Positioning Health at the Heart of the Just Transition

Insights from a Scoping Study on the Climate–Health Nexus in South Africa

November 2025

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Pivot Collective

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Positioning Health at the Heart of the Just Transition:
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Executive Summary

Purpose and Scope

South Africa faces a convergence of climate and health challenges that threaten to deepen existing inequities while straining an already overburdened health system. Rising temperatures, extreme weather events, deteriorating air quality, changing disease patterns, and growing pressure on water and energy systems are already being felt in clinics, communities, and households across the country.

This scoping review was undertaken to better understand how climate change is reshaping health risks and health system performance in South Africa, and to identify practical, system-wide pathways for action. It draws on an extensive review of policy and evidence, complemented by interviews and dialogues with stakeholders from national and provincial government, research institutions, civil society, and community-based organisations. The analysis explores how climate and health agendas intersect across four main domains: the organisation and performance of the health system, climate-related disease and infrastructure risks, governance and institutional arrangements, and financing and investment mechanisms.

The report is intended for policymakers, planners, funders, implementers, and researchers working across health, climate, infrastructure, and development. It offers a high-level diagnosis of the current landscape and proposes an integrated set of strategic pathways to strengthen resilience, equity, and sustainability in South Africa's health sector.

Why Climate and Health Are Inseparable

Climate change is no longer a distant or abstract risk; it is already affecting both the health of South Africans and the capacity of the health system to deliver care. Heatwaves contribute to increased morbidity and mortality, particularly among pregnant people, newborns, older adults, and those with chronic conditions. Floods and storms damage roads and bridges, disrupt outreach and referrals, and destroy medicines, files, and equipment. Droughts undermine water security, with direct implications for infection prevention, sanitation, and the dignity of patients and staff. Poor air quality, both ambient and household, drives respiratory illness, cardiovascular disease, and other chronic conditions, often in communities already facing multiple forms of deprivation.

At the same time, the health sector itself contributes to climate change, through coal-based electricity use, diesel generators during power cuts, carbon-intensive procurement and supply chains, and health-care waste. The sector is therefore both affected by and contributing to the crisis but it also holds enormous potential to drive positive change. Building a climate-resilient and low-carbon health system offers a "double dividend":

protecting population health while advancing South Africa's equity and decarbonisation goals.

Across the review, a central message emerged: climate change is a risk multiplier. It amplifies existing weaknesses in service delivery, infrastructure, governance, and financing, and it compounds long-standing structural inequities in who is exposed to risk and who can access protection.

Key System Challenges and Findings

The findings from Chapters 3–6 of the report paint a coherent picture of a system under strain, but also rich with opportunity for transformation.

Health system pressures and inequities

The analysis of the health system shows a sector marked by deep historical and spatial inequality, persistent capacity gaps, and fragmentation. A resource-constrained public sector serves the majority of the population, while a well-resourced private sector remains accessible to a small minority. Rural districts, former homeland areas, and informal settlements continue to face chronic under-investment in infrastructure, staffing, and management support. Facilities vary widely in their readiness: some have robust management, reliable utilities, and strong data systems; others struggle with ageing buildings, staffing shortages, and frequent disruptions to power and water. These underlying weaknesses make climate shocks more damaging and recovery slower, especially in already-marginalised areas.

Climate risks to health and health systems

The climate–health diagnosis reveals that South Africa's health system is both highly vulnerable to climate impacts and an important contributor to emissions. Extreme heat, floods, storms, droughts, and changing vector ecologies are reshaping disease burdens and placing new pressures on service delivery. Heatwaves exacerbate maternal, neonatal, and occupational health risks; flood events interrupt chronic care, damage infrastructure, and contaminate water sources; vector-borne and waterborne diseases are sensitive to shifting climate patterns; and air pollution, linked to coal, traffic, industry, and household fuels, undermines respiratory and cardiovascular health. These impacts do not fall evenly: they are patterned by housing conditions, livelihood insecurity, environmental exposure, and access to care, reinforcing existing social and spatial inequities.

Governance and institutional architecture

The governance review finds that South Africa has a strong policy architecture for both climate and health, including national climate strategies, adaptation plans, and health system reforms. However, implementation is hampered by fragmented mandates, unclear institutional responsibilities, and misaligned planning and budgeting cycles across spheres

of government. Responsibilities for climate, health, water, energy, disaster management, and infrastructure are distributed across different departments that do not always share a common agenda or timeline. Provincial and district managers frequently lack clear directives, dedicated budgets, and practical tools for climate–health integration. Data systems for health, environment, and infrastructure remain siloed. At the same time, there are promising innovations such as network-based leadership models and provincial resilience initiatives that show what is possible when mandates, relationships, and incentives align.

Financing and investment constraints

The financing analysis emphasises that current public financial management systems are not yet configured to support climate-resilient health investment. Budgets and grants remain tied to historical baselines and short-term service pressures, with limited flexibility for prevention, adaptation, or low-carbon upgrades. Climate-related spending is not consistently tracked, and health-sector needs are not systematically reflected in national climate finance strategies or just transition plans. While there is significant potential to access climate and development finance, especially for renewable energy, energy efficiency, and resilient infrastructure, few health-sector proposals currently meet the technical and financial criteria required. Provinces and municipalities often lack project preparation capacity and decision-support tools, and smaller, rural facilities struggle to make their needs visible in investment pipelines.

Reframing Climate and Health as a Systems Challenge

The review shows that climate resilience cannot be treated as a stand-alone technical function located in a single unit or programme. Climate risks interact with, and intensify, existing stresses across service delivery, human resources, governance, data, infrastructure, and financing. A clinic without water cannot deliver safe care, regardless of how strong its clinical guidelines may be. A health worker exposed to extreme heat, with no protective measures or psychosocial support, cannot sustain high-quality, compassionate care. A district without timely, disaggregated data cannot anticipate outbreaks, target resources, or make the case for investment. A municipality struggling with drainage, waste, or electricity cannot protect the environmental conditions that underpin public health, let alone withstand climate shocks.

Addressing these interconnected vulnerabilities requires a systems approach. This means:

- Making climate adaptation and mitigation a core element of governance, leadership, and accountability.
- Strengthening the capacity, safety, and wellbeing of the health workforce.
- Building robust, integrated data, analytics, and early-warning systems that inform day-to-day and long-term decisions.
- Ensuring essential medicines, technologies, and facility infrastructure are climate-resilient, low-carbon, and appropriate to local contexts.

- Integrating climate risk into programme design, continuity-of-care planning, environmental health responses, and emergency preparedness.
- Aligning financing mechanisms, procurement rules, and investment frameworks with long-term resilience, sustainability, and equity objectives.
- Grounding reforms in equity and community knowledge so that those most affected by climate risks help define priorities and shape solutions.

Seen through this lens, climate resilience is not a new silo of work. It is the connective tissue that strengthens and reinforces all other health system functions.

From Diagnosis to Strategic Pathways

To translate this diagnosis into action, the report proposes six system pathways and two cross-cutting pathways, adapted from the World Health Organization's Operational Framework for Climate-Resilient Health Systems and tailored to South Africa's context:

1. **Leadership and Governance** – Clarifying mandates, strengthening coordination across sectors and spheres of government, and embedding climate objectives into planning, budgeting, and accountability systems.

2. **Health Workforce** – Training and protecting health workers, designing climate-ready roles and teams, and recognising community health workers as central actors in climate–health response, particularly in underserved districts.

3. **Knowledge, Data, and Innovation Systems** – Building interoperable data platforms, locally relevant research, risk and vulnerability assessments, and early warning systems that translate climate information into timely decisions at provincial, district, facility, and community levels.

4. **Sustainable Medicines, Technologies, and Infrastructure** – Ensuring that supply chains, procurement, medical technologies, and health facilities are resilient to climate shocks, resource-efficient, and aligned with South Africa's decarbonisation and just transition goals.

5. **Climate-Informed Service Delivery** – Mainstreaming climate considerations into core health programmes, clinical guidelines, environmental health interventions, and emergency preparedness plans, to safeguard continuity of care and prevention efforts under changing conditions.

6. **Financing and Investment for Climate Resilience** – Reforming budget and financing systems so that climate-related investments in infrastructure, workforce, data, and service delivery can be planned, costed, funded, and monitored over the long term.

Two cross-cutting themes underpin all of these pathways:

- **Equity by Design** – Ensuring that climate–health responses actively redress, rather than reproduce, structural inequalities by prioritising high-risk and historically marginalised communities, and embedding equity metrics into planning, investment, and monitoring.
- **Community-Led Resilience** – Recognising communities, community health workers, traditional and faith-based leaders, and civil society organisations as co-producers of resilience, and creating mechanisms for their knowledge, priorities, and feedback to shape climate–health strategies at all levels.

Together, these pathways offer an integrated agenda for action. Rather than a rigid blueprint, they are intended as a flexible framework that provinces, districts, and partners can adapt to their own realities, building on existing initiatives, piloting new solutions, and scaling what works.

An Opportunity for Shared Action

The pathways outlined in this report reveal not only the scale of the challenge, but also the scale of the opportunity. Many building blocks already exist: provincial pilots, strong national policy commitments, local service delivery innovations, experienced civil society organisations, and research institutions with global standing. The task now is to connect and strengthen these efforts through a shared, systems-oriented strategy.

Doing so will require:

- Coordinated leadership across climate, health, finance, environment, water, energy, infrastructure, and planning sectors.
- Investments that prioritise underserved communities & address structural inequities.
- Strengthened capacity and resources at provincial, district, and facility levels.
- Sustained collaboration between government, researchers, civil society, communities, and development partners.
- Adaptive systems that learn from pilots, scale successful models, and retire approaches that are not fit for purpose.
- Flexible, long-term financing aligned with resilience and sustainability goals.

No single actor can deliver this transition alone. Climate resilience in health demands a whole-of-society approach, one that leverages the knowledge and capabilities of frontline workers, policymakers, planners, engineers, environmental practitioners, communities, and service users alike.

Health is, ultimately, a test of whether the just transition is reaching people's lives. By embracing the pathways and principles set out in this report, and by working collectively to adapt and implement them, South Africa can move decisively toward a health system that is inclusive, anticipatory, and capable of protecting the wellbeing of all who rely on it in a rapidly changing climate.

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1. Introduction

Climate change is no longer a future threat; it is a present and escalating disruptor to health systems and public health worldwide. Rising temperatures, extreme weather events, biodiversity loss, and ecosystem disruption are already driving significant health burdens, particularly in low- and middle-income countries (LMICs) with limited adaptive capacity (World Economic Forum, 2024; IPCC, 2023). These impacts are both direct, such as heat-related illnesses and injuries from floods, and indirect, including food insecurity, mental health stress, and the spread of climate-sensitive diseases (WHO, 2019; PAHO/WHO, 2023).

South Africa is among the most climate-vulnerable countries, warming at nearly twice the global average (Igamba, 2023). Average temperatures have already increased markedly, with projections of up to 4°C of warming by the end of this century if global warming exceeds 2°C (Chersich et al., 2018; IPCC, 2018). These changes are intensifying extreme weather events such as heatwaves, prolonged droughts, and severe flooding, which will have differential impacts across South Africa's diverse climatic and geographic zones (Chersich et al., 2018; Wright et al., 2014). The economic toll is also projected to be substantial, with climate-related disruptions straining multiple sectors, including agriculture and health infrastructure (Department of Environmental Affairs, 2011).

Provinces are impacted differently according to their specific geographic, climatic, and socio-economic conditions. The Western Cape faces severe droughts and wildfires, which exacerbate water-supply stress and heighten exposure to heat and air-pollution risks (Western Cape Climate Change Response Strategy 2022). Limpopo and Mpumalanga are experiencing increased vector-borne diseases like malaria due to rising temperatures and changing rainfall patterns. Coastal areas like KwaZulu-Natal are particularly vulnerable to flooding and sea-level rise (increasing exposure to cholera and other water-borne diseases). Urban heat islands across provinces intensify heat-related illnesses, particularly in informal settlements (Chersich et al., 2018). A study in Cape Town, for instance, found that a 5°C rise in weekly minimum temperatures correlated with a 40% increase in diarrheal cases one week later (Musengimana et al., 2016). Climate change also exacerbates food insecurity across much of South Africa as crop yields decline and livestock losses increase, threatening rural livelihoods and elevating malnutrition rates (Wright, 2024). Water scarcity also worsens hygiene conditions, leading to higher rates of diarrheal disease and water-borne illness.

These climate stressors intersect with an already strained health system marked by extreme inequality, infrastructure deficits, and dual burdens of communicable and non-communicable diseases. These challenges are amplified by South Africa's extreme income inequality and significant disparities in access to and quality of healthcare services. South Africa's public health system serves the majority of the population but operates under significant resource constraints, including chronic staff shortages, outdated infrastructure,

and frequent disruptions to essential services like electricity and water (Stats SA, 2019). Additionally, systemic inefficiencies, such as fragmented governance structures and inequitable resource distribution, exacerbate service delivery challenges (South African Department of Health, 2014; Western Cape Department of Health, 2022). These issues manifest in real-time care disruptions, missed treatments, and increased disease burdens among underserved populations. Vulnerable communities, those least responsible for emissions, face disproportionate exposure to air pollution, water scarcity, and climate shocks, entrenching cycles of poverty and inequity.

South Africa's Dual Challenge: Decarbonisation and Health-System Resilience

The health system contributes to the crisis

Healthcare depends on carbon-intensive energy, transport and supply chains that drive emissions and waste.

People's health bears the burden

Rising heat, floods, drought and air pollution are already harming people's health and disrupting care, especially in under-resourced communities.

The health system must adapt, and lead

Building climate-resilient, low-carbon health systems is central to a just and equitable transition.

South Africa faces a dual challenge: reducing its significant greenhouse gas emissions while preparing its health system to address the mounting health impacts of climate change. The country's heavy reliance on coal for energy production makes it one of the largest greenhouse gas emitters in Africa. At the same time, many regions depend on coal-linked livelihoods, complicating the transition to renewable energy sources.

Despite these challenges, South Africa has made significant progress in developing policy frameworks for climate resilience. While these frameworks provide a foundation for healthcare system climate resilience, their translation into actionable, location-specific plans remains limited. Reconciling the need to reduce emissions with the urgent need for

equitable healthcare access and climate resilience will require transformative policies, green infrastructure investments, and cross-sectoral collaboration to reduce the sector's environmental footprint while advancing health equity.

