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Impacts of COVID-19 on SDGs implementation and service delivery in South Africa

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As the world races towards the 2030 deadline on Sustainable Development Goals (SDGs) implementation, the COVID-19 pandemic posed significant setbacks on progress, particularly at local levels. This paper examines COVID-19's disruption of the implementation of SDGs and service delivery in South Africa, with a focus on Limpopo Province. The study focuses on perceptions from government employees (n = 191), households (n = 4,564), civil society organizations (n = 143), and agricultural communities (n = 68). Results show uneven impact of the pandemic across different SDGs. While all SDGs, except SDG14 (Life Below Water), were affected, six goals were especially hard hit: SDG1 (No Poverty), SDG2 (Zero Hunger), SDG3 (Good Health and Wellbeing), SDG4 (Quality Education), SDG8 (Decent Work), and SDG12 (Responsible Consumption and Production). The Limpopo Province, which grapples with high levels of poverty, unemployment, and inequality, faces additional hurdles in regaining its momentum toward SDG attainment. The study observes an urgent need for targeted interventions, revised strategies, and enhanced monitoring frameworks to ensure that the province, and South Africa at large, can make meaningful progress in the remaining years toward the 2030 Agenda. The work also reveals that without deliberate and scaled-up efforts, the province's path to sustainable development remains out of reach, exacerbating existing inequalities and development challenges.

KEYWORDS

COVID-19, SDGs, stakeholders, state governments, service delivery

1 Introduction

In September 2015, the United Nations commissioned the 2030 Agenda for Sustainable Development (AfSD), whose clarion call seeks to leave no one behind (United Nations, 2015). The 2030 AfSD expanded and refined the Millenium Development Goals (MDGs) agenda. Embedded in this 2030 AfSD are 17 Sustainable Development Goal (SDGs) that governments, including national, state, provincial and local needed to embrace. However, following the COVID-19 pandemic of 2020 (Estrada-Araoz et al., 2023; Kanyanda et al., 2021), all corners of the earth were negatively affected, rolling back the implementation of the SDGs by at least 3 years or more if the chain effect is considered. Safitri et al. (2021), observe that the pandemic stretched SDG3 (good health and wellbeing) far beyond, leading to significant setbacks for the attainment of many, if not all SDGs. In fact, there is no doubt and arguing that COVID-19 had significant negative impacts on progression towards the attainment of the 2030 AfSD (Hesselman et al., 2021; Li et al., 2023; Shulla et al., 2021; Yin et al., 2022).

The South African government identified synergies between the SDGs and its development trajectory expressed through the National Development Plan (NDP): Vison 2030 (Mthembu and Nhamo, 2021a). The NDP realises the triple challenge of poverty, unemployment and inequality, with the nexus of these challenges remaining a top priority for eradication. Discovering significant existing overlaps between the NDP and the SDGs meant that the

country had to continue addressing many of its developmental objectives, but with the renewed focus on addressing the SDGs targets and indicators. The three spheres of government namely: national, provincial and local[1] were brought to meeting places of SDGs localisation coordinated through the Presidency. This meant that all lower tier government spatial structures had to align with the national (and by default) global agenda focusing on attainment of the SDGs by 2030. At the national level, the SDGs implementation institutional framework involves the cabinet; Cabinet Cluster Committee; Inter-ministerial Committee on SDGs, Agenda 2063 and SADC-RISDP; Director-Generals National Steering Committee; and the Inter-Departmental Implementation Committee (Mthembu and Nhamo, 2021b). Below the Inter-Departmental Implementation Committee sits various working groups attending to specialised themes and topics. In addition, there is the Presidential SDGs Coordinating Council and the National Sustainable Development Stakeholders Forum. Appropriate institutional frameworks also exist at provincial level. While provinces in South Africa could be equated to States in other countries, these do not have independent status although they have concurrent responsibilities with national departments and district municipalities.

The Limpopo Provincial Government embraced the SDGs, with challenges observed from the young population, meaning there was a need to prioritise SDG4, among other SDGs (Limpopo Provincial Government, 2018). The province also ranks among the poorest from the nine the country has, making it imperative that matters of poverty (SDG1) and inequality (SDG10), as well as job creation (SDG8) be addressed and remain on the radar.

While significant work has focused on how the national governments responded to the COVID-19 pandemic, and how movement in that direction slowed down the implementation of the SDGs (Bardier and Burgess, 2020; Hesselman et al., 2021; Li et al., 2023), a gap in knowledge remains. The gap is on how other sub-national institutions like provinces and municipalities in South Africa got affected and/or got involved. To this end, using this paper sets an objective to explore the multifaceted impacts of COVID-19 on the implementation of the SDGs and service delivery in the Limpopo Provincial Government. The Limpopo Government in the case, is understood to also include the provincial government, as well as district and local municipalities. By examining the pandemic's effect on governance structures, policy responses, and institutional capacities, the study aims to provide a comprehensive understanding of the challenges and opportunities for advancing sustainable development in the post-pandemic era. Through an analysis of data from multiple sectors, this research highlights critical lessons for building resilience in service delivery and ensuring the recovery of SDG progress in the country.

2 Literature survey: impact of COVID-19 on the SDGs

Martín-Blanco et al. (2021) highlight that COVID-19 had significant impacts on all countries and on almost every SDG. This view is supported by Wang and Huang (2021), whose cluster analysis unequivocally revealed that the pandemic brought negative effects on all the 17 SDGs. COVID-19 is also acknowledged by Fenner and Gernev (2021) as having brought huge uncertainties in attaining the 2030 AfSD. Similar work by Elsamadony et al. (2022), which examined the global quantitative impact of COVID-19 on the 17 SDGs using 65 proxy indicators across 72 countries had interesting findings. The study reflected adverse impacts on SDG5 (Gender), SDG7 (Sustainable Energy), SDG8 (Decent Work), SDG11 (Sustainable Cities and Communities), and SDG12 (Sustainable Consumption and Production). Fenner and Gernev (2021) proceeded to explore how COVID-19 could impact the attainment of targets associated with four 'foundational' SDGs. These foundational SDGs are identified as SDG1 (No Poverty), SDG3, SDG14 (Life Below Water, now associated with the blue and/or ocean economy) and SDG15 (Life on Land). Already, the findings start to reveal cross-cutting impacts on the entire SDGs spectrum. Mubvuma et al. (2023) also found that COVID-19 affected the implementation of SDG1 (No Poverty), SDG2 (Zero Hunger), SDG3 (Good Health and Wellbeing) and SDG6 (Clean Water and Sanitation) in Zimbabwe. Through the use of an adaptive multi-regional input–output model, Li et al. (2023) find that COVID-19 responses reduced the overall progress towards the SDGs by 8.2%. Socio-economic sustainability was reduced by about 18.1%, with environmental sustainability having improved by about 5.1% compared with the business-as-usual scenario. In addition, developing countries emerged to be suffering greater decline in overall sustainability (9.7%), compared to 7.1% from the developed nations.

Shulla et al. (2021) implore us to understand the effects of COVID-19 on the SDGs from an interdependency perspective. This implies that while COVID-19 directly impacted on SDG3 (Heath and Wellbeing) (United Nations, 2015), it also affected other SDGs. Investigating the Zimbabwean situation, Chapungu et al. (2023) reiterated that the pandemic had pushed all the health management systems to their edges. This has consequential effects on the implementation of several SDGs as well as service delivery at all government levels. Shulla et al. (2021) discovered COVID-19 had effects on SDG3, SDG4 (Quality Education), SDG8 (Decent Work and Economic Growth), DG12 (Consumption & Production) and SDG13 (Climate Action). Further analysis revealed that additional spillover effects remained potential obstacles for the attainment of SDG5 (Gender Equality), SDG9 (Infrastructure and Innovation), SDG10 (Reducing Inequalities), SDG17 (partnerships for the goals) and SDG11 (sustainable cities). While the synergies are evident, Bardier and Burgess (2020) bring up the challenge associated with the developed countries of the northern hemisphere of being able, but not willing to finance the SDGs agenda in the developing countries of the southern hemisphere.

