väättäinen-Chimpuku S. Defining climate change adaptation and disaster risk reduction policy integration: Evidence and recommendations from Zambia. *Int J Disaster Risk Reduct.* 2016;19:461–473. <https://doi.org/10.1016/j.ijdrr.2016.07.010>
2. Rivera C, Wamsler C. Integrating climate change adaptation, disaster risk reduction and urban planning: A review of Nicaraguan policies and regulations. *Int J Disaster Risk Reduct.* 2014;7:78–90. <https://doi.org/10.1016/j.ijdrr.2013.12.008>
3. Begum RA, Sarkar MSK, Jaafar AH, Pereira JJ. Toward conceptual frameworks for linking disaster risk reduction and climate change adaptation. *Int J Disaster Risk Reduct.* 2014;10(PA):362–373. <https://doi.org/10.1016/j.ijdrr.2014.10.011>
4. Djalante R, Thomalla F. Disaster risk reduction and climate change adaptation in Indonesia. *Int J Disaster Resil Built Environ.* 2012;3(2):166–180. <https://doi.org/10.1108/17595901211245260>
5. Forino G, Von Meding J, Brewer G, Van Niekerk D. Climate change adaptation and disaster risk reduction integration: Strategies, policies, and plans in three Australian Local Governments. *Int J Disaster Risk Reduct.* 2017;24:100–108. <https://doi.org/10.1016/j.ijdrr.2017.05.021>
6. Thomalla F, Downing T, Spanger-Sieffried E, Han G, Rockström J. Reducing hazard vulnerability: Towards a common approach between disaster risk reduction and climate adaptation. *Disasters.* 2006;30(1):39–48. <https://doi.org/10.1111/j.1467-9523.2006.00305.x>



7. Birkmann J, von Teichman K. Integrating disaster risk reduction and climate change adaptation: Key challenges-scales, knowledge, and norms. *Sustain Sci*. 2010;5(2):171–184. <https://doi.org/10.1007/s11625-010-0108-y>
8. Seidler R, Dietrich K, Schweizer S, Bawa KS, Choppe S, Zaman F, et al. Progress on integrating climate change adaptation and disaster risk reduction for sustainable development pathways in South Asia: Evidence from six research projects. *Int J Disaster Risk Reduct*. 2018;31:92–101. <https://doi.org/10.1016/j.ijdrr.2018.04.023>
9. United Nations Office for Disaster Risk Reduction (UNDRR). Integrating disaster risk reduction and climate change adaptation in the UN sustainable development cooperation framework. Geneva: UNDRR; 2020.
10. Intergovernmental Panel on Climate Change (IPCC). Managing the risks of extreme events and disasters to advance climate change adaptation – SREX summary for policymakers. In: Field C, Barros V, Stocker T, Qin D, Dokken D, Ebi K, et al., editors. A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press; 2012.
11. Pörtner HO, Roberts D, Tignor M, Poloczanska E, Mintenbeck K, Alegria A, et al., editors. Climate change 2022: Impacts, adaptation, and vulnerability. Cambridge, UK: Cambridge University Press; 2022.