Global and local models demonstrate that decarbonizing healthcare can enhance service delivery, ranging from solar-powered clinics ensuring uninterrupted care during load-shedding to circular economy approaches that reduce waste and operational costs. While South Africa's Just Energy Transition (JET) framework provides an important foundation, the specific pathways for integrating health system resilience into the country's broader transition remain under-defined. Beyond a few notable case studies (described below), there is limited evidence on effective climate-health interventions within the South African healthcare system. To date, many initiatives have emerged from private sector settings or individual champions, rather than through coordinated, system-wide approaches.

Nonetheless, there is a significant opportunity to leverage the health sector as a site for climate resilience and social justice. Climate action can also strengthen health systems when designed intentionally, through co-benefits such as improved air quality, greater health equity, and stronger support for local leadership and community-based approaches. Community-led interventions, renewable energy, sustainable infrastructure, and health system strengthening all offer pathways for transformation. Realising these opportunities will require political will, adequate funding for climate–health initiatives, inclusive governance that engages marginalized communities, and stronger cross-sectoral collaboration.

Rationale, Objectives, and Scope of Review

This scoping review was undertaken to clarify South Africa's current climate–health landscape and identify opportunities for strengthening system-wide resilience. Responding to a growing recognition that health must be central to climate-resilience planning, the Agence Française de Développement (AFD) commissioned Pivot Collective to conduct a rapid scoping study on the climate–health nexus in South Africa. AFD, which is increasingly prioritising the intersection of climate and health within its South African programming, commissioned this work to help clarify opportunities for strengthening climate resilience within the health sector.

To address these needs, the review aims to:

- Map the current state of knowledge, policy, and practice around the climate–health nexus in South Africa;
- Assess systemic gaps, barriers, and opportunities in integrating health resilience into national and subnational climate responses;
- Identify scalable innovations and priority areas for investment and partnership;

- Provide evidence-based recommendations for government, funders, and other stakeholders, including AFD, to support transformational change.

The analysis focuses on three interconnected thematic areas:

- The structure and financing of South Africa's health system;
- The intersection of climate and health, including infrastructure vulnerabilities, health outcomes, and enabling policies;
- Emerging opportunities for strategic investment, innovation, and cross-sectoral collaboration.

The review draws on a combination of literature analysis, stakeholder interviews, a national dialogue convened in February 2025, and a sense-making workshop with key stakeholders. Through this analysis, it highlights systemic enablers and bottlenecks and proposes pathways for embedding equity, sustainability, and accountability in climate–health strategy. Together, these elements provide the foundation for the analysis presented in the chapters that follow.

2. Methodology

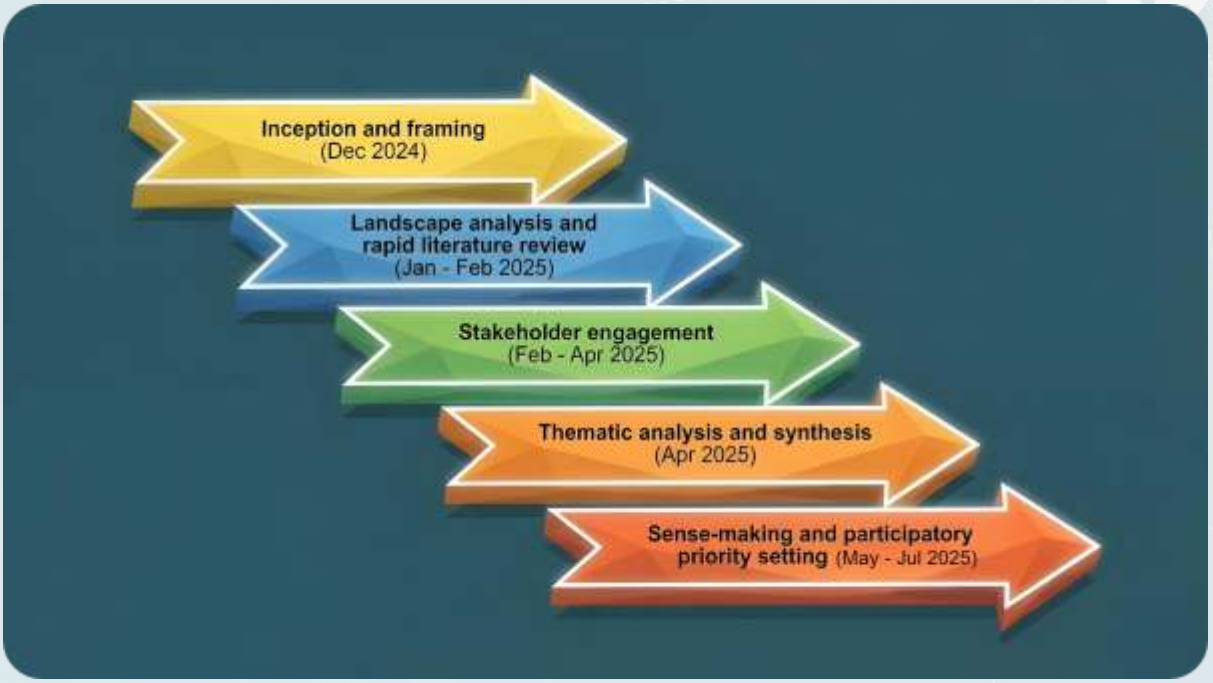
The scoping review employed a multi-phase, mixed-methods approach to map the intersection of health, climate change, and sustainable investment in the South African context. The methodology evolved iteratively in response to stakeholder input and new learning, grounded in a commitment to producing actionable, equity-centered insights for strengthening climate–health responses in South Africa. While the process was initially designed to support AFD in aligning future technical and financial cooperation with local priorities at the climate–health interface, the approach was intentionally structured to generate findings and pathways relevant for a wide range of public, private, and civil-society actors working to strengthen climate resilience in South Africa's health system.

How this approach differs from conventional scoping reviews

Traditional scoping reviews rely primarily on mapping published evidence. In contrast, this study employed an expanded, participatory design to ensure that findings reflect not only documented knowledge but also the lived realities, operational constraints, and strategic priorities of actors within South Africa's health system. Stakeholder engagement, including 22 semi-structured interviews, a national dialogue, and a participatory sense-making workshop, served as a core analytic component rather than an add-on. These engagements generated insights not captured in the literature, enabled triangulation between documentary evidence and practitioner experience, and provided a grounded basis for identifying practical, context-specific pathways for strengthening climate–health resilience.

This participatory emphasis reflects Pivot Collective's commitment to locally informed, equity-oriented approaches that centre the perspectives of those who shape, deliver, and experience health services. It ensures that the analysis speaks directly to the operational and governance realities that shape implementation. At the same time, the approach retains the breadth and systematic mapping characteristic of scoping reviews, while expanding their relevance by foregrounding voices that are often underrepresented in formal policy and academic texts.

Design and Phases



The study was implemented in five overlapping phases:

1. **Inception and framing** (December 2024)

Development of a framing paper outlining the project's rationale, thematic axes, guiding questions, and proposed methodology. This phase included a preliminary literature review and planning of the stakeholder engagement process. The research team designed a collaborative, team-based workflow for literature analysis and stakeholder mapping. A key early step was the co-development of detailed research questions for each of the three core themes, which then informed search terms and queries for the preliminary literature review. A suite of collaborative digital tools was used to support ideation, literature screening, and reference management. We also conducted a structured stakeholder mapping process to identify stakeholders to engage in interviews and dialogues and understand actor networks in the climate and health space in South Africa. This mapping guided interview sampling, with representation across government, civil society, academia, private sector, and frontline workers.

2. **Landscape analysis and rapid literature review** (January - February 2025)

A comprehensive review was conducted of peer-reviewed literature, grey literature, government policy documents, and financing instruments relevant to the study's three thematic areas. References were tagged and organized by theme and relevance using Zotero, supported by digital tools that assisted with document parsing, summarization, and synthesis. Screening and initial coding of sources informed the development of the thematic structure, while stakeholder references were tracked for early mapping. The literature review

phase combined automated and manual workflows to ensure coverage, triangulation, and consistency across sources. This provided the foundation for mapping South Africa's health system structure, climate–health linkages, and existing initiatives.

3. **Stakeholder engagement** (February - April 2025)

A series of semi-structured interviews and dialogue engagements were held with key actors across government, development finance institutions, academia, civil society, and the private sector. A national stakeholder dialogue was convened in Cape Town in February 2025 to deepen preliminary findings, catalyze collaboration across the climate and health sectors, explore practical and context-specific solutions, and reflect on challenges and opportunities for financing, implementation, and policy alignment. Semi-structured interviews followed a flexible guide tailored to respondents' roles, focusing on governance, service delivery, financing, infrastructure, and climate-health readiness. In total, 22 key informant interviews were conducted, and 31 stakeholders were engaged across the interviews and the national dialogue.

4. **Thematic analysis and synthesis** (April 2025)

Integration of data across sources was undertaken to understand the current landscape and identify system-level gaps and opportunities. Stakeholder interviews were transcribed, cleaned, and coded into a structured matrix aligned with the scoping framework. Detailed notes from the February 2025 stakeholder dialogue were also reviewed and incorporated into the coding process to ensure that group reflections and emergent priorities were captured alongside individual interviews. Additional insights were extracted through re-review and iterative cross-theme analysis. Data was coded both deductively (to predefined themes) and inductively (to capture emergent issues).

The project team then used a structured analysis and collaborative writing workflow anchored in a four-step process for each thematic subsection: (1) review of relevant literature, transcripts, and coded quote matrices; (2) drafting of narrative analysis incorporating background materials, stakeholder reflections, and key insights; (3) validation and contextualization of selected quotes; and (4) refinement for clarity, alignment, and flow. The process emphasized triangulation between literature, stakeholder interviews, and workshop input to identify points of convergence, tension, and emerging learning.

5. **Sense-making and participatory priority setting** (May- July 2025)

Following the drafting of the initial scoping review report, the project team convened to identify and consolidate the most promising strategic opportunities and levers for transforming South Africa's health system toward greater climate resilience, decarbonisation, and equity. This synthesis drew from the literature, stakeholder interviews, policy dialogue, and emerging innovations across national, provincial, and facility levels.

To deepen and refine this analysis, the team then hosted a participatory sense-making workshop with stakeholders who had engaged in earlier phases of the project, either

through the national dialogue or key informant interviews. During this workshop, participants critically interrogated the pathways and strategic actions that had emerged from the scoping process, surfaced overlooked opportunities, and refined both the framing and substance of the proposed actions.

The revised pathways and actions were subsequently tested through a priority-setting survey distributed to all stakeholders engaged across the project. The survey asked participants to rank and prioritise the proposed pathways and actions, providing a final layer of input to shape the report's recommendations and conclusions.

Finally, a participatory priority-setting workshop was held with a broader group of stakeholders, including representatives from the National Department of Health, National Treasury, the Development Bank of South Africa, AFD, and the Presidential Climate Commission. This workshop served as a high-level validation step, enabling national stakeholders to review the emerging pathways and assess their feasibility within current policy and financing structures. Participants engaged in a structured prioritisation exercise that helped consolidate the pathways and ensure alignment with national priorities. Insights from this session played a key role in refining the final framework

Limitations

As a rapid scoping study, the review did not aim to provide an exhaustive assessment of all health–climate linkages in South Africa. Rather, it sought to develop a foundational understanding of the landscape and identify key strategic entry points and knowledge gaps to guide further work. While efforts were made to engage a diverse group of stakeholders, the sample did not include participants from all provinces or key government departments, particularly those responsible for infrastructure, finance, and public health implementation. In addition, despite efforts, no interviews were secured with private sector stakeholders.

The constraints of a rapid scoping process also limited the extent to which frontline health service providers, programme implementers, community-based actors, and individuals with lived experience of climate–health impacts could be engaged. This represents a significant limitation in offering detailed and nuanced insights into implementation realities and the lived effects of climate change on health. It also means that the priority-setting process, while participatory in design, is not fully representative of the range of perspectives needed to support an inclusive transformation agenda.

Although participatory engagement strengthened the relevance and depth of the analysis, the perspectives gathered still represent only part of the broader system. Ongoing and expanded engagement, particularly with communities, implementers, and underrepresented institutions, will be essential for validating, deepening, and operationalising the findings presented in this report.

3. The South African Health System Landscape

South Africa's health system reflects the complex and unequal legacy of its past, ongoing reform efforts, and the intersecting pressures of demographic change, disease burden, and fiscal constraint. Despite a progressive constitutional commitment to the right to health, the system remains deeply fragmented, with clear inequalities between the public and private sectors and across provinces, rural and urban areas, and levels of care. At the same time, the sector has made important strides in expanding access, strengthening public health programmes, and laying the foundation for universal health coverage.

Strengthening climate resilience within South Africa's health sector requires a clear understanding of how the system is currently structured, governed, financed, and staffed. Climate-related shocks do not occur in isolation. They interact with longstanding system constraints, uneven service readiness, and persistent inequities shaped by historical legacies and resource distribution. This chapter therefore provides a foundational review of the health system landscape to contextualise the opportunities and limitations for climate–health integration. It examines the structures, capabilities, and coordination mechanisms that determine whether climate resilience strategies can be implemented in practice and highlights aspects of the system that will be taken forward in the analysis of climate–health vulnerabilities and pathways for action that follows in the rest of the report.

Understanding this landscape is essential for assessing how the health system can adapt to climate change, contribute to decarbonisation, and advance equity. Climate-related shocks and stresses interact with existing structural weaknesses, such as infrastructure deficits, workforce shortages, and governance fragmentation, shaping the system's capacity to protect population health in a changing environment.

This section provides an overview of the structure and functioning of South Africa's health system to inform analysis of its capacity to adapt to climate change and contribute to decarbonisation, while moving toward greater equity. It draws on a review of national policy frameworks, academic and grey literature, and insights from stakeholder interviews and dialogue. Each subsection presents a synthesis of key features and implementation challenges, with particular attention to how structural dynamics shape equity and resilience.

The section begins with a historical and strategic overview of the health system and its governance structures, followed by a mapping of key stakeholders and their roles across sectors and levels of government. It then explores the condition and distribution of health infrastructure and human resources, including the integration of traditional and community-based care models. The final subsections examine the structure and equity of health financing, decision-making around investment, and the future implications of the National Health Insurance (NHI) reform initiative.

3.1 Historical and Strategic Overview

South Africa's health system has been shaped by its historical legacies, major reform efforts, and evolving health priorities. It operates as a hybrid public–private system: the public sector serves most of the population under considerable resource constraints, while a smaller, wealthier minority access services in the private sector. Within this pluralistic landscape, traditional healers and faith-based practitioners also remain important providers, particularly in rural and peri-urban areas (Thipanyane et al., 2022). Understanding these structural dynamics is also essential for assessing how climate pressures, such as increased disease burden, infrastructure strain, and resource volatility, will interact with existing system capabilities.