Mastropietro et al. (2020), looked at emergency measures aimed at cushioning energy (SDG7) users during the pandemic. The work focused on different spatial levels from the local government, through state, county, provincial and national. The authors are of the view that COVID-19, particularly the hard lockdowns, exacerbated energy poverty and insecurity across the world. To this end, many governments introduced policies to address the gap. Several measures emerged, including banning disconnections, deferring energy bills, and putting in place payment extension plans, enhanced energy assistance programmes, energy bill reduction and/or complete cancellation, measures for commercial and small industrial activities.

1 Local government can further be divided into three levels of metropolitan, district, and local municipalities.

There were further measures regarding the creation of funds and other energy support measures for suppliers. Detailed presentations on the measures highlighted can be found from the cited works.

Focusing on the same subject of energy poverty under the pandemic, Hesselman et al. (2021) identify more than 380 emergency measures instituted in more than 120 countries in both the global north and south. The emergency measures further reveal how the world has failed in the rights to energy space and universal access as enshrined in SDG7. The authors were touched by the fact the emergency measures mainly followed defined consumers. Such consumers included those in conventional energy supply systems like on-grid, off-grid, regulated, or non-regulated, post-paid or prepaid. Regarding fuels, only specific fuels fell under the emergency measures. Furthermore, there seemed to be a lack of attention to renewable off-grid energy services, a perspective that poured cold water on the green recovery during and post COVID-19.

Responding to the call to re-think and revise the targets of the SDGs in the wake of COVID-19, Ottersen and Engebretsen (2020) acknowledge that there was a real shock into the system. However, the authors are of the view that the pandemic provided a new impetus for the world to move even quicker towards resourcing the 2030 AfSD. In their own words, "Rather than calling for a revision of the SDGs, COVID-19 should be seen as a catalyst for progress … By its very nature, a pandemic teaches that no one should be left behind and that no one is safe until everyone is safe." (Ottersen and Engebretsen, 2020, p. 1672). In line with this, Coyle et al. (2021) noted that the pandemic led to important insights for health provision which have great potential in enhancing high performance post-COVID-19. Troisi et al. (2022) observed a COVID-19 driven reorganization of healthcare procedures that resulted in more efficient use of resources, both human and otherwise, which in the post-crisis period could lead to faster achievement of the 2030 Agenda goals. Troisi and Alfano (2022) claim that COVID-19 enhanced adaptability by prompting more decisive changes in governance structures, thereby reducing the rigidity that characterized earlier phases. Besides contributing to SDG3, COVID-19 triggered action which resulted in the improvement in other SDGs. For example, Chapungu et al. (2022) saw a COVID-19 driven opportunity to advance SDG13 through a reduction in emissions and advances in renewable energy technologies.

Since the focus province of Limpopo is predominantly rural and agricultural, there is a need to spare few lines to review the impacts of COVID-19 on the attainment of SDG2 and others closely associated with it. Stephens et al. (2020), identify few COVID-19 disruption areas from the agricultural sector namely: food security, labour availability, farm system resilience and agricultural systems connectivity. All the highlighted impact areas were as a result of stay home regulations under hard lockdowns. In India, lockdowns led to massive reverse migration with workers returning to their home regions (Singh et al., 2020). Such migrant labourers provide the agricultural workforce in the key agricultural states of Punjab and Haryana in Northwest India, and disturbances in rice-wheat cropping cycles led to significant losses. From the Caribbean, Blazy et al. (2021), raise that the key impacts on the agricultural sector included drops in income and production due to difficulties in marketing as conventional channels diminished from lockdowns. There were also challenges in managing farming as there was reduced access to inputs and labour. However, to counter the risks, farmers adapted to be more self-sufficient. Such measures included the reduction in the size of cultivated areas and looking for new short marketing channels. Farmers further diversified their production and reorientation towards supplying the local market. Reduced income (SDG8), new styles of consumption, new poverties and inequalities (SDG10) and changes in nutritional composition of the diets (SDG3) were some of the short-term effects of COVID-19 in Italy (Mastronardi et al., 2021).

Yin et al. (2022), take us to the food, energy, and water (FEW) nexus, bringing onboard the water (SDG6) element from what has been presented so far (Zhao et al., 2022). In drawing solutions guiding the FEW to recover from COVID-19, Yin et al. (2022), use 164 FEW-related SDG acceleration actions with several key solutions emerging. The solutions include building and/or upgrading FEW infrastructure, nature-based contribution to the FEW nexus, embracing and developing digital technologies, and promoting community production and changing lifestyles. However, while all SDGs were impacted in one way or the other, Elavarasan et al. (2022) single out SDG2 and SDG8 as the most impacted.

Focusing on the African continent, Ekwebelem et al. (2021), portray an already existing layer of challenges retarding progress prior to COVID-19, an argument supported by Zhao et al. (2022) from their studies elsewhere. In Ekwebelem et al.'s (2021) view, the negative impacts of the pandemic leading to "exacerbated hunger, poor health care, poor educational systems, poverty, and lack of potable water and sanitation" (p. 457). Aggravated by the global recession emanating from COVID-19, the continent's ability to attain the SDGs (SDGs) in the post-pandemic era has been questioned. In assessing threatened SDGs, it emerged that SDGs1–4, SDG5 SDG6, SDG8, SDG10, as well as SDGs16 (peace, justice and strong institutions) and SDG17 were threatened. Specific targets were also identified falling under the said SDGs including (United Nations, 2015, p. 14; Ekwebelem et al., 2021, p. 458):

- Target 1.2: halve proportion of people living in poverty by 2030,
- Target 1.4: provide equal access to basic service,
- Target 2.3: double agricultural productivity and incomes of small-scale food producers,
- Target 3.8: achieve universal health coverage,
- Target 4.1: provide free, equitable, and quality education for all children,
- Target 6.1: give access to safe and affordable drinking water for all,
- Target 8.1: sustain *per capita* economic growth,
- Target 10.1: sustain above-average income growth of the bottom 40% of the population,
- Target 16.1: reduce all forms of violence and related deaths everywhere, and.
- Target 17.2: developed countries should commit at least 0.7% of gross national income in overseas aid for developing and 0.2% to least-developed nations.

The findings of Ekwebelem et al. (2021) are corroborated by Odey et al. (2021), who noted that since 2015, Africa had made significant progress, particularly in SDG5 (Gender Equality), SDG13 (Climate Action), and SDG15 (Life on Land). Fagbemi (2021) further highlights the challenges posed by COVID-19 in achieving the SDGs in Nigeria. The pandemic negatively impacted various critical socio-economic sectors, including education, infrastructure development, and employment, across all spatial levels. For instance, Chazireni et al. (2023) report that COVID-19 worsened the factors contributing to

unemployment, which directly affects progress on several SDGs. This study seeks to expand the existing global literature through exploring the multifaceted impacts of the COVID-19 pandemic in the Limpopo province of South Africa.

3 Materials and methods

3.1 Study area

This study was conducted in Limpopo province of South Africa, which lies in the northern part of the country as shown in Figure 1.

The province comprises a vast Lowveld plain, which is divided by many mountain ranges that rise from the Highveld plateau (Tikkanen, 2023). The majority of black inhabitants in the province's rural parts work as migrants or engage in subsistence farming. In addition, the province grows tea, tobacco, citrus fruits, potatoes, corn (maize), and peanuts (groundnuts). Sheep and goats are herded, and breeding cattle is widespread. Economically, the province is regarded as the poorest province in South Africa, making it more susceptible to global pandemics than other provinces.

3.2 Sampling

The study employed a combination of non-probability sampling techniques, specifically purposive and census sampling methods, to select participants. The initial impetus for the research arose from an invitation extended by the Government of Limpopo (GoL) in October 2022 to assess the impact of COVID-19 in the province. Consequently, the choice of Limpopo Province as the study area was driven by a need-based selection, responding directly to the request from provincial authorities. To comprehensively analyse the pandemic's impact across both rural and urban settings, the Capricorn District Municipality was strategically selected due to its mixed geographic characteristics, encompassing both urban and rural localities. Within this district, the Polokwane Local Municipality was purposefully chosen as the urban study site, given its status as the provincial capital, while the Molemole Local Municipality was selected as the rural study site due to its proximity to Polokwane, facilitating logistical feasibility and comparative analysis between rural and urban contexts.