12. Kelman I, Gaillard JC, Mercer J. Climate change's role in disaster risk reduction's future: Beyond vulnerability and resilience. *Int J Disaster Risk Sci*. 2015;6(1):21–27. <https://doi.org/10.1007/s13753-015-0038-5>
13. Busayo ET, Kalumba AM. Coastal climate change adaptation and disaster risk reduction: A review of policy, programme and practice for sustainable planning outcomes. *Sustainability*. 2020;16(12), Art. #6450. <https://doi.org/10.3390/su12166450>
14. Adger WN. Social and ecological resilience: Are they related? *Prog Hum Geogr*. 2000;3(24):347–364. <https://doi.org/10.1191/030913200701540465>
15. Lee JY, Van Zandt S. Housing tenure and social vulnerability to disasters: A review of the evidence. *J Plan Lit*. 2019;34(2):156–170. <https://doi.org/10.1177/0885412218812080>
16. Nemaokonde LD, Van Niekerk D. Enabling conditions for integrating government institutions for disaster risk reduction and climate change adaptation in the SADC region and beyond. *Risk Hazards Crisis Public Policy*. 2023;14:6–26. <https://doi.org/10.1002/rhc3.12246>
17. Nemaokonde LD, Van Niekerk D, Becker P, Khoza S. Perceived adverse effects of separating government institutions for disaster risk reduction and climate change adaptation within the Southern African Development Community member states. *Int J Disaster Risk Sci*. 2021;12:1–12. <https://doi.org/10.1007/s13753-020-00303-9>
18. Becker P, Hagelsteen M, Abrahamsson M. 'Too many mice make no lining for their nest' – Reasons and effects of parallel governmental structures for disaster risk reduction and climate change adaptation in southern Africa. *Jamba J Disaster Risk Stud*. 2021;13(1), Art. #a1041. <https://doi.org/10.4102/jamba.v13i1.1041>
19. Nemaokonde LD, Van Niekerk D. A normative model for integrating organisations for disaster risk reduction and climate change adaptation within SADC member states. *Disaster Prev Manag An Int J*. 2017;26:361–376. <http://doi.org/10.1108/DPM-03-2017-0066>
20. Nalau J, Handmer J, Dalesa M, Foster H, Edwards J, Kauhiona H, et al. The practice of integrating adaptation and disaster risk reduction in the south-west Pacific. *Clim Dev*. 2016;8:365–375. <https://doi.org/10.1080/17565529.2015.1064809>
21. Mall RK, Srivastava RK, Banerjee T, Mishra OP, Bhatt D, Sonkar G. Disaster risk reduction including climate change adaptation over South Asia: Challenges and ways forward. *Int J Disaster Risk Sci*. 2019;10:14–27. <https://doi.org/10.1007/s13753-018-0210-9>
22. Lethoko M. Inclusion of climate change strategies in municipal integrated development plans: A case from seven municipalities in Limpopo Province, South Africa. *Jamba*. 2015;8(3), Art. #a245. <https://doi.org/10.4102/jamba.v8i3.245>
23. Pasquini L, Ziervogel G, Cowling RM, Shearing C. What enables local governments to mainstream climate change adaptation? Lessons learned from two municipal case studies in the Western Cape, South Africa. *Clim Dev*. 2015;7(1):60–70. <https://doi.org/10.1080/17565529.2014.886994>
24. Matikincá P, Ziervogel G, Enqvist JP. Drought response impacts on household water use practices in Cape Town, South Africa. *Water Policy*. 2020;22(3):483–500. <https://doi.org/10.2166/wp.2020.169>
25. Ziervogel G. Unpacking the Cape Town drought: Lessons learned. Cape Town: African Centre for Cities; 2019. Available from: [https://www.africancentreforcities.net/wp-content/uploads/2019/02/Ziervogel-2019-Lessons-from-Cape-Town-Drought\\_A.pdf](https://www.africancentreforcities.net/wp-content/uploads/2019/02/Ziervogel-2019-Lessons-from-Cape-Town-Drought_A.pdf)
26. Pamela A, Thondhlana G, Ruwanza S. Persistent droughts and water scarcity: Households' perceptions and practices in Makhanda, South Africa. *Land*. 2021;10(6), Art. #593. <https://doi.org/10.3390/land10060593>
27. South African History Online. Apartheid and reactions to it [webpage on the Internet]. c2016 [cited 2017 Oct 02]. Available from: <http://www.sahistory.org.za/article/apartheid-and-reactions-it>