The legacy of apartheid has deeply shaped inequities in South Africa's health system. Under apartheid, healthcare services were racially segregated and structurally biased in favour of the white minority, who accessed well-resourced biomedical facilities. In contrast, Black South Africans were relegated to underfunded facilities in rural homelands (Coovadia et al., 2009; Stuckler et al., 2011). Post-apartheid reforms, including the National Health Act of 2003 and free primary healthcare (PHC) policies, sought to unify the health system and reduce disparities. While these reforms have improved access and expanded services, significant spatial and socio-economic inequities remain (Benatar & Gill, 2021). As discussed later in the section, resource allocation patterns continue to favour urban centres and wealthier provinces such as Gauteng and the Western Cape, while rural areas like Limpopo and the Eastern Cape face persistent challenges in access and service readiness (Stuckler et al., 2011; van Rensburg, 2014). This imbalance perpetuates systemic inequalities, leaving many South Africans without access to quality healthcare.

Intersectionality (the overlapping of social identities such as race, gender, geography, and socioeconomic status) continues to shape patterns of healthcare access. Stakeholders noted, for example, how social expectations around masculinity can deter men from seeking timely care, a pattern reflected in the literature (Nguse, 2023). These dynamics highlight the importance of integrating structural and social determinants into health strategy and service delivery (Coovadia et al., 2009).

South Africa's health system is also shaped by a complex quadruple burden of disease: high levels of infectious disease, growing non-communicable diseases, maternal and child health challenges, and elevated rates of injuries and violence (Global Burden of Disease Study, 2019; Ntusi, 2022). South Africa continues to have one of the world's highest HIV and TB burdens, necessitating substantial public and international investment in ART and TB control. These investments have expanded ART coverage and strengthened community-based delivery models and surveillance systems (Kubjane et al., 2022). At the same time, stakeholders noted that vertical, donor-funded programmes have sometimes reinforced fragmentation in service delivery. As one participant reflected, *"everything else is neglected."*

The COVID-19 pandemic further exposed systemic constraints, including workforce shortages, infrastructure gaps, and fragmented service pathways (Pillay et al., 2021).

The South African Health Strategy

South Africa's constitutional commitment to healthcare as a human right, articulated in Section 27, provides a strong legal foundation for progressive realisation of access to care. The Constitution links health to broader socio-economic rights, including food, water, housing, and social protection. While this framework is globally recognised as progressive, realising these rights remains constrained by resource limitations, competing priorities, and variable implementation capacity across provincial and local levels.

The National Development Plan (NDP) 2030 outlines the central vision for South Africa's health system, with goals to increase life expectancy, reduce maternal and child mortality, combat HIV and AIDS, and decrease the burden of TB and injuries. Achieving these outcomes requires strengthening primary healthcare (PHC), expanding community-based services, and progressively implementing universal health coverage. The NDP also calls for more equitable resource distribution across provinces and districts, improvements in facility infrastructure and supply chains, and greater attention to social determinants such as poverty, education, water, and sanitation (van Rensburg, 2014). Collectively, these strategies aim to build an equitable and resilient health system capable of meeting the needs of all South Africans by 2030.

In addition to the NDP, South Africa has implemented several national health policies and initiatives to address its complex epidemiological profile and health system challenges. One of the most influential is the National Strategic Plan for HIV, TB, and STIs 2023–2028 (NSP), which aims to break barriers to equitable access, strengthen prevention and treatment services, and build resilient health systems integrated with social protection frameworks. Progress under the NSP includes major achievements in scaling up the national ART programme, which now reaches 6.2 million of the approximately 8 million South Africans living with HIV (Johnson & Dorrington, 2024) and deepening community-based delivery through CHWs, who play a crucial role in PHC outreach. The NSP has also advanced more integrated models of care by linking mental health and gender-based violence services into HIV and TB programmes. Recent reductions in PEPFAR and USAID funding have heightened concerns about sustaining key components of the NSP, particularly in high-burden districts long supported by donor programmes. These shifts underscore the importance of strengthening domestic systems and building sustainable financing models for critical HIV and TB services.

Despite this progress, stakeholders noted that implementation capacity varies across provinces, particularly in rural and remote areas, where resource constraints can limit service reach. Reliance on donor funding for some programme components also poses sustainability challenges (Ntusi, 2022). As one stakeholder reflected:

“Everything is in place on paper, but rural areas still don’t have services.”

The National Health Insurance (NHI) policy represents the government's flagship initiative to achieve universal health coverage through addressing the inequities and inefficiencies of the dual public-private healthcare system. By pooling public and private resources, the NHI aims to provide access based on need rather than ability to pay, strengthen PHC through district-based models, and improve resource allocation to underserved areas (National Department of Health, n.d.). Signed into law in May 2024, the National Health Insurance Act (Act 20 of 2023) will be implemented through a phased, multi-year process, beginning with the establishment of the NHI Fund

While the vision is widely supported, stakeholders highlighted practical considerations related to governance capacity, fiscal pressures, and coordination across levels of the health system. Several interviewees noted that national planning can remain disconnected from the operational realities faced by provinces and districts, underscoring the importance of strong cross-government alignment as implementation progresses.

Key Insights, Gaps and Areas for Learning

South Africa’s national health strategies are grounded in strong legal and policy commitments, but translating these frameworks into consistent implementation remains challenging. Historical inequities, capacity variation across provinces, and resource constraints shape the system’s ability to advance equity and climate resilience.

Key gaps and areas for learning include:

- **Operationalising social determinants:** Limited evidence exists on how national commitments translate into action at district and facility levels.
- **Frontline engagement:** More documentation is needed on the involvement of CHWs, nurses, and facility managers in planning and governance.
- **Alignment across major strategies:** Clarification is needed on how the NDP, NSP, and NHI interact in practice and how overlaps or gaps affect implementation.

3.2 Governance and Decision-Making Structures

South Africa's public sector provides essential healthcare services to approximately 84% of the population (South African Government, 2024). Governance is devolved across national, provincial, district, and municipal spheres, with the intent that local authorities adapt services to local needs while remaining aligned with national priorities. In practice, however, stakeholders described a governance landscape marked by overlapping mandates, variable capacity, and inconsistent coordination. These long-standing structural features complicate service delivery, accountability, and effective intersectoral collaboration. These governance arrangements also shape the extent to which climate–health priorities can be coordinated, financed, and implemented across national, provincial, and local spheres.

At national level, the National Department of Health (NDoH) provides policy leadership, sets priorities, establishes norms and standards, and oversees major national initiatives such as the National Health Insurance (NHI). It also provides technical support and monitoring for provinces. As in many devolved systems, the NDoH does not directly deliver services and has limited authority to enforce provincial implementation (Government Communication and Information System, 2017). This structural design influences both the strengths and the constraints of national–provincial coordination.

Statutory bodies such as the Health Professions Council of South Africa (HPCSA) and the South African Nursing Council (SANC) play essential roles in maintaining professional standards within the health system. The HPCSA licenses and accredits healthcare professionals and oversees compliance with ethical and educational requirements, while SANC regulates nursing education and practice, ensuring adherence to training and ethical standards. The South African National AIDS Council (SANAC) is another key body, coordinating the national response to HIV, TB, and STIs across government, civil society, and the private sector, and overseeing implementation of the National Strategic Plan (NSP).

Provincial health departments manage public health budgets, deliver services, and employ the majority of healthcare personnel. They are responsible for adapting national strategies to local contexts and for allocating resources to district and facility levels. Stakeholders reported significant differences in administrative capacity, financial management, and leadership across provinces, contributing to uneven policy implementation.

Provincial authorities also oversee District Health Systems (DHS), which deliver primary healthcare (PHC) through clinics, community health centres, and district hospitals (van Rensburg, 2014). The DHS is intended as the foundation for universal PHC, easing pressure on tertiary hospitals and improving access for rural and underserved communities (Schneider & Nxumalo, 2017). District Health Councils are responsible for integrated planning, service coordination, and performance monitoring, ideally through collaboration between municipalities and provincial departments (Barron and Asia, 2001).

Municipalities are responsible for Municipal Health Services (MHS), including water quality monitoring, waste management, food safety, and environmental health surveillance. They

also lead Integrated Development Plans (IDPs), constitutionally mandated tools for aligning health-related priorities with broader development objectives in areas such as water, sanitation, housing, and spatial planning. When effectively implemented, IDPs help align health services with local conditions. However, stakeholders noted that provincial–municipal engagement varies widely, contributing to coordination challenges outlined below.

Challenges of Implementation and Coordination

Stakeholders consistently highlighted the gap between well-developed national policies and uneven implementation across provinces and districts. As one senior stakeholder observed:

> *"We have all these beautiful policies, but they live in a folder somewhere. Implementation is what's missing." (Senior government official)*

Provincial discretion plays a major role, and provinces often cite competing priorities or limited capacity to implement national policies. A health researcher explained:

> *"The national department sets the tone, but the provinces can choose to implement or not." (Provincial health official)*

Coordination across spheres of government was described as inconsistent and often reliant on individual relationships rather than institutionalised mechanisms. Collaboration between provinces and municipalities is similarly variable:

> *"Some municipalities are quite unresponsive or change their mind. It's inconsistent in the local government sphere." (Provincial health official)*

These gaps complicate programmes requiring aligned action across environmental health, PHC services, hospitals, and essential infrastructure (Hendricks et al., 2015).

Municipalities were described as essential but capacity-constrained partners. Several interviewees noted that, although the District Health System is central to national design, there's a disconnect between policy intentions and operational realities.

> *"The DHS is supposed to be the implementation engine, but it's barely mentioned in planning meetings."*

Operational bottlenecks, particularly procurement delays, were repeatedly cited as barriers to effective service delivery. One stakeholder explained:

> *"The biggest challenge is navigating the layers of government and procurement processes that are shrouded in bureaucracy." (Provincial health official)*

These issues contribute to medicine stockouts, such as those documented in Northern KwaZulu-Natal, where stockouts affected over 85% of medicines across eight facilities (Mabizela et al., 2023).

Overall, governance fragmentation undermines coordinated service delivery and poses additional challenges for advancing climate resilience, health system decarbonisation, and responses to environmental determinants of health.

Opportunities and Emerging Models

Despite these challenges, stakeholders highlighted examples of more adaptive and coordinated governance. The COVID-19 pandemic demonstrated that close collaboration between national and provincial departments, municipalities, and civil society is possible when resources and political will align (Quintana et al., 2023). Interviewees pointed to rapid improvements in digital health, telemedicine, decentralised care, and data sharing as innovations with long-term potential, though many noted that momentum has waned:

> *"We saw what was possible during COVID, but we're slipping back into old patterns." (Senior provincial health official)*

Some provinces are experimenting with approaches to strengthen internal coordination. In the Western Cape, the Department of Health introduced the "CALM" model (Connection, Alignment, Learning, and Making) as a post-COVID effort to reduce bureaucratic rigidity and encourage collaborative problem-solving (Quintana et al., 2025). A provincial official described the approach as *"a move away from bureaucratic hierarchy towards models emphasising alignment and shared problem-solving."*

These emerging practices point to the value of more flexible, network-based governance, supported by investment in leadership development, organisational learning, and cross-sectoral collaboration.

Key Insights, Gaps, and Areas for Learning

South Africa's devolved governance model offers important opportunities for locally responsive health services but is constrained by persistent fragmentation, variable capacity, and inconsistent coordination across spheres of government. Strengthening governance coherence will be essential for improving service delivery, advancing equity, and embedding climate resilience within the health system.

Key gaps and areas for learning include:

- **Functionality of District Health Systems:** Limited comparative evidence on how DHS structures operate across provinces.
- **Intergovernmental forums:** Wide variation in the effectiveness of planning and oversight platforms.
- **Municipal planning roles:** The contribution of IDPs and municipal processes to health investment is under-examined.
- **Adaptive governance models:** More analysis is needed on the scalability of emerging network-based approaches.
- **Cross-sectoral contributions:** Roles of Treasury, Public Works, Energy, and local government remain insufficiently explored in relation to health resilience.

3.3 Health System Stakeholder Landscape

South Africa's health system is shaped by a diverse network of stakeholders operating across all levels of government and society, including national and provincial departments, statutory councils, public and private providers, non-profit organisations, civil society groups, academic institutions, and frontline workers. While national policy frameworks emphasise inclusivity and intersectoral collaboration, coordination in practice remains uneven and inconsistently institutionalised. This section examines how these actors interact within the broader health ecosystem. This stakeholder constellation also forms the ecosystem through which climate–health interventions must be delivered, coordinated, and sustained

Private Sector and Public-Private Partnerships

The private sector provides care to an estimated 16% of the population but consumes nearly half of total health expenditure (Coovadia et al., 2009; Naidoo, 2012). Private medical

schemes such as Discovery Health and Momentum dominate coverage for wealthier, insured populations, while the public sector remains overstretched and under-resourced. The disparity in infrastructure and staffing contributes to patient migration to private providers, reinforcing structural inequities. Public-private partnerships (PPPs) have been employed to address service gaps, particularly in specialized care and infrastructure, but remain limited in scale and sustainability (Kula & Fryatt, 2014; Stuckler et al., 2011).

Stakeholders noted that private sector actors are largely absent from national strategy development or climate-health dialogue, despite their significant influence on healthcare financing and delivery. Collaborations through PPPs are often ad hoc, constrained by divergent priorities: the public sector prioritizes access and equity, while the private sector is primarily profit-driven (Health Systems Trust, 2014). Stakeholder interviews confirmed a significant gap in how private providers are engaged in strategy development, implementation, or reform, highlighting the need for deeper integration of these actors into system-wide planning processes.

Civil Society, NGOs, and Community-Based Actors

Non-governmental organisations (NGOs), civil society organisations (CSOs), and community health workers (CHWs) play a pivotal role in bridging service delivery gaps, especially in underserved and rural areas. These actors often focus on high-burden areas across major public health priorities (Zihindula et al., 2019; Pletzen et al., 2014). Civil society has also historically advanced accountability and access to treatment. For example, the Treatment Action Campaign (TAC) played a critical role in advancing access to ART (Sabi & Rieker, 2017). NGOs also address structural and interpersonal barriers to care among key populations, such as migrants, sex workers, and LGBTQ+ individuals, by offering tailored, stigma-sensitive services (IOM South Africa, n.d.).

CHWs, typically employed by NGOs or provincial outreach programs, are central to South Africa's primary healthcare strategy and are positioned as key enablers of universal health coverage. They deliver home-based care, chronic disease support, basic treatment, and health education, often under difficult and resource-constrained conditions (Schneider & Nxumalo, 2017). CHWs play a critical role in bridging gaps between communities and formal healthcare systems by providing culturally sensitive care tailored to local needs. Despite their importance, CHWs face significant challenges. Stakeholder feedback revealed that CHWs are structurally under-recognised within health service planning and reform processes. Funding volatility further compounds these issues; donor-supported programmes often contract without sustainable government support to maintain CHW employment or training programmes (Ngobeni et al., 2020).