Although this sampling strategy provides an in-depth understanding of the COVID-19 impact within the selected areas, it inherently limits the generalizability of the findings to the broader Limpopo Province due to its subjective nature. Nonetheless, it offers a robust representation of the pandemic's effects in the specific municipalities under investigation.

3.3 Research design and data collection

A mixed-methods research design was employed, integrating four distinct surveys alongside document analysis and key informant interviews. Figure 2 shows the specific procedures followed in implementing the selected methodological framework.

The adoption of surveys to assess public sector responses to COVID-19 is substantiated by Schuster et al. (2020), who advocate for their efficacy in capturing perceptual and behavioural insights within governmental settings. This methodological approach is further validated by its successful application in related studies, such as those by Wang and Huang (2021). The primary survey targeted perceptions of government employees ($n = 194$), providing a foundational dataset for analysis. Additionally, household ($n = 4{,}564$), civil society

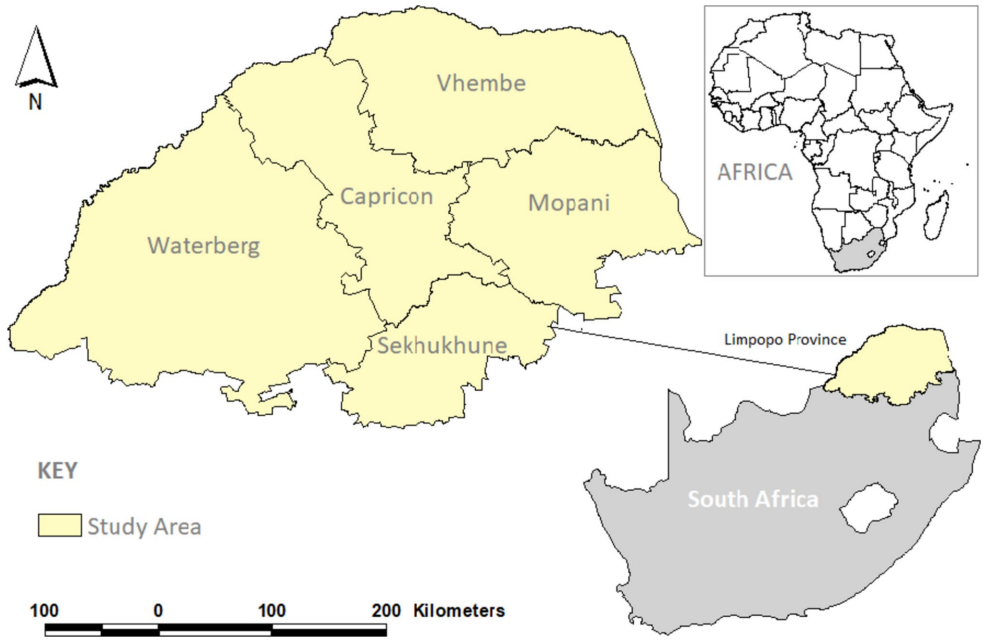

FIGURE 1
Geographic location of Limpopo province.

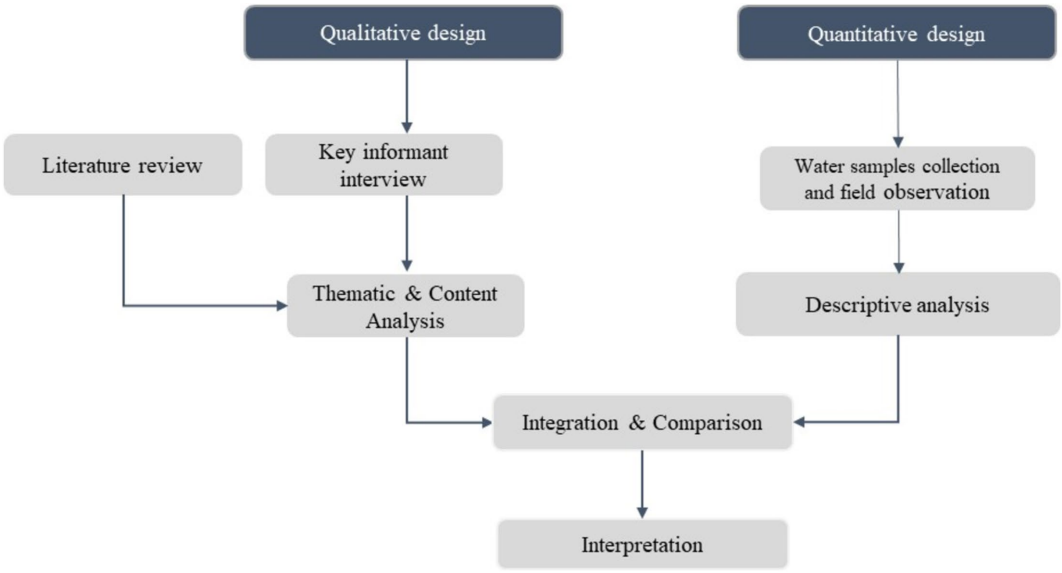

FIGURE 2
Mixed methods research design adopted for the study. Modified from Chapungu and Nhamo (2024).

organizations ($n = 149$), and the agricultural sector surveys ($n = 68$) were conducted to obtain comprehensive datasets that would lead to the understanding of SDGs implementation amid COVID-19. The survey technique was particularly attractive to the researchers given its extensive utilisation in global contexts, as indicated by the aforementioned studies. Complementing the primary data, secondary data sources, including policy documents and academic publications were reviewed to explore the implications of COVID-19 on Sustainable Development Goals (SDGs) implementation and public service delivery. This use of secondary data is consistent with established research practices observed in studies by Zindi and Shava (2022) and Zhao et al. (2022).

The main survey on perceptions of government and municipal officials regarding service delivery and SDG implementation included questions on standard demographic information, the effectiveness of various institutions in managing COVID-19 interventions, the impact of the pandemic on officials' well-being, and its effects on SDGs and service delivery aligned with the National Development Plan Vision 2030. In addition, triangulation questions were incorporated into subsidiary surveys, with responses used to support emerging findings from the main survey and the discussion section. Key informant interviews provided further in-depth data that could not be obtained through the predominantly closed-ended survey questions. Relevant documents, including Limpopo Development Plan (2020–2025) and the Reconstruction and Economic Recovery Plan as key provincial frameworks guiding the response to COVID-19 were also used as data sources.

The fieldwork took place from October to 2022 to March 2023, with survey questions uploaded on an online platform called QuestionPro. Since over 30 filed enumerators had to be employed, training was done prior to embarking on data generation. The training involved theory and on the ground pilot testing of research instruments, ensuring that the instruments generated the intended data. To enhance response rates, the surveys were administered face-to-face, both on and offline. The use of QuestionPro had added advantages in that generated data come with processed descriptive statistics, which makes writing easier.

The work received Ethics Clearance granted by the Limpopo Government Research Ethics Committee on 20 July 2022 for Research Project No. LPREC/35/2022. The Limpopo Provincial Research Ethics Committee (LPREC) is registered with National Health Research Council (NHREC) Registration Number REC-111513-038.

4 Presentation of key findings

This section comes in three sub-sections namely: the presentation of general demographics from the main and three other complementary surveys, COVID-19 impact on SDGs implementation, and COVID-19 impacts on conventional service delivery in the Limpopo Province.

4.1 General demographics

Table 1 shows the demographic profile for survey respondents from government employees, civil society organisations and agricultural community categories.

As shown in Table 1, the main survey used to assess COVID-19 impact on SDGs implementation and service delivery in the Limpopo Province was for government employees ($n = 191$). From those surveyed, the bulk of the respondents were middle managers, taking up 40.84% of the share. Regarding employment status, up to 87.56% of those completing the survey were permanently employed. This was followed by 6.74% of those in fixed term contracts, 3.11% who were part-time, 2.07% temporary full-time and those who indicated 'other' at 0.52%. From the agriculture survey ($n = 68$), 52.94% of the respondents were small scale commercial, 26.47% large scale commercial, 8.82% fell under the category communal and/or subsistence farmers, with 4.41% being urban backyard farmers and

TABLE 1 Demographic profiles of respondents.