28. Hamann M, Tuinder V. Introducing the Eastern Cape: A quick guide to its history, diversity and future challenges. Stockholm: Stockholm University; 2012. Available from: <http://www.sapecs.org/wp-content/uploads/2013/11/Eastern-Cape-Background-Report.pdf>
29. Westaway A. Rural poverty in the Eastern Cape Province: Legacy of apartheid or consequence of contemporary segregationism? *Dev South Afr*. 2012;29(1):115–125. <https://doi.org/10.1080/0376835x.2012.645646>
30. Shackleton S, Luckert M. Changing livelihoods and landscapes in the rural Eastern Cape, South Africa: Past influences and future trajectories. *Land*. 2015;4(4):1060–1089. <https://doi.org/10.3390/land4041060>
31. Kepe T, Tessaro D. Trading-off: Rural food security and land rights in South Africa. *Land Use Policy*. 2014;36:267–274. <https://doi.org/10.1016/j.landusepol.2013.08.013>
32. Government of the Republic of South Africa. National climate change response white paper. Pretoria: Government Printer; 2011. Available from: [https://www.gov.za/sites/www.gov.za/files/national\\_climatechange\\_response\\_whitepaper0.pdf](https://www.gov.za/sites/www.gov.za/files/national_climatechange_response_whitepaper0.pdf)
33. Spiers MH. Barriers to and enablers of climate change adaptation in four South African municipalities, and implications for community based adaptation [PhD thesis]. Grahamstown: Rhodes University; 2015. <http://hdl.handle.net/10962/d1018913>
34. Santhia D, Shackleton S, Pereira T. Mainstreaming sustainable adaptation to climate change into municipal planning: An analysis from the Eastern Cape, South Africa. *Dev South Afr*. 2018;35(4):589–608. <https://doi.org/10.1080/0376835x.2018.1488583>
35. Municipal Systems Act No. 32 of 2000. Pretoria: Government of the Republic of South Africa; 2000. Available from: <https://www.preventionweb.net/publication/south-africa-national-climate-change-adaptation-strategy-2019>
36. Ruwanza S, Shackleton CM. Incorporation of environmental issues in South Africa's municipal Integrated Development Plans. *Int J Sustain Dev World Ecol*. 2016;23(1):28–39. <https://doi.org/10.1080/13504509.2015.1062161>
37. Disaster Management Amendment Act No. 16 of 2015. Pretoria: Government of the Republic of South Africa; 2015. Available from: [https://www.gov.za/sites/default/files/gcis\\_document/201512/39520act16of2015disastermanamendact.pdf](https://www.gov.za/sites/default/files/gcis_document/201512/39520act16of2015disastermanamendact.pdf)
38. Disaster Management Act No. 57 of 2002. Pretoria: Government of the Republic of South Africa; 2002. Available from: [https://www.cogta.gov.za/cgta\\_2016/wp-content/uploads/2016/06/DISASTER-MANAGEMENT-ACT.pdf](https://www.cogta.gov.za/cgta_2016/wp-content/uploads/2016/06/DISASTER-MANAGEMENT-ACT.pdf)
39. The Constitution of the Republic of South Africa [document on the Internet]. c1996 [cited 2023 Jul 24]. Available from: <https://www.justice.gov.za/legislation/constitution/saconstitution-web-eng.pdf>
40. The Government of the Republic of South Africa. Climate change bill [webpage on the Internet]. c2022 [cited 2024 Mar 10]. Available from: <https://www.parliament.gov.za/bill/2300773>
41. South African Department of Environmental Affairs. South Africa National Adaptation Strategy [webpage on the Internet]. c2019 [cited 2022 Apr 12]. Available from: <https://www.preventionweb.net/publication/south-africa-national-climate-change-adaptation-strategy-2019>
42. South African Department of Environmental Affairs. South Africa National Adaptation Strategy: Draft for comments [document on the Internet]. c2015 [cited 2017 Oct 14]. Available from: <https://www.environment.gov.za/sites/default/files/docs/nas2016.pdf>





43. Statistics South Africa. Census 2022 [webpage on the Internet]. c2022 [cited 2024 Jan 22]. Available from: <https://census.statssa.gov.za/#/province/2/2>