In addition to CHW's, informal caregivers, including family members and neighbours, provide critical day-to-day support for individuals with chronic illness, disability, or frailty. This unpaid labour remains largely invisible in health planning, despite being especially prevalent in contexts where formal services are unavailable or inaccessible.

Interviewees expressed concern that despite their essential role, these frontline actors are rarely meaningfully engaged in system-level planning.

> *"There's a lack of involvement of frontline actors, especially nurses and CHWs, in planning conversations about resilience." (Civil society organisation staff member).*

Others emphasized that implementation efforts would be stronger if they were designed around those responsible for delivery:

> *"Implementation should consider the drivers who have to drive the message… not always the people from the top." (Health researcher)*

Stakeholders also underscored the need for better communication tools and knowledge sharing platforms to support this essential community-based work.

Traditional Healers

South Africa's healthcare system operates within a pluralistic landscape where biomedical services coexist with traditional, faith-based, and community-led care systems, particularly in rural and peri-urban areas.These approaches play a vital role in supporting health access, particularly in rural, remote, and under-served communities where the reach of formal health services remains limited. Despite formal recognition in national policy, such as the Traditional Health Practitioners Act (Republic of South Africa, 2007), the integration of traditional and community-based actors into the public health system remains fragmented and inconsistently operationalized.

Traditional healers are often the first point of care for many South Africans, especially in areas with limited access to public clinics or hospitals. Studies estimate that between 60–80% of South Africans consult traditional or faith-based healers for both physical and spiritual concerns (Moshabela et al., 2016). These practitioners address culturally embedded health needs and fill service delivery gaps in remote areas where biomedical services are sparse (Ngobeni et al., 2020). The Traditional Health Practitioners Act (Republic of South Africa, 2007) provides a regulatory framework for their practice, including licensing requirements and ethical guidelines. However, implementation has been slow and uneven across provinces, with limited engagement between traditional healers and formal healthcare providers (South African Department of Health, 2023).

Stakeholders highlighted that while traditional healers are legally recognized, they remain largely excluded from formal collaboration, training, or referral systems. For example, there are few structured pathways for integrating traditional healers into maternal health programs or chronic disease management initiatives. Public health institutions rarely engage traditional healers in shared care models or health promotion efforts, despite evidence suggesting that collaboration could improve health outcomes in underserved areas (Moshabela et al., 2016).

Non-Health System Actors

Stakeholders also pointed to additional actors whose roles are vital but often overlooked in strategic discussions. Environmental officers, engineers, systems professionals, and infrastructure specialists are instrumental in enabling resilient and adaptive healthcare delivery, yet rarely appear in formal stakeholder typologies or high-level planning processes.

> *"These actors play an essential role in operationalizing facility-level resilience… but are rarely included in national stakeholder dialogues." (Civil society organisation staff member)*

Academic institutions were similarly noted for their research contributions, but criticized for operating in disciplinary silos or disconnected from policy and implementation realities.

Key Insights, Gaps and Areas for Learning

South Africa's stakeholder landscape is broad and diverse, yet many essential contributors, particularly frontline, community, and non-state actors, remain underrepresented in system-level decision-making. Strengthening collaboration across sectors is critical for equity and resilience.

Key gaps and areas for learning include:

- **Fragmented stakeholder engagement:** Coordination between public, private, civil society, and traditional systems is inconsistent and often informal.
- **Underutilised frontline expertise:** Nurses, CHWs, informal caregivers, and traditional healers are seldom included in strategic forums despite their central delivery roles.
- **Community-led innovation:** Locally developed solutions show promise but remain poorly documented and rarely scaled.
- **Public-private partnerships:** Limited evidence exists on PPP impacts on equity, resilience, or climate-health integration.
- **Traditional healing systems:** More work is needed to understand how traditional practitioners can be meaningfully integrated into planning and referral pathways.

3.4 Infrastructure and Human Resources

Infrastructure and human resources are among the most persistently strained components of South Africa's health system. Despite commitments outlined in national frameworks such as the Health Facility Revitalisation Grant (HFRG) and the Human Resources for Health Strategy 2030, infrastructure and staffing continue to reflect deep inequalities and operational fragility. This section synthesises recent literature, stakeholder insights, and public data to map the current status of these systems and the challenges shaping their performance. These infrastructure and workforce conditions also underpin the system's ability to absorb climate shocks, maintain continuity of care, and adapt to emerging climate-related risks.

Overview of public health infrastructure

South Africa's public health system is organized into three main tiers of care:

- **Primary care**, delivered through more than 3,400 public clinics offering preventive and community-based services;
- **District and regional hospitals**, providing specialised outpatient and inpatient care across more than 260 facilities; and
- **Tertiary and central hospitals**, comprising 31 highly specialised referral centres, primarily concentrated in Gauteng and the Western Cape. (National Treasury, 2023).

Despite this extensive footprint, access and quality remain highly uneven. Rural clinics often lack adequate water and sanitation, reliable electricity, and essential supplies. Approximately 80% of rural facilities rely on coal-powered electricity, and many depend on diesel generators during load-shedding, increasing operational costs by up to 30% (National Institute for Communicable Diseases [NICD], 2025; PMC, 2025). Stakeholders described wide-ranging facility-level dysfunction, from broken plumbing and inoperable waste systems to facilities rendered inaccessible by poor road conditions. In the Eastern Cape's Hlankomo community, for example, deteriorating roads limit access to care during rainy seasons (Ngumbela et al., 2025). As one civil society representative noted:

> *"In some provinces, it's completely inaccessible. There's no road that leads to a health facility." (Civil society health activist)*

Infrastructure challenges are compounded by administrative and procurement bottlenecks, particularly at district level. Although the HFRG allocated R6.8 billion in 2023/24 for upgrades, facility managers often lack the authority to undertake timely repairs (Health Infrastructure and Facilities Management, 2023). Stakeholders highlighted that procurement processes can take up to 18 months for basic maintenance, limiting the impact of national investments and reinforcing the gap between policy and practice.

Human Resources: Shortages and Maldistribution

Human resource constraints mirror the inequities found in health infrastructure. South Africa's health workforce includes over 211,000 public healthcare workers, including more than 20,000 doctors and 143,000 nurses (Human Resources for Health Strategy, 2030), yet distribution is highly uneven. Rural areas, home to 43.6% of the population, are served by only 12% of doctors and 19% of nurses. The distribution of medical specialists is even more skewed, ranging from just 1.4 per 100,000 people in Limpopo to 25.8 per 100,000 in urban centers like the Western Cape (National Department of Health, 2020).

Table 1: Distribution of medical staff in South Africa

Category	Urban areas	Rural areas
Population distribution	57%	43%
Doctors	88%	12%
Nurses	81%	19%
Medical specialists	31.3 per 100,000 (WC)	1.8 per 100,000 (Limpopo)

Source: Human Resources for Health Strategy 2030

This maldistribution is reinforced by a parallel divide between public and private sectors. Although the public sector serves the vast majority of the population, it employs only about 30% of doctors and 15.5% of pharmacists. Stakeholders described the resulting strain as profound.

> *"The public health system in South Africa is fragile and highly constrained, spread thin, burned out, stressed out." (Health researcher)*

Several structural issues contribute to workforce shortages. Professional nurses are in critically short supply, while an oversupply of enrolled nurses cannot fill higher-skilled roles (National Department of Health, 2020). Retention remains particularly challenging in rural and underserved areas due to limited professional development, inadequate infrastructure, and demanding work environments. Emigration further weakens capacity, with more than 600 specialists leaving the country between 2020–2024 (South African Medical Research Council, 2024). Although interventions such as rural allowances and targeted scholarships exist, stakeholders agreed these efforts have not yet shifted system-wide retention patterns.

Stakeholders also stressed that frontline workers, particularly nurses and CHWs, are often excluded from the very reform efforts that aim to improve their work conditions. Their absence from planning processes diminishes the system's ability to design responsive

strategies. In addition, several participants emphasized the importance of strengthening leadership at the facility level, noting that empowered, well-supported managers are critical to ensuring operational efficiency and staff retention.

Key Insights, Gaps, and Areas for Further Learning

Infrastructure and human resources remain foundational constraints to health system performance, equity, and climate resilience. Spatial inequities, procurement bottlenecks, and workforce shortages persist despite ongoing policy commitments and investment.

Key gaps and areas for learning include:

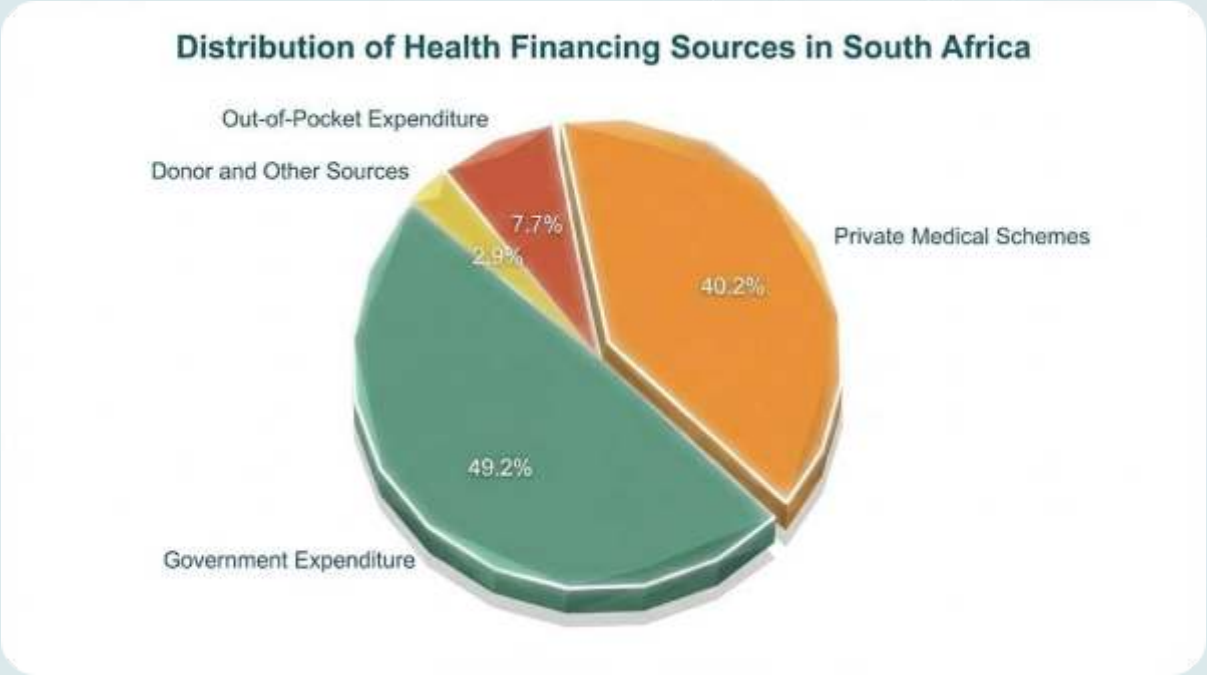
- **Spatial inequities:** Urban–rural disparities in facility condition and staffing continue to undermine equitable access.
- **Procurement and maintenance challenges:** Centralised, slow, and inconsistent systems limit the impact of infrastructure investment.
- **Workforce shortages and strain:** Chronic shortages, especially in rural areas, combine with burnout and emigration to weaken service delivery.
- **Frontline exclusion:** Nurses, CHWs, and facility managers are often absent from planning processes that directly impact their work.
- **Leadership gaps:** Strengthening facility-level management and autonomy remains essential for improving operations and retention.

3.5 Health System Financing: Modalities and Inequities

South Africa's healthcare system operates through a mixed financing model, combining public funds, private medical schemes, out-of-pocket payments, and donor contributions. Although health accounts for an estimated 8.6% of GDP (World Bank, 2024), the system remains deeply unequal and structurally fragmented, reflecting broader socio-economic divides. This section outlines the core modalities of health financing, summarises key inequities, and highlights systemic challenges in achieving efficient, equitable, and climate-resilient healthcare delivery. Financing arrangements are therefore critical determinants of whether climate–health priorities can translate into durable investments and scalable system strengthening.

Public and Private Financing: A Dual System with Unequal Outcomes

Total annual health expenditure is estimated at approximately R259 billion, with public spending accounting for about 49% of the total while serving nearly 84% of the population (WHO, 2023). In contrast, private medical schemes, covering roughly 16% of South Africans, account for over 40% of health expenditure. Per capita spending illustrates this divide: approximately R8,463 in the public sector versus R30,000 in the private sector (World Bank, 2024).



Source: Stats SA and WHO Health Expenditure Database - South Africa

These disparities are spatially and structurally embedded. Provinces such as Gauteng and the Western Cape, with stronger fiscal and institutional capacity, generally perform better on health indicators and infrastructure investment. Rural and historically under-served provinces, including Limpopo and the Eastern Cape, continue to face ageing infrastructure, staff shortages, and unreliable access to water and electricity (NDoH, 2022; Stuckler et al., 2011; OECD, 2018). Although provincial budget allocations broadly reflect population shares, this formal parity often masks functional under-resourcing in high-burden settings. Maternal mortality, infrastructure backlogs, and low health worker-to-patient ratios remain concentrated in these provinces (Department of Health, 2021), underscoring the importance of evolving toward more needs-based allocation models that account for disease burden, infrastructure gaps, and workforce distribution.