Category	Description	Count	%	Missing: count and (percentage)
Government employees	Top management	8	4.19	
	Middle management	78	40.84	
	Supervisory level	29	15.18	
	Shopfloor level	20	10.47	
	General hand	13	6.81	
	Other	43	22.51	
	Total	191	100.00	3 (1.55)
	Permanent	169	89.89	
	Part time	13	6.91	
	Fixed term	6	3.19	
	Total	188	100.00	
Civil society organisations	Top management	20	13.99	
	Middle management	15	10.49	
	Supervisory level	15	10.49	
	Shopfloor level	14	9.79	
	General hand	57	39.86	
	Other	22	15.38	
	Total	143	100.00	0 (0.0)
	Permanent	78	57.78	
	Fixed term	29	21.48	
	Part time	11	8.15	
	Temp full time	14	10.37	
	Other	3	2.22	
	Total	135	100.00	8 (5.59)
Agriculture	Small scale farmers	36	52.94	
	Large scale farmers	18	26.47	
	Communal/ subsistence	6	8.82	
	Urban backyard	3	4.41	
	Other	5	7.35	
	Total	68	100.00	0 (0.0)

7.35% in the 'other' group. Most of the respondents had been farming for 6–10 years, with 14.71% engaged for more than 20 years, 11.78% involved for 11–15 years, and 4.41% with 16–20 years of experience. The remaining 33.82% were engaged for 1–5 years. Furthermore, of the farmers surveyed, the majority were doing crops (50.93%), followed by those practicing mixed farming (12.96%), and those in livestock (16.67%). Poultry took up 13.89%, with fruit and/or plantation and game taking 2.78% and 0.935, respectively. The remaining 1.85% went to 'other'.

As for the household survey ($n = 4,564$), the majority of the respondents (19.47%) were aged 18–29 years. An estimated 17.88% were in the 30–39 years age cohort, 17.09% were aged 60–69, with 19.95% falling between 50 and 59 years, while 15.33% were in the 40–49 years category. Those over 70+ years comprised 13.93% of the respondents, with the remaining 0.35% wishing not to disclose their age group. Regarding gender, 66.25% of those surveyed were females, 33.68% male and 0.07% wished not to disclose their gender. The bulk of the households had 3–4 people (33% of the respondents), followed by those with 5–6 people (27%), 1–2 people (21.07%) and those with seven or more people sitting at 18.29% of the respondents.

The CSO survey ($n = 143$) had 58.16% of the respondents being permanently employed in the sector, 20.57% being on fixed contracts, with 11.35% in temporary full-time positions. Part-timers comprised 7.8%, and the remaining 2.13% was defined by the 'other' category. Figure 3 reveals the nature of organisation the respondents came from. The CSOs became a target of our surveys given that they are heavily involved in SDGs implementation and service delivery at various spatial scales in the Limpopo Province. The key interest was on how budgets evolved in response to the COVID-19 pandemic. From the CSOs that took part in the survey, most of the respondents were from self-help associations (38.1%), followed by 27.89% of those that indicated were professional organisations. While the 'other' category took up 21.05, 6.8% of the respondents came from faith-based organisations, with another 6.12% of the respondents being from professional associations. No trade unions, veterans' associations or political entities formed part of the sample. The CSO survey revealed that these agents of change were active in several areas cutting across the SDGs spectrum like education, community safety, environment, gender, health care, human rights, water and sanitation, poverty alleviation and many more (Figure 3).

Given that 78% of the respondents from the CSOs had worked in province for between six and more than 20 years, only 22% of the responding representatives had been in the province for less than 6 years. This presents a scenario in which these CSOs are part and parcel of the developmental, and by default SDGs implementation and service delivery programme. Asked to rate their capacity at the time of the survey, only 32.41% of the respondents said they had reached pre-pandemic levels. An estimated 24.14% of respondents revealed 25% capacity of pre-COVID-19, with 22.07% saying they were at 50% capacity and the remaining 21.38% of the respondents revealing their entities had reached 75% of pre-COVID-19 capacity. The scenarios being painted show that there is some way before the Limpopo Provincial government and partners get back to full capacity in SDGs implementation and service delivery.

4.2 COVID-19 impact on SDGs implementation

Since much of the literature indicated that all the SDGs were in one way or another, impacted by COVID-19, and from the United Nations' own understanding, all SDGs are linked (United Nations, 2015), respondents were requested to evaluate the impacts on all SDGs, apart from SDG14. SDG14 was excluded given that the

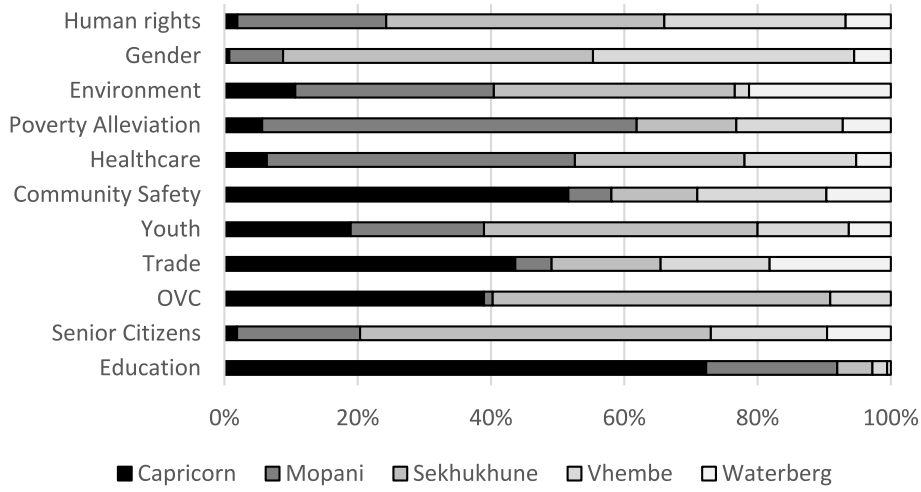

FIGURE 3
Thematic focus areas of surveyed CSOs.

Limpopo Province is landlocked. The government officials had to rank the severity of COVID-19 impact on SDGs implementation (Table 2).

First, the analysis divided the SDGs based on Boar et al.'s (2020) categories of social, economic, and environmental. Thus, SDGs8, 9, 10, and 12 were classified as economic, SDGs1, 2, 3, 4, 5, 7, 11, and 16 as social while SDGs6, 13, and 15 were classified as environmental. It emerged that, economic SDGs were the most affected by the COVOD-19 pandemic, with an average impact score 7.93. Social SDGs were the second most affected, with an average impact score of 7.85 while environmental SDGs were the least affected, with an average impact score of 7.1. A Kruskall Wallis test revealed that there is a significant ($p = 0.000$; $\alpha = 0.05$) difference on the level of impact for the 3 SDGs categories. Figure 4 shows the differences amongst the SDGs classes based on Kruskall Wallice test.

As shown in Figure 4, while significant differences exist between the impact of COVID-19 on environmental and social SDGs as well as between environmental and economic SDGs, there is no significant ($p = 0.300$; $\alpha = 0.05$) difference between social and economic SDGs. Overall, the results show that COVID-19 impacted every SDG. Figure 5 provides further details regarding the impacts of COVID-19 on each SDG.

From the findings, it emerged that the top five severely impacted SDGs were SDG1 (Ending Poverty), SDG8 (Decent Work), SDG4 (Quality education), SDG3 (Health and Wellbeing), and SDG2 (Zero hunger). The least five SDGs impacted were SDG15 (Life on Land), SDG13 (Climate Change), SDG7 (Energy), SDG5 (Gender) and SDG16 (Peace and Security).

While the percentage of respondents was very high ranging from 70.06–90% across the SDGs, the top five impacted SDGs were SDG4, SDG3, SDG1, SDG8 and SDG12 (Sustainable Consumption and Production). The ranking was very close to the those indicated as being severely impacted, with only SDG8 now taking position 6. The least five SDGs impacted were SDG15, SDG13, SDG5, SDG7 and SDG16. These remained almost unchanged, apart from an exchange in positions between SDG5 and SDG7. This finding brings some validity in terms of the responses as both sets of the top and bottom five remained almost the same. Overall, as shown in Table 2, very few respondents indicated that there was no impact on the SDGs and also that they were not sure of the impacts.