44. Le Roux A, Van Huyssteen E. The South African socio-economic and settlement landscape. In: South African vulnerability atlas. Pretoria: Department of Science and Technology; 2013. Available from: [https://www.dffe.gov.za/sites/default/files/docs/sarva\\_atlas.pdf](https://www.dffe.gov.za/sites/default/files/docs/sarva_atlas.pdf)
45. Htonl. Map of the municipalities in the Eastern Cape province of South Africa, with all municipalities named and district municipalities shaded different colours [image on the Internet]. c2016 [cited 2024 Jul 25]. Available from: [https://en.wikipedia.org/wiki/List\\_of\\_municipalities\\_in\\_the\\_Eastern\\_Cape#/media/File:Map\\_of\\_the\\_Eastern\\_Cape\\_with\\_municipalities\\_named\\_and\\_districts\\_shaded\\_\(2021\).svg](https://en.wikipedia.org/wiki/List_of_municipalities_in_the_Eastern_Cape#/media/File:Map_of_the_Eastern_Cape_with_municipalities_named_and_districts_shaded_(2021).svg)
46. Eastern Cape Department of Economic Development and Environmental Affairs. Eastern Cape climate change response strategy [webpage on the Internet]. c2011 [cited 2017 Oct 02]. Available from: [https://www.cityenergy.org.za/uploads/resource\\_182.pdf](https://www.cityenergy.org.za/uploads/resource_182.pdf)
47. Midgley G, Chapman R, Mukheibir P, Tadross M, Hewitson B, Wand S, et al. Impacts, vulnerability and adaptation in key South African sectors: An input into the Long Term Mitigation Scenarios Process. Cape Town: Energy Research Centre; 2007. <http://hdl.handle.net/11427/16760>
48. Mahlalela PT, Blamey RC, Hart NCG, Reason CJC. Drought in the Eastern Cape region of South Africa and trends in rainfall characteristics. *Clim Dyn*. 2020;55(9):2743–2759. <https://doi.org/10.1007/s00382-020-05413-0>
49. Municipal Demarcation Board. Section 21 maps and notices: EC – municipal demarcation board [webpage on the Internet]. c2017 [cited 2017 Oct 02]. Available from: <http://www.demarcation.org.za/site/section-26-dems-ec-4>
50. Shackleton CM, Gwedla N. The legacy effects of colonial and apartheid imprints on urban greening in South Africa: Spaces, species, and suitability. *Front Ecol Evol*. 2021;8, Art. #579813. <https://doi.org/10.3389/fevo.2020.579813>
51. Intsika Yethu Local Municipality. Intsika Yethu local municipality integrated development plan 2015–2016 [webpage on the Internet]. c2015 [cited 2017 Oct 20]. Available from: [http://www.intsikayethu.gov.za/sites/default/files/file\\_picker/1/IYM\\_IDP\\_Draft\\_2015-2016.pdf](http://www.intsikayethu.gov.za/sites/default/files/file_picker/1/IYM_IDP_Draft_2015-2016.pdf)
52. Ndlambe Municipality. Integrated Development Plan (IDP) 2017–2022 [webpage on the Internet]. c2017 [cited 2017 Oct 20]. Available from: [https://www.ndlambe.gov.za/index.php?option=com\\_docman&task=doc\\_view&gid=1764&tmpl=component&format=raw&Itemid=](https://www.ndlambe.gov.za/index.php?option=com_docman&task=doc_view&gid=1764&tmpl=component&format=raw&Itemid=)
53. Mbizana Local Municipality. Integrated Development Plan 2015–2016 review [webpage on the Internet]. c2016 [cited 2017 Oct 20]. Available from: <http://www.winniemlm.gov.za/wp-content/uploads/2022/06/WMM-LM-FINAL-IDP-2022-27.pdf>
54. Engcobo Local Municipality. Engcobo local municipality: Revised Integrated Development Plan 2013–2014 [webpage on the Internet]. c2014 [cited 2017 Oct 20]. Available from: [https://slideblast.com/engcobo-local-municipality-revised-integrated-development-plan-for-\\_596ccf941723ddcf122bbb80.html](https://slideblast.com/engcobo-local-municipality-revised-integrated-development-plan-for-_596ccf941723ddcf122bbb80.html)
55. Vermaak J, Van Niekerk D. Disaster risk reduction initiatives in South Africa. *Dev South Afr*. 2004;21(3):555–574. <https://doi.org/10.1080/0376835042000265487>
56. United Nations Office for Disaster Risk Reduction (UNDRR). UNISDR terminology on disaster risk reduction. Geneva: UNDRR; 2009.