Funding Architecture: Revenue Flows and Allocation Mechanisms

Public healthcare financing in South Africa is structured through the Division of Revenue Act (DoRA), which structures transfers from the national treasury to provinces and municipalities

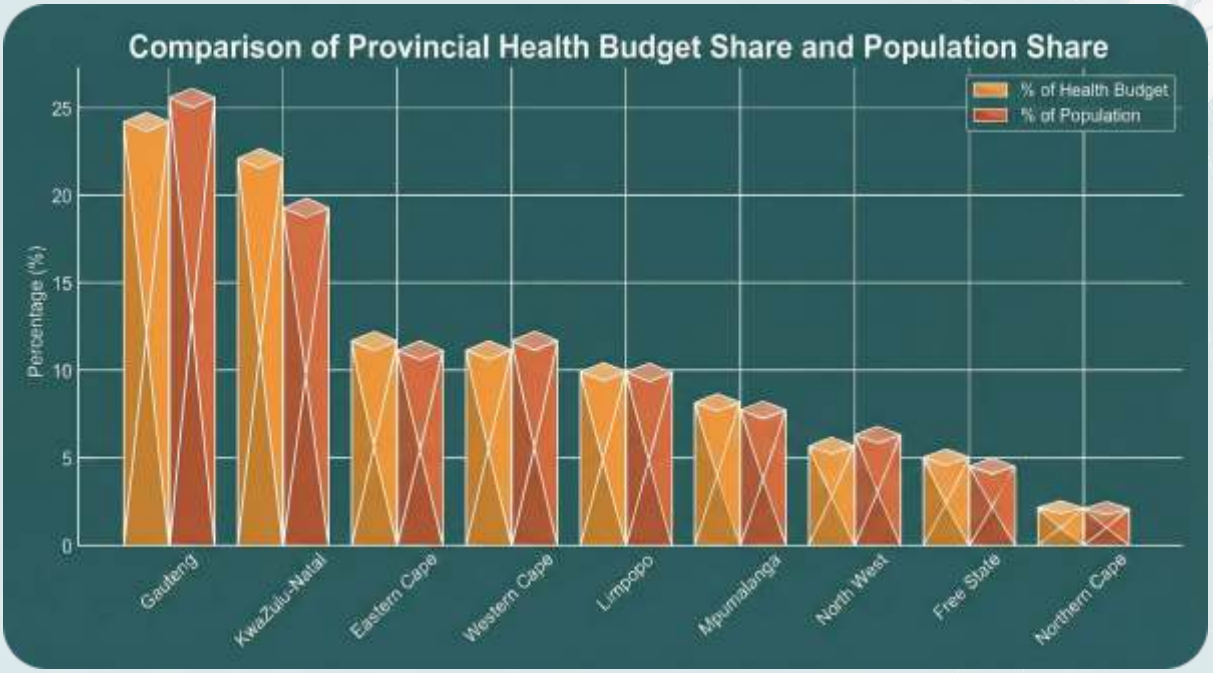
(Coovadia et al., 2009; OECD, 2018). Provinces receive funding through two main channels: equitable share allocations and conditional grants.

The provincial equitable share is the largest component of provincial health funding. It is an unconditional transfer based on a weighted formula that incorporates population size, poverty, health burden, and demographic factors. This arrangement provides provinces with flexibility to set their own priorities, but inter-provincial equity gaps persist, influenced by differences in fiscal capacity, service delivery efficiency, and administrative strength. Provinces such as Gauteng and the Western Cape often utilise these resources more effectively than under-resourced provinces like Limpopo and the Eastern Cape (National Treasury, 2022).

By contrast, conditional grants are targeted funds earmarked for specific programmes or functions, including:

- **Health Facility Revitalisation Grant (HFRG):** Supports construction, maintenance, and upgrading of health infrastructure, especially in under-resourced areas (National Treasury, 2022).
- **National Tertiary Services Grant (NTSG):** Funds advanced clinical services and tertiary hospitals, including support to provinces where tertiary services are less developed (National Treasury, 2023).
- **District Health Programmes Grant:** Finances priority programmes for HIV, TB, malaria, and maternal and child health, with a large share dedicated to antiretroviral treatment (National Department of Health, 2020).

These grants are intended to narrow health system inequalities by directing resources to high-need areas and strategic programmes (National Treasury, 2024). However, stakeholders and official reviews point to ongoing challenges in realising their full impact, including delays in fund allocation, capacity constraints in planning and implementation, and pressures to divert resources toward urgent operational expenses, such as salary backlogs or medico-legal claims (Parliamentary Budget Office, 2022). In practice, these factors can lead to under-utilisation or misalignment of funds relative to identified infrastructure and service gaps.



Source: Source: Author's compilation based on available data from Department of Health Annual Report 2023/2024.

Municipalities play a crucial but often under-resourced role in providing primary and municipal health services, including sanitation and environmental health. They are funded through agency agreements from provinces and a small set of conditional grants, but their fiscal autonomy is limited, and mandates are not always clearly defined. In some areas, municipalities provide district-level services without proportional budget support. Stakeholders noted that role confusion and broader fiscal strain can lead to delayed payments or diversion of funds to other pressing municipal priorities, particularly in historically under-developed areas such as former homelands. These dynamics can dilute the impact of national investments and highlight the importance of clearer mandates and accountability mechanisms within the DoRA framework (South African Government, 2013).

Private Contributions and Out-of-Pocket Payments

Private contributions, largely through medical schemes and out-of-pocket payments, play a significant role in healthcare financing but also reinforce inequities. While the public sector is underfunded relative to need, many households must pay directly for medicines or services not available in public facilities, particularly when seeking care in the private sector (Stuckler et al., 2011; Ataguba & McIntyre, 2012). This financial burden disproportionately affects low-income groups, who may delay or forego treatment (Padarath & English, 2011). Among individuals earning less than R2,000 per month, the cost of a single emergency visit has been estimated at one-third of monthly income (Morrow and Laher, 2022). Another study found that 22.4% of uninsured low-income households still opted for private GPs, often bypassing free public PHC services due to waiting times and perceived quality concerns (Govender et al., 2021). Stakeholders echoed these findings, noting that trust and perceived quality are central drivers of care-seeking behaviour.

Donor Funding and Sustainability Challenges

Donor funding has been an important complement to domestic resources, particularly for HIV and TB. Since the early 2000s, initiatives such as the Global Fund and PEPFAR have supported ART scale-up, TB control, and related systems costs in high-burden districts. While the South African government now finances around 80% of its HIV and AIDS programme, external support remains important for personnel, outreach, and programme innovation (EATG, 2025; The Global Fund, 2024; U.S. Department of State, 2023).

Stakeholders and researchers have highlighted two main risks. First, donor resources have often flowed through vertical, disease-specific programmes, which can fragment services and complicate broader system-strengthening efforts (Reynolds, 2014; Phaswana-Mafuya et al., 2023). Second, shifts in donor priorities can create discontinuities in service delivery. When PEPFAR began reducing support for direct HIV service delivery in 2012, the government faced difficulties absorbing programme costs; studies estimate around 20% loss-to-follow-up among patients transferred from PEPFAR-supported sites to public facilities, affecting up to 200,000 people living with HIV (Cloete et al., 2014; Kavanagh, 2014).

More recent changes have renewed these concerns. The rapid withdrawal of certain U.S. government-funded projects in early 2025 affected more than 40 USAID-funded initiatives and an estimated 24,264 health workers (Malan, 2025). A modelling study commissioned by the NDoH suggests that, without compensatory domestic investment, these cuts could result in 150,000–295,000 additional HIV infections and up to 65,000 additional HIV-related deaths by 2028 (Meyer-Rath et al., 2025; UNAIDS, 2025). These developments underscore the importance of integrating donor-supported activities into core health system functions and developing diversified, sustainable financing strategies going forward.

Spending Categories and Cost Drivers

Investment in healthcare infrastructure remains critical but insufficient, particularly in rural areas where facilities are outdated or entirely lacking. The National Department of Health estimates a national infrastructure backlog of R7.9 billion (Baduza and Lencoasa, 2023). Although the Health Facility Revitalisation Grant (HFRG) allocated R6.8 billion in 2023, this funding remains inadequate to address the scale of need (National Treasury, 2023). Over the Medium-Term Expenditure Framework (MTEF), R26.9 billion has been earmarked for infrastructure development, including projects such as Limpopo Central Hospital (GCIS Yearbook, 2021). Between 2014 and 2023, dozens of hospitals and primary healthcare facilities were constructed or revitalised (Health Infrastructure and Facilities Management, 2023), but stakeholders noted that progress remains uneven and does not keep pace with growing service demands.

Human resources constitute the single largest share of health spending, about 65% of provincial budgets, with approximately 40% of overall public health expenditure allocated to workforce costs (UNICEF SA, 2022) . Workforce pressures are driven by chronic shortages,

wage demands, and high turnover. Nearly 69% of nurses report moonlighting to compensate for low pay and understaffing, reducing productivity and increasing labour costs (Rispel & Blaauw, 2015). Recruitment and retention incentives such as housing allowances and hardship pay aim to attract specialists to rural areas, but stakeholders noted limited success (Tiwari et al., 2021). The emigration of more than 600 healthcare professionals between 2020–2024—driven by poor working conditions and uncertainty around the NHI—has further strained the system (Ntuli & Maboya, 2017). Persistent challenges with the training pipeline also persist, including insufficient faculty capacity and Workforce costs are driven by several additional pressures:

Medical products represent another significant cost driver. Expenditure on essential medicines increased by 40% between 2016 and 2021 due to rising demand and pandemic-related pressures (UNICEF SA, 2022). While donor funding has supported key commodities such as antiretroviral therapy, overreliance on external suppliers highlights the need for more sustainable domestic financing and manufacturing capacity (National Department of Health, 2010; Cleary & McIntyre, 2010). The COVID-19 pandemic underscored the vulnerability of global supply chains and the importance of strengthening local production systems (Takawira and Mutambara, 2022).

Table 2: South Africa's national health budget allocations for the 2023/24 financial year

Category	Allocation (R Billion)	Notes
District Health Services	113.1	Largest portion of the consolidated budget.
Central Hospital Services	48.6	Covers centralized hospital care.
Other Health Services	46.1	Includes various national programs.
Provincial Hospital Services	40.2	Support for regional/provincial hospitals.
Facilities Management and Maintenance	11.3	Facility upkeep and minor works.
Health Facility Revitalisation Grant (Direct to Provinces)	22.2	To provinces for infrastructure and equipment.
Health Facility Revitalisation (Managed by National Dept.)	4.7	Managed by the National Department for provinces.
National Tertiary Services Grant	14.0	Supports tertiary services, with a focus on Mpumalanga and Limpopo.
District Health Programmes	26.9	Funds HIV, TB, malaria programs; targets 7 million individuals on antiretroviral treatment by 2025/26.
NHI Indirect Grant	2.5	Supports NHI rollout, including infrastructure.
Direct NHI Grant	2.1	Supports provincial NHI rollout, focusing on doctors, oncology, and mental health services.

Source: National Treasury: Estimates of National Expenditure 2023 . Vote 18, 2023

National Health Insurance (NHI): Promise and Uncertainty

As of April 2025, South Africa is advancing the implementation of National Health Insurance (NHI) as part of its commitment to achieving universal health coverage. The NHI Act, signed into law in May 2024, establishes a centralised fund that will purchase healthcare services from both public and private providers, aiming to ensure equitable access based on health need rather than socio-economic status (Department of Health, 2024). Initial steps include establishing advisory committees and aligning related legislation with the NHI framework.

The NHI is expected to significantly reshape financing arrangements by consolidating resources, reducing out-of-pocket expenditure, and promoting a more equitable distribution of services (Michel et al., 2020). If implemented as intended, the model could support a more coherent and integrated health system. At the same time, further research is required to understand how the NHI will function across provinces and how the transition will affect existing service delivery pathways.

Stakeholders across sectors expressed broad support for the equity goals underpinning NHI while also noting practical uncertainties. Concerns centred on procurement systems, human resource management, and intergovernmental coordination, areas that have historically faced implementation constraints.

> *"The idea is beautiful. The reality is still taking shape." (Senior health researcher)*
>
> *"Implementation will depend on whether the money reaches clinics." (Civil society leader)*

These reflections align with broader debates about institutional readiness for a reform of this scale. Persistent workforce shortages, uneven infrastructure quality, and variable provincial administrative capacity all pose considerations for rollout (Chuene and Kgarose, 2023). Some interviewees emphasised the importance of ensuring that early phases of NHI implementation prioritise underserved and rural areas, cautioning that without deliberate attention, existing inequities could persist.

Affordability is an additional consideration in the current fiscal environment (Blecher et al., 2019). Estimates project that NHI costs may reach R450–500 billion annually by 2035, almost double current public health expenditure of approximately R254 billion in 2023/24. Fiscal modelling suggests that achieving these goals will require phased implementation and potential adjustments to the national revenue framework (Bhekisisa, 2025). These dynamics underscore both the ambition and the complexity of the reform process.

Table 3: Comparative Assessment of the NHI – Opportunities & Challenges		
Theme	**Opportunities (Pro-NHI)**	**Challenges (Critiques & Concerns)**
Equity	Seeks to eliminate disparities by allocating healthcare based on need, not income or geography *(Parliament, 2024)*.	Risk of urban bias without clear mechanisms for rural prioritisation *(Ngwara et al., 2019)*.
Financial Protection	Reduces out-of-pocket payments at point of care, shielding households from catastrophic health expenses *(NHI, 2024)*.	Fiscal burden of expanding coverage could strain national budgets & require significant tax reform *(Health Systems Trust, 2020)*.
Infrastructure Investment	Investment is expected in public facilities, especially in underserved areas *(Ngwara et al., 2019)*.	Overstretched public sector may be unable to absorb increased demand without service quality deterioration.
Global & Policy Alignment	Supports WHO UHC goals and aligns with SDG 3 – "Ensure healthy lives for all" *(NDoH, 2021)*.	Success depends on South Africa's institutional capacity to meet international standards and reporting obligations.
Resource Pooling	Centralised fund aims to increase efficiency and ensure sustainability *(NDoH, 2021)*.	Centralisation raises risks of corruption and weak governance *(Prinsen, 2023)*.
System Integration	Bridges public & private sectors to improve service access across the population.	May disrupt private medical insurance markets, affecting jobs and patient choice.
Administrative Capacity	Creates potential to reform HR, procurement, and digital systems.	Current limitations in implementation readiness, including HR shortages & fragmented data systems *(HST, 2022)*.

Key Insights, Gaps and Areas for Further Learning

South Africa's health financing system reflects deep structural imbalances that affect efficiency, equity, and resilience. While fiscal frameworks provide a foundation, implementation challenges and misalignment between planning and frontline realities hinder progress.

Key gaps and areas for learning include:

- **Facility-level autonomy:** Unclear and inconsistently applied budget authority limits local responsiveness and innovation.
- **Municipal financing roles:** The contribution of municipalities to climate-sensitive health services is poorly understood and often underfunded.
- **Conditional grants:** Limited data exists on performance, fund absorption, and disbursement bottlenecks across provinces.
- **Private-sector engagement:** Infrastructure, service delivery, and NHI planning lack clear mechanisms for private-sector participation.
- **Sustainability of blended and donor finance:** PPPs and blended models require deeper evaluation to assess equity and feasibility at scale.

Conclusion – The South African Health System Landscape

South Africa's health system is characterised by deep structural inequities, fragmented governance, and persistent disparities in infrastructure, human resources, and financing. These challenges affect service quality and access today, but they also determine the system's ability to adapt to future pressures, including those emerging from climate change. As this chapter has shown, long-standing weaknesses such as uneven provincial capacity, under-resourced rural facilities, workforce shortages, and rigid procurement systems create vulnerabilities that climate-related shocks are likely to intensify. By confronting these structural, fiscal, and governance barriers head-on, South Africa can begin to build a health system that not only advances universal health coverage but is also resilient, equitable, and responsive to future shocks.