Given the role played by agriculture (SDG2) in the Limpopo Province, a separate survey ($n = 68$) was pitched to assess some of the critical matters emanating from COVID-19. The respondents were asked to indicate from eight options, activities that were negatively impacted by COVID-19. The top three activities negatively disrupted by the pandemic turned out to be income from farming (22.86%), access to markets (22.38%) and input supplies (20%). Additional details are reflected in Figure 6.

However, while respondents (16.18%) revealed that at some point their activities completely shut down, 26.47% said operations were moderately scaled down, with 13.24% indicating there were minimal disruptions. The majority (44.12%) revealed that operations continued as usual. In addition, the farmers were requested to indicate if they received government support to mitigate the impacts of COVID-19. The majority (56.72%) said they did not, with 43.28% indicating otherwise. Those that received financial support from government got R50,000[2] or less (60% of the respondents), R50,000-R100,000 (6.67%) and more than R200,000 (3.33%). On supply chain disruptions, in emerged that the increased cost of inputs was at the top (39.17% of respondents), followed by inefficient and unreliable transport systems (27.5%), then unavailability of specific inputs (23.33%) and input suppliers affected by COVID-19 induced barriers. Lost farm labour (SDG8) was also identified by 36.44% of the respondents as one of the short to long-term impacts of COVID-19. The respondents (42.65%) were also of the view that women (SDG5) and other vulnerable groups were impacted more by COPVID-19. This was in contrast to 47.06% and the 10.29% that remained neutral in their evaluation.

Additional insights from the household survey show that 41.48% of the respondents experienced drastic price increases on food stuffs. A further 43.74% of respondents experienced price increases. Altogether, 85.22% of respondents were in the affirmative regarding

2 The USD to ZAR exchange rate averaged $1=ZAR 19 in January 2023.

TABLE 2 Impact of COVID-19 on SDGs.

Statement	Variable	Severely Impacted	Impacted	Moderately Impacted	Stayed Unchanged	Not Sure	Overall
Reducing Poverty (SDG1)	Responses	125	34	11	9	12	191
	Percentage	65,45%	17,80%	5,76%	4,71%	6,28%	100,00%
Zero Hunger (SDG2)	Responses	88	58	15	9	19	189
	Percentage	46,56%	30,69%	7,94%	4,76%	10,05%	100,00%
Good Health and Well-being (SDG3)	Responses	98	56	17	9	11	191
	Percentage	51,31%	29,32%	8,90%	4,71%	5,76%	100,00%
Quality Education (SDG4)	Responses	103	50	18	8	11	190
	Percentage	54,21%	26,32%	9,47%	4,21%	5,79%	100,00%
Gender Equality (SDG5)	Responses	67	57	18	20	28	190
	Percentage	35,26%	30,00%	9,47%	10,53%	14,74%	100,00%
Clean Water and Sanitation (SDG6)	Responses	73	56	25	17	18	189
	Percentage	38,62%	29,63%	13,23%	8,99%	9,52%	100,00%
Affordable Energy (SDG7)	Responses	62	62	17	31	16	188
	Percentage	32,98%	32,98%	9,04%	16,49%	8,51%	100,00%
Decent Work and Economic Growth (SDG8)	Responses	108	50	10	10	11	189
	Percentage	57,14%	26,46%	5,29%	5,29%	5,82%	100,00%
Industry, Innovation and Infrastructure (SDG9)	Responses	82	60	15	14	19	190
	Percentage	43,16%	31,58%	7,89%	7,37%	10,00%	100,00%
Reduce Inequality (SDG10)	Responses	77	52	21	14	25	189
	Percentage	40,74%	27,51%	11,11%	7,41%	13,23%	100,00%
Making Cities and Communities Sustainable (SDG11)	Responses	83	60	9	15	21	188
	Percentage	44,15%	31,91%	4,79%	7,98%	11,17%	100,00%
Responsible Consumption and Production (SDG12)	Responses	78	73	11	10	17	189
	Percentage	41,27%	38,62%	5,82%	5,29%	8,99%	100,00%
Climate Change Action (SDG13)	Responses	59	56	23	21	29	188
	Percentage	31,38%	29,79%	12,23%	11,17%	15,43%	100,00%
Life on Land (Biodiversity) (SDG15)	Responses	55	56	20	24	32	187
	Percentage	29,41%	29,95%	10,70%	12,83%	17,11%	100,00%
Peace, Justice and Strong Institutions (SDG16)	Responses	71	57	19	15	27	189
	Percentage	37,57%	30,16%	10,05%	7,94%	14,29%	100,00%
Partnerships (SDG17)	Responses	71	52	24	21	18	186
	Percentage	38,17%	27,96%	12,90%	11,29%	9,68%	100,00%

Light colour denotes the minimum values, and darkest colour denotes the maximum values.

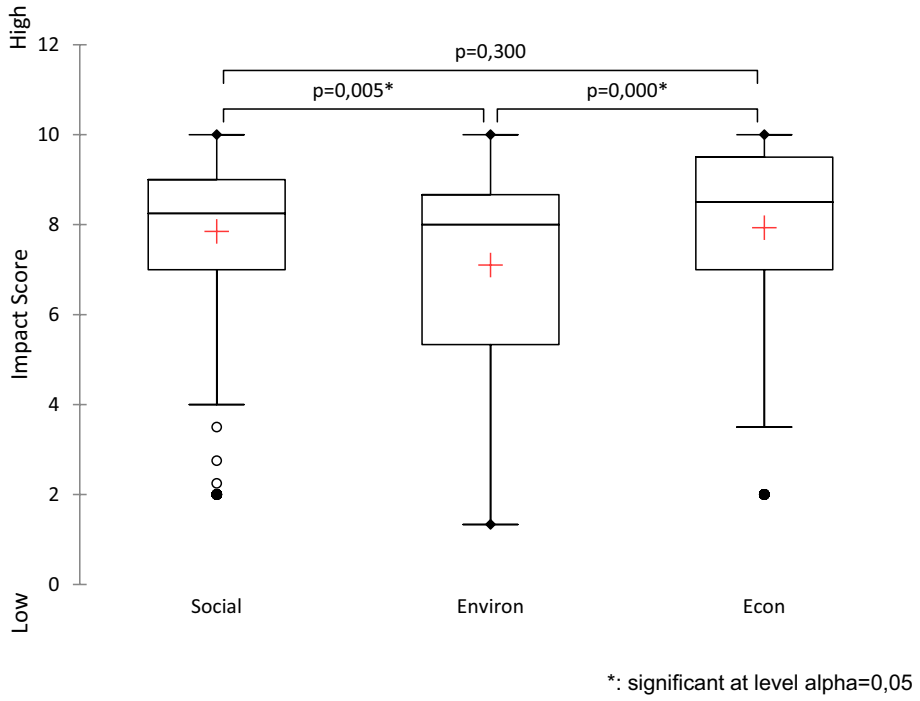

FIGURE 4
Differences in the COVID-19 impact scores for the 3 SDGs categories.