Despite these barriers, stakeholders also pointed to meaningful foundations for transformation. Existing policy frameworks (including the NDP, NSP, and NHI) articulate a strong commitment to equity and universal health coverage. Community-based delivery models, emerging innovations in governance, and early examples of infrastructure

adaptation demonstrate that the system can evolve when incentives, leadership, and resources align. These experiences underline that resilience is not only a technical question of infrastructure or financing. It is also a governance and equity issue shaped by relationships across government, civil society, and communities.

Across all components of the health system (governance, financing, infrastructure, human resources, and stakeholder engagement), this chapter highlighted a consistent pattern: **policy ambition is high, but implementation capacity is uneven**. Provinces and districts face differing levels of administrative capability, infrastructure readiness, and fiscal flexibility. Facility managers, community health workers, and local stakeholders often remain distanced from decision-making processes, limiting the system's ability to design contextually appropriate, climate-responsive interventions. Data fragmentation further constrains strategic planning, with limited integration between health, infrastructure, and environmental information systems.

At the same time, the chapter identified clear opportunities to strengthen the system's adaptability. Locally driven innovations, such as community health worker programmes, emerging network-based leadership models, and early energy and water resilience pilots, show the potential of collaborative, context-specific approaches. Strengthening facility-level autonomy, improving procurement processes, and investing in data systems are recurrent themes that can enable more effective responses to both current service delivery challenges and future climate risks.

These insights collectively underscore an important conclusion: **South Africa's climate resilience will ultimately depend on the strength of its underlying health system**. Climate shocks will interact with existing vulnerabilities, exacerbating inequity, straining infrastructure, and intensifying demand for care. Conversely, investments that close implementation gaps, broaden community participation, and build robust governance and financing mechanisms will enhance both health outcomes and climate readiness.

This sets the stage for Chapter 4, which examines how climate change is already affecting health in South Africa and identifies specific pathways for integrating climate resilience into the architecture of the health system. While Chapter 3 maps the landscape of current capacity, Chapter 4 explores how these system dynamics intersect with climate risks, and where targeted interventions can catalyse a more resilient, equitable future.

4. The Health Sector's Environmental Footprint, Climate Risks, and System Vulnerabilities

South Africa's health system is navigating a convergence of pressures as climate change accelerates. Already shaped by deep structural inequalities, chronic under-resourcing, and fragmented governance, the system must now contend with both the environmental impacts it produces and the climate risks it absorbs. The sector is a significant contributor to national greenhouse gas emissions, driven largely by coal-based electricity, diesel generator use, and carbon-intensive procurement, while simultaneously facing escalating threats from extreme heat, floods, droughts, infrastructure failures, and shifting disease burdens. These intersecting pressures expose and intensify existing operational and equity gaps across provinces, facilities, and communities.

This chapter provides a three-part diagnostic of South Africa's climate–health landscape, drawing on literature review, policy analysis, stakeholder interviews, and participatory dialogues:

1. The health sector's environmental footprint: analysing emissions, energy use, water security, and waste management to map how the system contributes to climate change and where mitigation opportunities lie.

2. Climate-related risks and impacts on healthcare delivery: assessing how heat, floods, droughts, air pollution, and changing disease patterns are disrupting infrastructure, service continuity, patient outcomes, and staff wellbeing.

3. Socio-economic and spatial determinants of vulnerability: examining how historical inequities, poverty, gendered care burdens, and spatial segregation shape which communities are most exposed and least protected in the face of climate impacts.

Together, these dimensions provide a baseline understanding of the system's current exposure, capacity, and risk profile. They also set the stage for Chapter 5, which turns to the institutional, governance, and financing mechanisms needed to translate climate–health priorities into actionable and sustained system reform.

4.1 Greenhouse gas emissions, energy, water, and waste management

South Africa's healthcare sector has a substantial environmental footprint, driven by coal-dependent electricity, diesel generators, energy-intensive facilities, and reliance on single-use materials. These drivers shape both the health system's mitigation responsibilities and its operational vulnerabilities. This section examines current evidence on greenhouse gas emissions, energy use, water security, and waste management,

highlighting the diagnostic gaps that limit effective planning and the opportunities for low-carbon, climate-resilient system transformation.

Emissions and Energy Use: A System Without a Baseline

In 2024, the South African health sector was estimated to emit 15.93 million tonnes of CO_2e. Most of this comes from **Scope 2 emissions** (indirect emissions from purchased electricity), driven by near-total dependence on coal-powered grid energy. Additional emissions include **Scope 1 sources** (direct emissions from diesel generators, incineration, and ambulance fleets) and **Scope 3 sources** (indirect value-chain emissions such as the production and transport of pharmaceuticals, single-use plastics, staff and patient travel, and outsourced waste disposal) (see Table 3, Bhekisisa, 2024).

Table 3: Healthcare Carbon Emissions Breakdown (2022)

Scope	Description	Key Contributors	Emissions Estimate
Scope 1 (Direct emissions)	Emissions from healthcare facilities' owned/controlled sources	- Diesel generators during load-shedding - Medical waste incineration (e.g., plastics, chemicals) - Ambulance fleets (fuel combustion)	~1.2 million tonnes CO_2e/year
Scope 2 (Indirect emissions from purchased energy)	Emissions from electricity, steam, or cooling purchased for healthcare operations	- Coal-powered grid electricity for lighting, HVAC, and medical equipment - Public hospitals: 80% dependent on Eskom's coal grid	~12.5 million tonnes CO_2e/year
Scope 3 (Indirect value-chain emissions)	Emissions from healthcare supply chains and external activities	-Pharmaceuticals/medical devices (production, transport) - Single-use plastics (manufacturing, disposal) - Staff commuting and patient travel - Waste disposal (landfill methane, outsourced incineration)	~2.23 million tonnes CO_2e/year

Source: Bhekisisa Centre for Health Journalism, 2024

Stakeholders consistently highlighted profound data gaps across the sector, particularly the absence of energy audits, emissions tracking, or integrated monitoring systems. Without routine measurement, facilities cannot benchmark consumption, assess decarbonisation opportunities, or plan for long-term adaptation. These gaps also limit national ability to model health sector emissions or develop targeted mitigation policies.

> *"At district level, we're not collecting emissions data. It's not seen as a health metric."*

Pilot initiatives such as solar PV installations in the Western Cape and Gauteng have often proceeded without baseline diagnostics, resulting in ad hoc or assumption-based planning rather than strategic decarbonisation.

> *"They wanted to retrofit hospitals for solar but had no baseline on energy consumption. It was all assumption-based."*

Given these limitations, the subsections that follow summarise what is currently known about energy use, water security, and waste management, drawing from both available studies and stakeholder insights.

Electricity Use

Electricity consumption, driven almost entirely by Eskom's coal-powered grid, is the single largest contributor to health sector emissions. Load-shedding intensifies this dependence by forcing facilities to rely on diesel generators, increasing both Scope 1 emissions and operating costs. Stakeholders described facilities running generators for extended periods without long-term energy plans, storage capacity, or efficiency retrofits, underscoring the absence of a coordinated strategy for energy resilience.

Private hospitals face similar risks. For example, electricity use accounts for 71% of Mediclinic's total emissions, reflecting the high energy intensity of diagnostic equipment, HVAC systems, and specialized inpatient care (Mediclinic International, 2020). Across both public and private sectors, healthcare facilities are among the most energy-intensive building types in the country, consuming nearly three times more energy than typical commercial buildings (Hohne et al, 2020). This dependency makes decarbonisation particularly challenging in the absence of robust technical planning, facility-level audits, or aligned financing mechanisms.

Water Security: Chronic Risk Meets Poor Planning

South Africa's health facilities face increasing water insecurity, driven by climate-related drought cycles, aging municipal infrastructure, and unclear institutional responsibilities for water planning. These disruptions affect hygiene, infection control, and continuity of care, often in both rural and urban settings, highlighting that water scarcity is no longer an episodic shock but a chronic operational risk for the health system. Stakeholders repeatedly

emphasized that even facilities in major metros are vulnerable to water shortages during heatwaves or municipal supply failures.

> *"Even urban clinics are vulnerable during heat waves due to poor plumbing and reservoir shortages." (Climate scientist)*

Although some facilities have installed rainwater harvesting or greywater recycling systems, these remain isolated pilots rather than components of a national approach. The health sector lacks technical guidelines, implementation standards, or funding mechanisms to support water resilience at scale, leaving facility managers without the tools needed to plan proactively.

Waste Management: High Emissions, Low Control

South Africa's health sector remains heavily dependent on clinical waste incineration—a carbon-intensive and costly method that contributes substantially to Scope 1 emissions and ongoing air-quality concerns. While alternative technologies such as frictional heating and microwave sterilization have been piloted in facilities like Khayelitsha and George Hospital, national uptake has been minimal due to regulatory misalignment, inflexible procurement rules, and limited technical maintenance capacity. Strict sterilization protocols further entrench the use of single-use plastics, which constitute an estimated 20–30% of clinical waste (Bhekisisa, 2024).

> *"A lot of the waste gets incinerated, and we don't have a viable, cleaner alternative." (Health researcher)*

Weak waste segregation practices compound these challenges. Many facilities struggle to separate hazardous, infectious, and general waste, resulting in unnecessary incineration volumes, safety risks for staff, and reduced compliance with environmental regulations. This also inflates the carbon footprint of waste disposal and limits opportunities for recycling or lower-emission treatment methods.

> *"Many clinics don't separate waste properly. Even sharps and general waste end up in the same bins." (Provincial official)*

Private Sector Contributions and Challenges

Although private healthcare serves only 16% of South Africans, it accounts for a disproportionately large share of health-sector emissions due to energy-intensive infrastructure, longer inpatient stays, and high-tech clinical procedures.

Some private providers have pioneered low-carbon initiatives, such as Netcare Montana Hospital's 683 MWh/year solar PV installation (Stephen, 2024), contributing to Netcare's 39% reduction in energy intensity since 2013 and its target of reducing Scope 1 and 2 emissions by 84% by 2030. However, these examples remain the exception rather than the norm.

Scaling such efforts is hindered by regulatory and financial barriers, including limits on municipal solar feed-in, lack of renewable-energy incentives, and misalignment between private-sector infrastructure plans and national health facility regulations. Many approved solar projects have faced delays because procurement and licensing systems were not designed to accommodate independent power generation (Stephen, 2024).

Private providers are also largely excluded from national climate-health frameworks, which restricts access to green infrastructure grants and technical support available to public facilities. Meanwhile, Scope 3 emissions from pharmaceuticals, medical devices, and transport remain unregulated with no sector-wide mitigation strategies (Bhekisisa, 2024). As a result, private-sector progress is fragmented, isolated, and difficult to scale.

Key Insights, Gaps and Areas for Learning

South Africa's health sector faces significant challenges in reducing emissions and strengthening climate resilience, largely due to data gaps, rigid operational systems, and limited facility autonomy. While local pilots demonstrate what is possible, system-wide progress remains constrained by fragmented procurement pathways, weak accountability, and the absence of standardised energy, water, and waste diagnostics.

Key gaps and areas for learning include:

- **Data and monitoring gaps:** Limited facility-level emissions data across Scopes 1–3, and no integration of environmental indicators into national health information systems.
- **Operational and procurement constraints:** Rigid, centralised procurement systems and unclear implementation guidance hinder energy, water, and waste resilience initiatives at facility level.
- **Financing and investment barriers:** Few costing studies or business cases to guide decision-making; limited access to green financing; proven pilots remain siloed without scale-up mechanisms.
- **Public–private collaboration gaps:** Regulatory barriers (e.g., solar feed-in restrictions, licensing requirements) limit private-sector innovation; learning from private-sector pilots is not systematically integrated into national strategies.

4.2 Climate-Related Risks and Impacts on Healthcare Delivery

South Africa's climate is warming at nearly twice the global rate, with studies projecting a 1–2% increase in mortality for every 1°C rise in temperature (Chersich et al., 2018; Wright et al., 2023). For the health system, this translates into growing stress from extreme weather events, shifting disease burdens, and mounting psychosocial impacts. These risks are unevenly distributed: they fall most heavily on communities already facing socio-economic and health vulnerabilities, compounding existing inequities. Stakeholders described a health system in which climate hazards increasingly damage facilities, disrupt supply chains, overwhelm staff, and undermine continuity of care.

Disruption from Climate Extremes

Heatwaves, floods, and droughts emerged as the most immediate and visible threats to health service continuity. In KwaZulu-Natal, the 2022 floods damaged 23 hospitals and 34 clinics, disrupting ART adherence and maternal care for more than 50,000 patients (Musuka & Dzinamarira, 2023; Health Systems Trust, 2023). Officials described cascading infrastructure failures, including damaged reservoirs, blocked roads, and electricity outages that left staff stranded and forced at least one major hospital to operate at severely reduced capacity. In Limpopo, prolonged droughts have forced communities to prioritise water collection over clinic visits, contributing to a reported 30% increase in default rates for chronic disease treatment (Khine & Langkulsen, 2023).

> *"Every facility needs its own disaster management plan, and contingency infrastructure to match." (Provincial health official)*

Across provinces, service interruptions during floods and droughts have led to missed appointments, treatment default, and long-term damage to already fragile infrastructure. ART adherence, continuity of maternal and child health services, and access to routine chronic care are often the first casualties. Clinics without cooling systems become dangerously hot during heatwaves, exposing both patients and staff to indoor temperatures that compromise safety and productivity.

> *"You'd see all these dead cows on the road, long queues of people waiting for water. Some of these people probably needed to be in the clinic that day, but competing priorities kept them away." (Health researcher, reflecting on drought conditions)*

Electricity and water interruptions jeopardise critical services, including vaccine refrigeration, sterilisation equipment, dialysis, and life-support systems. Outages frequently coincide with peak demand, amplifying clinical risk and operational strain. The economic toll is substantial: climate-related healthcare costs were estimated at R12.5 billion in 2024, with diesel for generators alone costing around R1.2 billion annually (Bhekisisa, 2024). These expenditures divert scarce resources away from health system strengthening and climate-resilient infrastructure investments.

Floods and droughts also exacerbate outbreaks of diarrhoeal diseases, cholera, and malaria, adding pressure to under-resourced facilities. Studies have documented a measurable expansion of malaria transmission zones since 2000, with increased incidence and geographic spread in Limpopo, Mpumalanga, and KwaZulu-Natal (Adeola et al., 2017). Water and sanitation failures undermine hygiene and infection control, while damaged roads and disrupted transport systems delay or prevent clinic access. Stakeholders noted that even short service interruptions can have cascading effects for patients with HIV, TB, or chronic conditions who depend on regular contact with the health system.

Despite these patterns, few surveillance systems in South Africa systematically track disease burdens in relation to climate events, limiting anticipatory planning and budget justification. Integrated early warning systems for climate-sensitive conditions such as malaria are largely absent. While all provinces report diarrhoeal disease through the District Health Information System (DHIS), only three provinces (Western Cape, Gauteng, and KwaZulu-Natal) have enhanced protocols that explicitly link diarrhoeal outbreaks to flooding events. As a result, an estimated 65–70% of post-flood diarrhoeal outbreaks may go undetected or are not adequately attributed to climate events (Wright et al., 2023; Musengimana et al., 2016).

Environmental Exposure and Hidden Risks

Direct climate shocks interact with chronic environmental exposures, particularly poor air quality, to compound health risks and further burden healthcare systems. In coal-dependent regions such as the Highveld and Vaal Triangle, air pollution has been linked to a 40% higher incidence of childhood asthma compared with national averages (Wright et al., 2023). A recent study associated elevated PM2.5 levels in Mpumalanga with a 15% increase in hospitalisations for chronic obstructive pulmonary disease (Musuka & Dzinamarira, 2023). Stakeholders working in these regions described routine surges in asthma and respiratory illness in communities living near coal-fired power stations and industrial sites.

> *"They are insanely polluted… kids are having asthma, respiratory health effects, you can see it on the ground." (Climate and health researcher)*

Yet limitations in air quality monitoring networks and attribution science make it difficult to translate these lived experiences into policy action. As one South African climate scientist noted, the absence of long-term cohort studies in African settings has constrained efforts to quantify the full health burden of air pollution. This weakens the evidence base that decision-makers rely on when weighing emissions reductions and clean energy transitions against other priorities.

Psychosocial and Mental Health Stressors

Environmental degradation and repeated service breakdowns also generate significant psychological distress, revealing how climate-related risks extend beyond physical health

into mental wellbeing and social resilience. Mental health impacts are largely absent from provincial climate adaptation plans, despite studies indicating a 25% increase in depression and anxiety in drought- and flood-affected communities (Musuka & Dzinamarira, 2023). Following the 2022 KwaZulu-Natal floods, 60% of displaced individuals reported symptoms consistent with post-traumatic stress disorder, yet fewer than 5% received any form of psychosocial support (Health Systems Trust, 2023).

> *"People spoke of depression and hopelessness, not from hunger alone, but from watching everything they built fall apart." (Mental health researcher, drought-affected district)*

Repeated displacement, livelihood loss, and ongoing strain on public services create layers of trauma that accumulate over time. Stakeholders called for mental health services, psychosocial surveillance tools, and community-based support structures to be explicitly integrated into climate-health adaptation efforts, rather than treated as peripheral or after-the-fact responses.

Key Insights, Gaps and Areas for Learning

Evidence from both the literature and stakeholder engagements highlights heat, air pollution, infectious diseases, and infrastructure vulnerability as overlapping, current climate-related threats to health and healthcare delivery. While formal analyses often frame these risks at a systems level, stakeholders emphasised their deeply local and operational character: missed appointments, disrupted continuity of care, cumulative psychological distress, and the slow erosion of trust in public services. These impacts are most acute in already marginalised communities, where fragile infrastructure and weak surveillance systems limit the visibility of climate-related health burdens.

Key gaps and areas for learning include:

- **Linking climate events to health outcomes:** There is no routine, integrated surveillance system that connects climate hazards (e.g. floods, heatwaves, pollution episodes) with morbidity, mortality, and service disruption data, limiting anticipatory planning and resource allocation.
- **Disaggregated and equity-focused data:** Existing reporting seldom disaggregates climate-related health impacts by geography, age, gender, disability, or socio-economic status, masking who is most affected and where adaptation investments are most urgently needed.
- **Operational integration of early warning systems:** Early warning information for climate-sensitive hazards rarely triggers clear, pre-agreed protocols at facility or district level (e.g. staffing, stock management, patient outreach), highlighting the need for context-specific, actionable playbooks.

Table 4: Typology of impacts of climate change on health outcomes & health systems in South Africa		
Category	**Impact**	**Details**
Direct Health Impacts	Heat-Related Illnesses and Mortality	Rising temperatures increase heat waves, leading to higher mortality rates. A 1°C rise in temperature correlates with a 2% increase in mortality for people over 65 years old. Vulnerable groups include children, pregnant women, and the elderly (Wright et al., 2014).
	Extreme Weather Events	Droughts, floods, & storms cause injuries, fatalities, & outbreaks of diseases like cholera due to compromised water quality (Wright, 2014).
	Air Quality and Respiratory Diseases	Climate change exacerbates air pollution through increased particulate matter and temperature inversions, contributing to respiratory diseases such as asthma and cardiovascular conditions (Khine & Langkulsen, 2023; Musengimana et al., 2016)
Indirect Health Impacts	Vector-Borne Diseases	Altered rainfall patterns and rising temperatures expand the range of diseases like malaria and Rift Valley Fever into previously unaffected areas. By 2050, approximately 300,000 people annually may be at risk of malaria under high-emission scenarios (Khine & Langkulsen, 2023).
	Food and Water Security	Droughts and soil degradation threaten food production, leading to malnutrition. Water scarcity worsens hygiene conditions, increasing diarrheal diseases like cholera (Khine & Langkulsen, 2023).
	Mental Health	Climate-related disasters contribute to stress, depression, and increased suicide rates among affected populations such as farmers facing prolonged droughts. (Khine & Langkulsen, 2023).
Impacts on Health Systems	Infrastructure Vulnerability	Many healthcare facilities lack adequate cooling systems or insulation against extreme temperatures, affecting service delivery and increasing risks for patients and staff (Wright et al., 2014).
	Increased Disease Burden	The rising prevalence of climate-sensitive diseases places additional strain on already overburdened health systems that struggle to meet existing demands. (Naidoo, 2016)
	Access Barriers	Extreme weather events disrupt supply chains for medical supplies and limit access to healthcare facilities for vulnerable communities. (Naidoo, 2016)

4.3 Socio-economic Determinants Exacerbating Vulnerability to Climate-Related Health Risks

South Africa's social, political, and environmental conditions create a layered set of vulnerabilities in the face of climate change. Climate-related health risks are not evenly distributed: they mirror long-standing inequities in socio-economic status, geography, infrastructure, and institutional capacity. In this context, climate change functions as a risk multiplier, intensifying deficits in public health, service delivery, and environmental justice. This section examines how vulnerability is socially structured and spatially concentrated, particularly in under-serviced communities where climate impacts intersect with historical and ongoing marginalisation.

Infrastructure Gaps and System Fragility in Vulnerable Settings

Stakeholders consistently identified infrastructure fragility as a major driver of climate-related vulnerability. Under-resourced facilities are often located in climate-exposed zones and lack the basic infrastructure required to maintain safe services during extreme weather events. In the Eastern Cape, 70% of rural clinics lack cooling systems, leaving patients and staff exposed to indoor temperatures surpassing 40°C during heatwaves (Wright et al., 2024).

> *"Health workers are collapsing. There's no aircon, no ventilation. That's not resilience, that's abandonment." (Provincial health official)*

Another stakeholder described the long-term consequences of climate shocks in KwaZulu-Natal, where floods caused widespread displacement and increased loss to follow-up among patients with chronic conditions:

> *"Close to 500 people lost their lives. Many were displaced and disconnected from their usual care, and some never re-engaged with the system." (Provincial health official)*

These examples illustrate how infrastructure deficits and extreme weather combine to weaken continuity of care, particularly in regions already experiencing low service uptake and fragile patient retention (Chersich et al., 2018; Wright et al., 2024; SAMRC, 2024).

Spatial and Economic Inequality

South Africa's apartheid-era spatial inequalities remain central to its climate vulnerability profile. Informal settlements and rural areas, home to 38% of the population, face disproportionate exposure due to inadequate infrastructure, hazardous location, and limited state presence (Grangxabe et al., 2023). Historical planning decisions continue to shape who is most exposed to floods, heat, and pollution.

> *"The same communities pushed to the margins under apartheid are now on the frontlines of climate risk." (Senior climate researcher)*

This spatial segregation is reinforced by persistent underinvestment. Rural clinics in former homelands are 40% less likely to have backup electricity or water storage than urban facilities (Health Systems Trust, 2023). Economic disparities further shape adaptive capacity: households in wealthier urban areas are five times more likely to have insurance, solar systems, or flood-resistant housing (Dasgupta et al., 2023)

During the 2022 KwaZulu-Natal floods, 80% of destroyed homes were in informal settlements, displacing 40,000 residents; only 12% received emergency healthcare within 48 hours (HST, 2023). These cascading risks deepen health inequities, with post-flood diarrhoeal disease rates three times higher in informal settlements than in formal townships (Chersich et al., 2018).

Gender, Age, and Care Work

Stakeholders emphasised the gendered nature of climate-health vulnerability. Women, particularly those in caregiving roles, face heightened exposure to indoor heat, household air pollution, and the burdens of water collection and family health management. Stakeholders reflected:

> *"Women are cooking in the heat with no ventilation. It's their lungs and bodies that take the hit first."*

One interviewee described a "perfect storm" of overlapping risks created by poor housing, lack of electricity, and reliance on paraffin or wood fuels. Children, the elderly, and people with chronic illness or disabilities also face compounded risks that are often invisible in planning processes. For the 16% of adults living with HIV, even short disruptions in water quality amplify vulnerability to diarrhoeal disease (Chersich et al., 2018). Children are exposed in overcrowded schools lacking ventilation or safe outdoor spaces, while elderly individuals face heightened cardiovascular and respiratory risks during heatwaves. Yet age-, gender-, and health-responsive adaptation strategies are largely absent from provincial and national climate-health planning.

Data systems further obscure these risks. There is no routine surveillance of heat stress in informal settlements, no monitoring of respiratory illness spikes during air pollution events, and limited integration of socio-demographic variables in climate-related morbidity data. As in the energy and emissions domain (Section 4.1), poor data systems undermine early warning and targeted intervention.

Patterns of marginalisation also shape climate vulnerability, as communities with the least voice in planning processes often face the greatest exposure, an issue we will return to in chapter 5.

Key Insights, Gaps, and Areas for Learning

Climate-related vulnerability in South Africa is deeply shaped by entrenched social and spatial inequities. Communities living in poverty, informal settlements, and rural areas experience disproportionate exposure to heat, floods, and service disruptions due to long-standing deficits in infrastructure, state capacity, and social protection. Vulnerability is also patterned by gender, age, and health status, creating layered risks for women, children, the elderly, and people with chronic illness. These patterns reveal that climate-health impacts cannot be addressed through technical interventions alone; equitable and community-grounded approaches are essential to strengthen resilience.

Key gaps and areas for learning include:

- **Lack of age- and gender-responsive adaptation planning:** Current adaptation efforts rarely account for the distinct climate-health risks faced by women, children, the elderly, and people with chronic illness, resulting in interventions that overlook key vulnerabilities.
- **Exclusion of marginalized communities from decision-making:** Rural residents, informal settlement communities, and frontline workers are seldom included in formal planning processes, reducing the relevance, uptake, and legitimacy of adaptation strategies.
- **Weak data systems linking social vulnerability and climate exposure:** Health information systems lack disaggregated data on climate-related morbidity and do not integrate early warning systems, limiting targeted planning and anticipatory action.
- **Limited evidence on effective community-driven models:** There is inadequate documentation and evaluation of locally led adaptation initiatives, restricting learning on scalable, equity-centered approaches that integrate traditional knowledge and lived experience.

Conclusion

South Africa's health system faces mounting and intersecting pressures from climate change, including heatwaves, flooding, drought, water insecurity, air pollution, and shifting disease patterns. These hazards disrupt service delivery, damage infrastructure, burden frontline providers, and increase acute and chronic health needs. The impacts are already visible across provinces, with recurrent interruptions to electricity, water, supply chains, and essential services compromising continuity of care for vulnerable patients.

Climate risks do not fall evenly across the population. They are concentrated in communities already facing the greatest social, spatial, and economic disadvantages, including rural areas, informal settlements, and households with limited access to insurance, transport, or resilient housing. Women, children, older adults, and people living with chronic illness or disability experience compounded risks that are rarely addressed in current planning. These patterns underscore that climate vulnerability is not only an environmental problem but a structural one, shaped by long-standing inequalities in infrastructure, governance, service quality, and state investment.

Despite these challenges, local innovations demonstrate what is possible when leadership, resources, and partnerships align. Solar-hybrid clinics, improved water management, alternative waste technologies, passive cooling interventions, and early-warning integration offer concrete examples of climate-resilient design emerging from within the health system. Yet these remain fragmented and isolated, highlighting the need for more systematic investment in diagnostics, data systems, and context-sensitive adaptation strategies.

Overall, the evidence from this chapter shows that building a climate-resilient health system requires confronting both climate hazards and the inequities that amplify their effects. Strengthening resilience will depend on understanding exposures, addressing socio-economic drivers of vulnerability, and supporting facility-level and community-led strategies tailored to local realities. The next chapter turns to the governance, coordination, and implementation structures that will determine whether these risks are met with reactive responses or with sustained, system-wide transformation.

5. Governance and Implementation

South Africa's ability to respond effectively to climate-related health risks depends not only on understanding exposures and vulnerabilities, but on the governance systems, institutional arrangements, and operational mechanisms that translate policy commitments into action. While Chapter 4 examined the ways in which climate hazards disrupt service delivery and deepen inequities, this chapter shifts focus to the structures that shape readiness, coordination, and implementation across the health system.

This chapter analyses the actors, policies, and systems that govern climate–health integration at national, provincial, and local levels. It examines the coherence of policy frameworks, the distribution of mandates and authority, and the persistent fragmentation, both vertical and horizontal, that hinders sustained implementation. It also explores the practical enablers and barriers that determine whether innovations scale or remain isolated pilots, from procurement and financing systems to data infrastructure and institutional culture. Together, these insights illuminate why climate–health ambitions often falter in practice, and what structural reforms are required to build a responsive, accountable, and climate-resilient health system.

5.1 Stakeholders at the climate-health interface

South Africa's climate–health landscape is shaped by a wide but fragmented network of actors whose mandates and priorities often do not align. Government departments, researchers, civil society groups and emerging private-sector innovators each contribute essential pieces of the climate–health puzzle, yet coordination remains limited and largely episodic. Stakeholder interviews highlighted that collaboration tends to intensify only during acute shocks or donor-funded initiatives, while routine alignment, role clarity and intersectoral mechanisms remain weak. These gaps create duplication, slow progress and reinforce the siloed nature of climate and health action in the country.