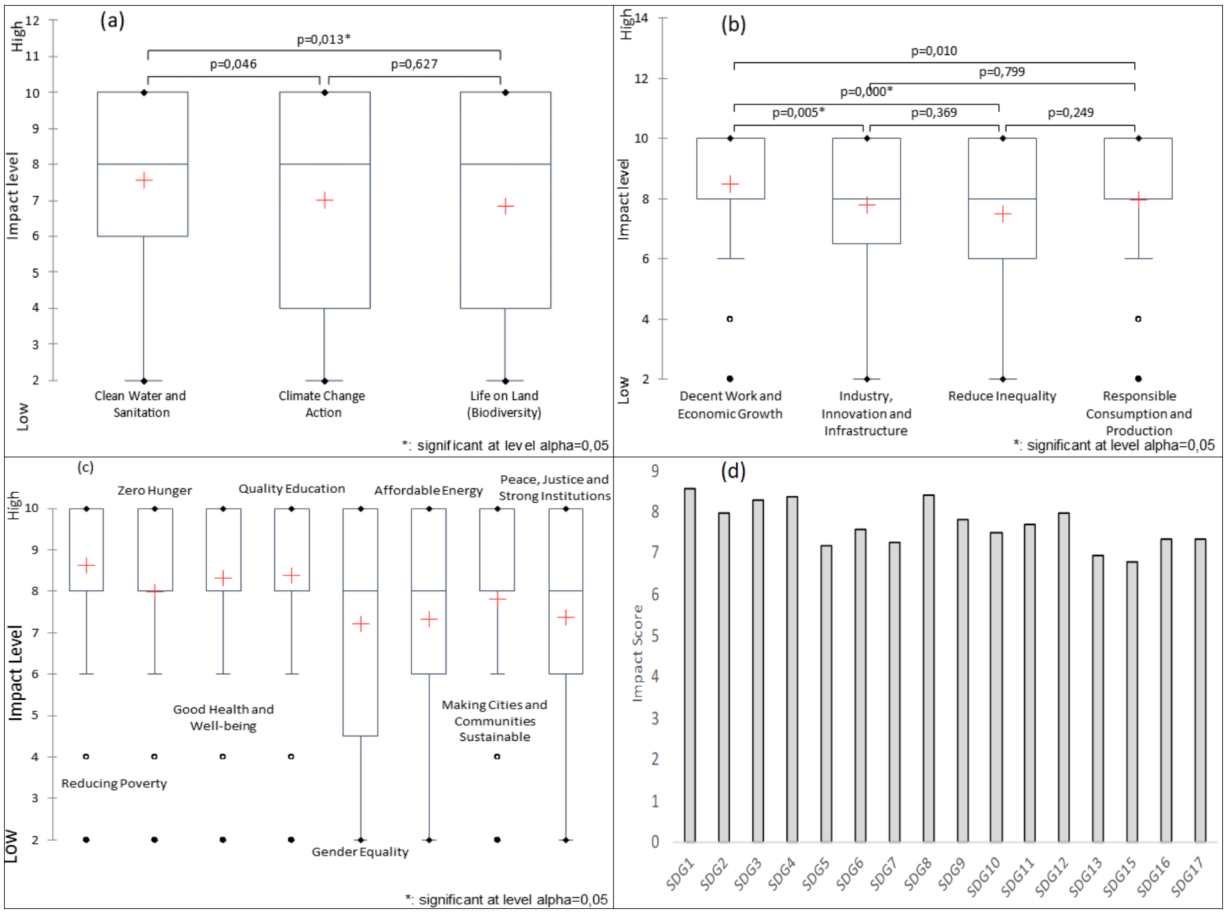

FIGURE 5
COVID-19 impact level for all SDGs: environmental SDGs (a), economic SDG (b) and social SDGs (c). (d) Shows the average impact scores for each SDG.

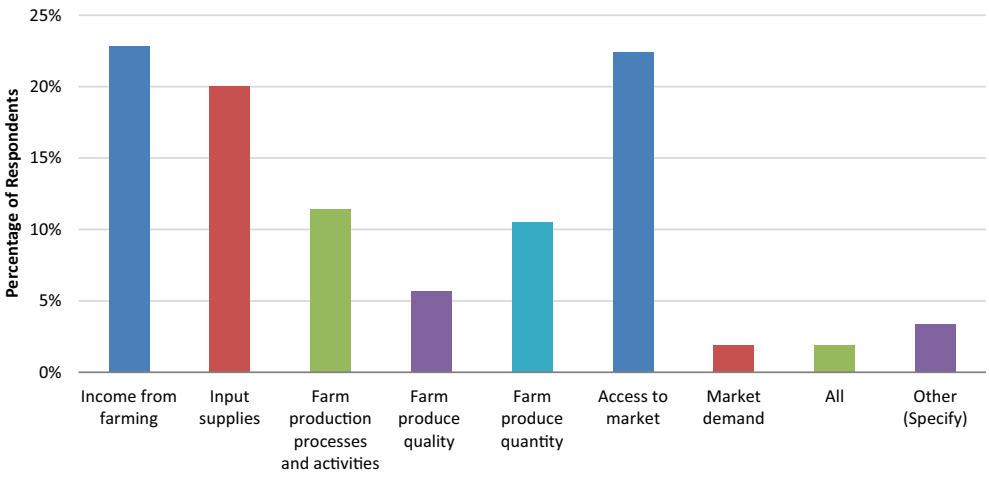

FIGURE 6
Impacts of COVID-19 on farming (SDG2).

food price increases. Only 13.2% of those responding said food prices stayed the same, drastically decreased (0.09%), decreased (0.26%) or were not sure (1.23%). While the government had to supplement food supply, only 29.4% of those surveyed confirmed they became part of the programme. An estimated 58.18% said they were not, with the remainder (12.43%) not sure of their status.

Probed if the food parcels alleviated hunger in the receiving households, only 22.54% indicated it did, with the majority (77.46%) denying it. The situation remained dare 4 years into COVID-19, with 70.3% of the responding households' representatives indicating they still needed relief, while 25.51% said they did not. Only 4.19% of the respondents were not sure. In fact, those that indicated they needed food parcels were in the majority (78.05%) and said they needed it more than a year.

4.3 COVID-19 and impacts on traditional service delivery systems

Given that there are conventional critical service sectors (although aligned to the SDGs) that both the provincial and local government provide, a series of further questions were raised in the survey. The first question focused on projects and budgets. Government officials were asked to indicate how the COVID-19 pandemic affected budgets in their departments and operational unit. Negative impacts would stall progress on ongoing and planned projects. The key findings are shown in Figure 7. An estimated 79.06% of the respondents revealed that there were budget cuts, while only 5.24% indicated otherwise. A further 8.9% indicated unchanged budgets. Similar trends came out of the CSOs survey, with 31.91% of the respondents indicating a total drying out on funding (Figure 8). Only 7.8% of the respondents wished not to disclose the impact, while 8.51% were not sure.

Ironically, 40.74% of the CSOs respondents revealed that they were getting funding from government. This was followed by individual donors (13.43%), the private sector (9.26%), local foundations (6.48%), international NGOs (4.63%), international foundations (1.83%) and bilateral and/or multilateral agencies (2.31%). An estimated 16.2% of the respondents indicated 'other' sources, with the remaining 5.09% not sure.

Requested to tick all applicable from eight typical service delivery sectors by government, and how COVID-19 lockdowns impacted such, most of the respondents (21.62%) picked the education systems (SDG4) as the most affected. This was followed by health services (SDG3), with 16.97% of the respondents indicating so, and social systems that had 15.62% of the respondents confirming so. Water services (SDG6) ranked 4th with 11.26% of the officials saying so, while road maintenance (SDG9), accounts billing and refuse collection came in with 10.06, 9.31 and 8.11% of the respondents picking them. Electricity supply once more seemed to have been spared with only 6.01% of the respondents indicating so. The remaining 1.05% of the respondents indicated the 'other' services category. The situation regarding the source of water during COVID-19 as revealed by the households is shown in Figure 9.

Many households used water from public community piped water (41.21% of the respondents). This was followed by those who utilised the private tap/piped water inside the house (16.93%). Coming in a far distance, were those drawing water direct from the boreholes (7.37%), with other significant numbers drawing from rainwater (6.48%) and mobile water tanks (3.93%). Asked if the same sources of water were being used prior to COVID-19, 96.10% indicating in the affirmative and only 3.9% to the contrary. Asked to determine the reliability of the sources of water, 40.66% of the respondents indicated the sources were unreliable, with 43.11% revealing sources were reliable, and 15.68% saying they were very reliable. Only 0.55% of the responding households indicted they were not sure. The bulk of the respondents (94.98%) also either strongly agreed or agreed that the water was safe for domestic use. This left only 2.91 disagreeing and 0.83% strongly disagreeing. The remaining 1.27% were not sure. However, asked further for the reason to use the identified source of water, 36.65% revealed they had no choice, while the majority (47.32% of the respondents) said it was due to accessibility. Other reasons sharing the remaining percentage included water being cheap, clean, reliable and 'other'. Requested to identify the challenges associated with accessing water during the pandemic, 27.66% indicated they had none. However, 22.57% again revealed unreliability, limited quantities (15.24%), timetabling (11.35%), expensive (5.16%) and water being too far (4.5%). Other reasons included water being dirty, congestion at water points, seasonality of sources and 'other'.

4.4 Impact of COVID 19 on organisations and employees

Considering the profound impact that the death of a loved one can have on an individual's performance and mental well-being, it is

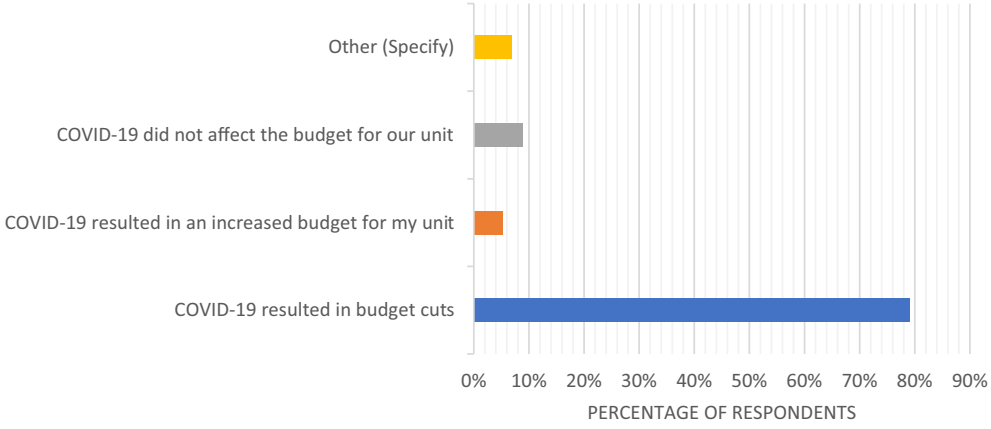

FIGURE 7
COVID-19 effects on budgets.

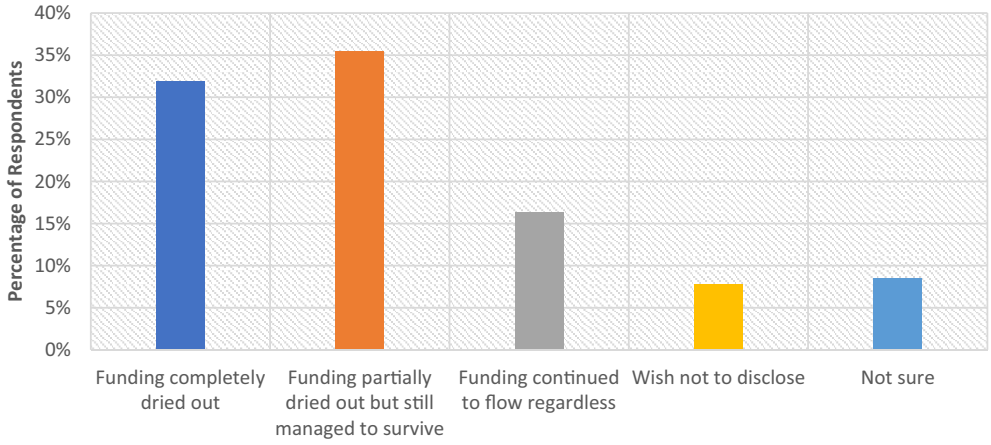

FIGURE 8
Financial impact of COVID-19 on CSOs.

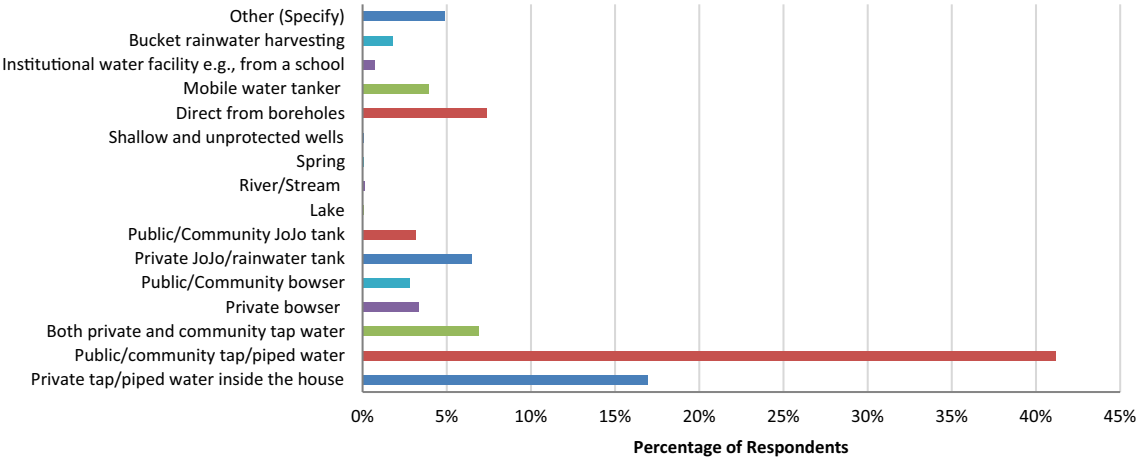

FIGURE 9
Main sources of water during COVID-19.

plausible to infer that service delivery in alignment with the Sustainable Development Goals (SDGs) may have been adversely affected, given that all respondents reported experiencing some form of personal loss during the pandemic. This assertion was corroborated by responses to a follow-up question, which specifically assessed the impact of the pandemic on officials' work and productivity. The findings revealed that 88.14% of respondents either strongly agreed or agreed that COVID-19 had a detrimental effect on their work performance, while only 8.28% disagreed, and 3.09% were unsure.

In terms of trauma, a similar pattern emerged, with 82.9% of the respondents reporting that they experienced psychological distress as a direct consequence of the pandemic. The data further highlights the widespread nature of bereavement among government employees. Approximately 27.27% of respondents experienced a COVID-19-related death within their immediate families, while 47.47% reported losing loved ones from their extended families. Another 25.25% indicated losses that spanned both their direct and extended family units. Additionally, the loss of colleagues due to the pandemic was significant, with only 7.77% of respondents indicating that no fatalities were recorded within their department or section. The majority (31.09%) reported losing between 1 and 10 colleagues, while 23.83% indicated losses ranging from 21 to 50 colleagues. Furthermore, 11.92% of respondents reported losing between 11 and 20 colleagues, and 8.81% indicated losses exceeding 50 colleagues. The remaining 16.58% of the respondents were unsure of the exact number of fatalities.

These findings illustrate the widespread impact of COVID-19 on public sector employees, revealing not only the personal toll in terms of bereavement and trauma but also the broader implications for productivity and service delivery within the governmental framework. The psychological and emotional distress experienced by respondents likely contributed to disruptions in service provision and, by extension, affected progress towards achieving the SDGs.

5 Discussion

The COVID-19 pandemic has posed unprecedented challenges to the global attainment of the Sustainable Development Goals (SDGs), with far-reaching implications for both high-income and low-income countries. In Limpopo Province, South Africa, the pandemic disrupted various socio-economic and environmental sectors, adversely affecting progress towards achieving key SDGs. This discussion synthesizes the specific impacts of the COVID-19 pandemic on several SDGs in Limpopo Province, drawing from empirical evidence gathered during the study.

The study indicated that the pandemic affected all the SDGs in the province except SDG14, which was excluded from analysis due to the landlocked nature of the province. The findings align with Wang and Huang (2021) who found that the pandemic negatively impacted on the delivery of all the 17 SDGs. This further concurs with Elsamadony et al.'s (2022) work, which revealed adverse impacts on selected goals. While the authors identified impacts on SDGs5, 7, 8, 11 and 12, with Fenner and Gernev (2021) identifying SDGs1, 3, 14, and 15, similar trends emerged in Limpopo. While all the SDGs were impacted, among the top six were SDG1, 2, 3, 4, 8, and 12.

COVID-19 significantly exacerbated poverty levels in Limpopo Province. The lockdowns and social distancing measures imposed to curb the spread of the virus disrupted local economies, particularly in rural and peri-urban areas where informal trading and subsistence farming are the primary livelihoods. Many households experienced income reductions due to job losses and business closures, which heightened vulnerability to food insecurity and poverty. This setback hampers the province's efforts to eradicate extreme poverty and reduce inequalities, thus undermining the progress towards SDG1. This finding corroborates Wang et al.'s (2023) findings which indicated that SDG1 is one of the SDGs that were adversely affected by the COVID-19 pandemic due to its direct and indirect links with various other socio-economic changes that were associated with the pandemic. In addition, the findings mirror the work by Wernecke et al. (2021) who tracked progress towards the SDGs in four Limpopo Province rural villages. The work was done in the deep heat of COVID-19 and revealed higher levels of poverty prevailing (SDG1). In comparison to national poverty levels, the villages' poverty levels stood at 17.7% while the national figure was 7.4%. Similar trends were discovered regarding unemployment, with the province sitting at 49% compared to 27.3% at the national level.

The findings from the agricultural survey reveal that the majority of respondents (44.12%) indicated that agricultural operations remained largely unaffected during the pandemic. This outcome can be attributed to the South African government's designation of agriculture as an essential service during the COVID-19 crisis, allowing for continued operations even amidst stringent lockdown measures. However, the prolonged demand for food parcel distributions by households, extending beyond 1 year, highlights the heightened levels of food insecurity exacerbated by the pandemic. The pandemic induced considerable strain on food systems, leading to disruptions in food production and supply chains. This, in turn, affected the availability and accessibility of food for many communities in Limpopo. Households, particularly in rural areas, faced challenges in accessing markets and obtaining necessary agricultural inputs due to restricted movement and financial constraints. Consequently, food insecurity rose significantly, reversing gains made towards achieving zero hunger. The loss of employment and reduced household incomes further limited the ability of families to purchase adequate and nutritious food, heightening the risk of malnutrition. This observation is consistent with the findings of Hart et al. (2022), who drew on data from two rounds of the longitudinal University of Johannesburg and Human Sciences Research Council's COVID-19 Democracy surveys. Furthermore, delays in the distribution of food relief were observed, stemming from the national government's decision to bypass established non-governmental organization (NGO) food relief structures. The integration of COVID-19 food relief into conventional procurement processes, coupled with corruption in tender allocations, further hindered the effective distribution of aid, contributing to elevated levels of household hunger. As a result, the proportion of households experiencing hunger increased significantly, rising from pre-pandemic levels of 11% to a peak of 42% in 2020 (Hart et al., 2022).

This study has shown that the health sector in Limpopo was directly impacted by COVID-19, with the healthcare system experiencing significant strain due to the increased demand for services, equipment shortages, and the redeployment of healthcare personnel to manage COVID-19 cases. The reallocation of resources to combat the pandemic resulted in the neglect of other essential health services, including maternal and child health, immunization programs, and the treatment of chronic illnesses. Psychological trauma and stress also increased among health workers and the general population due to the loss of loved ones, the fear of infection, and the prolonged social isolation. These factors collectively hindered the province's progress toward SDG3. The results confirm Wang et al.'s (2023) assertion that the pandemic had widespread direct and indirect impacts on health systems despite increased investment in the sector during the pandemic. Shaukat et al. (2020) also found that the pandemic had detrimental effects on several aspects of health, consequently compromising the achievement of SDG3.

The pandemic severely disrupted education systems across Limpopo, resulting in prolonged school closures and the transition to remote learning, which posed significant challenges given the limited access to digital technologies and internet connectivity in many parts of the province. Students from disadvantaged backgrounds were disproportionately affected, as they lacked the necessary infrastructure and support for effective online learning. This digital divide exacerbated educational inequalities, impeding progress towards achieving inclusive and equitable quality education (SDG4). Additionally, the interruptions in education led to learning losses, which may have long-term consequences on educational outcomes and human capital development in the region. In line with this finding, UNESCO estimates that 1.25 billion students were affected by the pandemic, posing serious challenges to the attainment of SDG4 (Fenner and Gernev, 2021).

Although SDG6 did not pop up among those severely impacted by COVID-19 in Limpopo, work by Zindi and Shava (2022) confirm that there were national challenges associated with supplying portable and adequate water (SDG6) by government for those in informal settlements.

Although South Africa and the Limpopo Province are generally experiencing high unemployment levels, findings from the household survey ($n = 4,564$) completed in 2023 reveal a worrisome picture. Up to 44.86% of the respondents indicated that they were unemployed, supporting findings that place SDG8 among the top five affected from the government officials survey. Furthermore, the household survey

shows 27.61% of the respondents being pensioners, 8.69% self-employed, with those in full time employment at a mere 6.23%. Those in part-time employment at the time of the survey stood at 5.91%, with 4.75 being students, 1.52% retired and 0.55% falling in the 'other' category. From the CSO survey, a comparison of staff levels current and pre-pandemic revealed that 49.32% of the respondents had their organisations experiencing a decrease in staff. This statistic was against 16.89% of respondents indicating staff levels increased, with 30.41% saying levels remained unchanged, and the remaining 3.38% indicating they were not sure.

The COVID-19 pandemic has had a multifaceted impact on the attainment of the SDGs in Limpopo Province, South Africa. It disrupted progress across various goals, with significant implications for poverty alleviation, food security, health and well-being, quality education, economic growth, and social equality. The pandemic not only highlighted the existing socio-economic vulnerabilities in the province but also underscored the need for robust, inclusive, and resilient systems to achieve sustainable development. Moving forward, targeted interventions and a strategic focus on building back better will be crucial in mitigating the long-term impacts of the pandemic and ensuring progress towards the SDGs in Limpopo Province.

6 Conclusion

As established throughout this paper, a significant research gap exists in understanding how COVID-19 has impacted the implementation of the Sustainable Development Goals (SDGs) and service delivery at sub-national levels. This study sought to address this gap by focusing on Limpopo Province and its sub-regional structures, including district and local municipalities. The primary objective was to evaluate the extent to which COVID-19 disrupted the Limpopo Provincial Government's efforts towards achieving the SDGs and meeting service delivery commitments.

The findings corroborate the initial hypothesis that COVID-19 significantly disrupted the implementation of the SDGs and routine service delivery operations in Limpopo Province. Government officials reported experiencing deaths within their immediate and extended families, as well as the loss of colleagues, all of which adversely affected their work performance and overall productivity levels. The analysis revealed that, with the exception of SDG14 (Life Below Water), which is not applicable to the landlocked province, all other SDGs were affected to varying degrees. While the degree of disruption varied, the top five most impacted SDGs were identified as SDG1 (No Poverty), SDG8 (Decent Work and Economic Growth), SDG6 (Clean Water and Sanitation), SDG3 (Good Health and Well-being), and SDG2 (Zero Hunger). Conversely, the five least impacted SDGs were SDG15 (Life on Land), SDG13 (Climate Action), SDG7 (Affordable and Clean Energy), SDG5 (Gender Equality), and SDG16 (Peace, Justice, and Strong Institutions).

Additional analyses, based on the combined responses from government officials, agricultural stakeholders, civil society organizations (CSOs), and households, further demonstrated the varied impacts of COVID-19 on the province. For instance, a significant number of CSOs reported a complete cessation of funding during the pandemic, which impeded their ability to provide essential services. Agricultural supply chains, including the procurement and distribution of inputs and the marketing of produce, were also heavily disrupted. Household surveys revealed increased levels of food insecurity, with a majority of respondents expressing a desire for continued government food relief interventions beyond 2023.

The study concludes that Limpopo Province was not immune to the disruptions experienced across South Africa and globally due to the COVID-19 pandemic. The province faces additional challenges as it is already ranked as the poorest region in the country, with high levels of unemployment and inequality. Given the considerable impact on frontline workers and the potential for long-term trauma, it is recommended that the Limpopo Government sustain and expand psychosocial support services for its employees. Furthermore, it is imperative to reinstate and increase funding for CSOs, which were heavily reliant on government support before the pandemic. In the remaining years leading up to the 2030 Agenda for Sustainable Development, a concerted effort is needed to accelerate progress in multiple developmental areas. This will require revised and well-defined frameworks for recording, monitoring, and verifying progress.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors upon reasonable request.

Author contributions

GN: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft. LC: Data curation, Methodology, Validation, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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