This section synthesises insights from the literature, stakeholder interviews, and network analysis to map the key institutions shaping climate–health action and the structural dynamics influencing their effectiveness. It does not attempt to provide an exhaustive stakeholder directory; rather, it identifies the actors whose roles, relationships and institutional positioning directly influence South Africa's capacity to integrate climate resilience into the health sector.

Institutional Stakeholders and Their Roles

South Africa's climate–health landscape is shaped by a wide but uneven constellation of institutions whose roles intersect more on paper than in practice. At national level, the

Department of Forestry, Fisheries and the Environment (DFFE) leads overall climate policy, while the National Department of Health (NDoH) is responsible for climate-health risk assessments, adaptation planning, and guidance to provinces (dos Santos et al. 2022). Yet stakeholders described limited coordination between the two sectors, with unclear lines of responsibility and little shared accountability.

Coordination is formally channelled through the National Climate Change and Health Adaptation Steering Committee, but this body has lost visibility and momentum since the end of the 2014–2019 National Climate Change and Health Adaptation Plan. Many stakeholders described it as lacking the authority and resourcing needed to shape implementation. In contrast, the Presidential Climate Commission (PCC) has emerged as the country's most influential cross-sectoral climate platform. Yet health participation remains inconsistent, and several stakeholders noted that key climate decisions are made with "*health largely absent from the room.*"

The National Disaster Management Centre (NDMC) plays a vital role in emergency coordination, early warning systems, and rapid response. But links between NDMC processes and health system planning remain underdeveloped, meaning that disaster-related risks are often managed separately from health service delivery and continuity planning.

Provincial and municipal governments, responsible for local-level implementation, face highly uneven levels of capacity. The Western Cape has made the most progress in embedding health considerations within its climate strategies, while provinces such as Limpopo and parts of the Eastern Cape report minimal technical capacity and few health-specific adaptation plans. Municipalities, despite being on the frontline of service delivery and disaster response, often lack climate expertise, clear mandates, and operational budgets for adaptation.

Stakeholders repeatedly emphasised that beyond formal structures, **relational capacity**, including trust, communication, and informal networks, plays a critical enabling role in climate-health coordination. A recently published case study on the health sector's response to the Western Cape's extreme drought between 2015 and 2018, highlighted that "strong relationships, good communication and shared values" were some of the most critical factors that helped forward the response (Quintana et al. 2025)

Table 5: Key stakeholders in climate-health in South Africa			
Level	**Actor**	**Key Actions and Responsibilities**	**Challenges**
National Level	Department of Forestry, Fisheries and the Environment (DFFE)	Policy coordination and leadership, climate risk assessments, monitoring and Reporting	- Lack of clarity in policies (Quintana et al., 2024) - Limited integration of health-specific adaptation measures (Quintana et al., 2024) - Weak cross-sectoral coordination (Chersich & Wright, 2019) - Insufficient high-quality data on climate-health linkages (Khine & Langkulsen, 2023)
	National Department of Health (NDoH)	Health system adaptation, implementation of climate-health RVAs, capacity building, education	
	National Climate Change and Health Adaptation Steering Committee	Fosters intersectoral coordination and guides the implementation of key adaptation activities	
	Presidential Climate Commission (PCC)	Shapes national climate policy across climate resilience & decarbonisation strategies.	
	National Disaster Management Centre	Disaster response strategies, spans early warning coordination, emergency response, and risk assessment	
Provincial Level	Provincial Departments of Environmental Affairs Other provincial actors involved can include: Provincial Department of Health, Provincial Treasury and Finance Departments, Provincial Disaster Management Centres	Coordinating the development and implementation of provincial climate response strategies, such as the Western Cape Climate Change Response Strategy (WCCCRS).	- Many provincial plans lack detailed health-specific adaptation measures. - Limited financial and technical resources for effective implementation. (dos Santos et al. 2022)
Local Level	Municipal Councils	Address localized adaptation challenges, e.g., developing heat-health warning systems. Implementation can involve Environmental Health Services and Municipal disaster management	- Limited financial and technical resources for effective implementation. - Limited capacity and expertise at the municipal level to design and execute adaptation strategies. (dos Santos et al. 2022)

Academic and Research Institutions

Academic and research institutions, including the SAMRC, UCT, Wits, Stellenbosch, and the CSIR, provide the bulk of technical expertise on climate risks, epidemiological modelling, health systems resilience, and risk and vulnerability assessments (RVAs). Key institutions include the South African Medical Research Council (SAMRC), the University of Cape Town (UCT), Stellenbosch University, the University of the Witwatersrand (Wits), and the Council for Scientific and Industrial Research (CSIR). These institutions are producing work on air quality, heat stress, health systems resilience, epidemiological modeling, and policy design. Their work underpins national guidance and informs international bodies such as WHO and the IPCC. However, the climate-health research workforce is extremely small relative to need, creating dependency on a handful of specialists.

> *"In South Africa, there are probably only 10-20 people who are really working full-time at the intersection of climate and health, for a population of over 65 million. That's insane." (Climate–health researcher)*

Civil Society organisations and NGOs

Civil society organisations play a critical bridging role in South Africa's climate–health ecosystem, translating technical evidence into public advocacy and community engagement. Organisations such as groundWork and the Rural Health Advocacy Project work closely with healthcare workers, using their credibility and community presence to strengthen public understanding of climate-related health risks.

Through its long-standing partnership with Health Care Without Harm and leadership in the Global Green and Healthy Hospitals (GGHH) network, groundWork has positioned health professionals as key public messengers in climate advocacy. They emphasize health literacy as a driver for public awareness and use medical professionals as credible messengers to bridge scientific evidence and community advocacy.

> *"We always work with the health sector because it's a trusted voice… people believe nurses and doctors more than politicians." (CSO representative)*

A 2024 evaluation found that campaigns co-led by nurses improved community climate-health literacy by 40% in Mpumalanga (groundWork, 2024).

Private Sector Actors and Funding Institutions

A small but growing number of hybrid and private sector actors, including digital health innovators and energy service companies (ESCOs), entities that develop, implement, and often finance energy efficiency and renewable energy projects, are also entering the space, especially in areas like solar installations, air quality monitoring, and climate data analytics. These actors are likely to play a larger role as public-private partnerships evolve.

Development finance institutions (DFIs), such as the DBSA, AFD, and AfDB, are also influential stakeholders in shaping the policy and financing landscape for climate-health integration. While traditionally focused on national-level policy alignment, some DFIs are beginning to explore sub-national partnerships, outcome-linked investments, and green infrastructure models tailored to provincial and municipal implementation (as will be explored in more detail in chapter 6). Their evolving role highlights the importance of financial architecture in enabling scalable and context-sensitive solutions. These emerging players represent an important lever for experimentation and scaling, provided partnerships with public institutions are strengthened.

Tensions, Synergies and Structural Barriers

Stakeholder insights illuminated how institutional roles and relational dynamics contribute to broader systemic fragmentation. While a number of stakeholders pointed to the PCC as a potential vehicle for aligning health, environmental, and infrastructure priorities, this platform remains underutilized in shaping the climate and health space, with unclear mandates and inconsistent participation from health sector representatives. Several participants pointed to the lack of shared ownership between departments, especially in national policy spaces like the Presidential Climate Commission, where health actors are often absent.

> *"The Department of Health isn't even in the room half the time. PCC discussions are happening, but health isn't at the table." (PCC stakeholder)*

Fragmentation also plays out at provincial and municipal levels, where climate responsibilities remain diffuse and often poorly understood. Health departments frequently do not view climate adaptation as part of their core mandate, while environment units lack the authority or resources to convene multisectoral planning. Municipalities, tasked with frontline implementation, face severe capacity barriers and are rarely included in upstream policy design, resulting in uncertainty about accountability.

> *"When you talk about climate at the municipal level, people say: 'That's not our job.'" (Provincial health official)*

Stakeholders noted that South Africa's devolved governance system further complicates coordination. Because health is principally a provincial competency, national climate–health strategies often fail to cascade into provincial priorities or municipal implementation. The mismatch between national vision and local authority dilutes accountability and fragments implementation, limiting the translation of policy ambition into coherent action.

Another recurring theme was the reliance on individual champions rather than institutionalised systems. Knowledge and capacity often sit with specific people rather than within organisational structures, leaving climate–health initiatives vulnerable to turnover and limiting long-term continuity. *"When they leave,"* one person commented, "*the knowledge leaves with them."*

Despite these barriers, several actors are working to bridge coordination gaps. Partnerships such as groundWork's collaboration with the Global Green and Healthy Hospitals (GGHH) network demonstrate how civil society can strengthen awareness and advocacy, while provinces such as the Western Cape are experimenting with new collaboration and financing models—including ESCO partnerships—that could support more scalable climate–health action.

Key Insights, Gaps, and Areas for Learning

Stakeholder engagement revealed a climate–health ecosystem that is diverse but highly fragmented, with actors operating across national, provincial, municipal, academic, civil society, private, and donor spaces but rarely in coordinated ways. While awareness of the climate–health agenda is growing, health sector participation in major climate governance platforms remains inconsistent, and collaboration often relies on individual champions rather than institutionalised systems. Promising examples, such as provincial experimentation, civil society partnerships, and emerging public–private models, demonstrate what is possible when leadership, resourcing, and aligned mandates converge. However, without clearer coordination mechanisms and stronger mandates for integrated planning, the system risks remaining siloed and reactive.

Key gaps and areas for learning include:

- **Coordination Architecture:** There is no comprehensive, up-to-date map of climate–health actors or mechanisms linking national, provincial, and municipal stakeholders, making it difficult to build coherent, multisectoral pathways for implementation.
- **Health Representation in Climate Governance:** Health actors are inconsistently represented in national climate bodies (e.g., the PCC), and health-specific mandates within broader climate structures remain weak, limiting the sector's influence on climate adaptation and mitigation agendas.
- **Local Implementation Capacity:** Municipalities and many provinces lack the technical skills, institutional capacity, and resources needed to design or operationalise climate–health interventions, resulting in highly uneven implementation across contexts.
- **Institutionalisation of Leadership and Learning:** Climate–health progress often depends on individual champions rather than embedded processes or systems. More work is needed to understand how to institutionalise leadership, retain knowledge, and strengthen continuity across provincial and municipal systems.

5.2 Policy Frameworks: Alignments and Gaps

South Africa has developed a robust set of climate and development frameworks over the past decade, many of which recognise the health system's vulnerability to climate impacts. However, health remains largely peripheral within the core architecture of climate governance: referenced in strategy documents but rarely backed by clear roles, funding pathways, or implementation mechanisms. Stakeholders consistently emphasized that the gap is not a lack of policy, but a lack of operational clarity and coordinated delivery. This section reviews how national, provincial, and international policy frameworks address the climate–health interface, and where alignment, gaps, and missed opportunities persist.

National Frameworks: Intent Without Operational Clarity

South Africa's foundational climate policy, the National Climate Change Response Policy (Republic of South Africa, 2011), was the first to formally recognize climate change as a multi-sectoral challenge, calling for sector-specific adaptation strategies, including for health, but it lacked enforceable mandates for health sector integration. The subsequent National Development Plan (Government of South Africa, 2013) emphasized a just transition as a national priority, yet did not articulate sector-specific mandates for health or position health as a strategic actor in climate resilience. To address this gap, the NDoH introduced the National Climate Change and Health Adaptation Plan (NCCHAP) 2014–2019 (National Department of Health, 2014), marking the first attempt to outline concrete health-specific climate adaptation measures, including vulnerability assessments, early warning systems, and intersectoral coordination. The plan expired in 2019 and has not been updated or replaced, a critical gap in national policy continuity that reflects broader governance and coordination challenges discussed below.

In the absence of an updated NCCHAP, the National Climate Change Adaptation Strategy (NCCAS) ((Department of Environment, Forestry and Fisheries, 2019) became the de facto guiding framework, aligning with South Africa's Nationally Determined Contributions (NDCs) and the Paris Agreement. It integrates principles from the NCCHAP and explicitly references health, but stakeholders noted that its health focus is diffuse and not accompanied by clear implementation levers at provincial and local levels. As one respondent explained:

> *"Policies exist, but there's no operational pathway. Everyone is siloed."*

In parallel, the National Department of Health developed the National Heat Health Action Guidelines in 2020, with technical input from the South African Medical Research Council (SAMRC) and the World Health Organization (WHO). These guidelines provide a comprehensive framework for health sector responses to extreme heat, including the development of Heat Health Warning Systems, identification of vulnerable populations, and strategies for prevention and management of heat-related illnesses. However, stakeholders noted that these guidelines remain underutilized and poorly integrated into broader policy and implementation frameworks.

The Climate Change Act (Republic of South Africa, 2024) marks a significant step by establishing a legal obligation to implement climate strategies, anchored in Section 24 of the Constitution, which guarantees the right to an environment not harmful to health. Importantly, it mandates the development of sectoral adaptation plans. Yet its mechanisms for enforcing climate-health integration remain to be defined in practice.

The Just Transition: Energy-Centered, Health at the Margins

This section shifts focus from national policy frameworks to South Africa's broader economic planning instruments, exploring how equity-centered transitions are addressing, or overlooking, health system needs. The Just Transition Framework (Presidential Climate Commission, 2022) and the Just Energy Transition Investment Plan (JET-IP, 2023–2027) represent ambitious efforts to restructure South Africa's economy while promoting equity. Health is acknowledged in the Just Transition Framework as a sector requiring resilience, and the importance of climate-smart healthcare is referenced. However, the JET-IP lacks explicit investment pathways or indicators for the health system. Without dedicated funding lines, health remains aspirational within this policy stream.

> *"The JET talks about workers, jobs, coal towns. But where is the health system? We're not even in the document." (Health researcher)*
>
> *Just the averted health costs from transforming our energy system would fund the rollout of renewables." (Civil society organisation)*

According to the WHO, fossil fuel-related air pollution costs South Africa R960 billion annually in healthcare expenses (Kelly, 2025). Redirecting these savings could finance solar clinics or heat-resilient infrastructure. It is also estimated that transitioning from coal could directly prevent 220,000 premature deaths by 2050 by reducing air pollution (Chersich et al., 2018).

This underscores a broader challenge that recurs throughout the policy landscape: although health is rhetorically included, the absence of clearly defined funding instruments or delivery mechanisms, particularly in climate-related financing structures like JET-IP and Treasury grants, renders implementation difficult. These financial gaps are closely linked to broader governance and accountability deficits, as explored further below.

Table 6: Key National frameworks Addressing the Climate-Health Nexus				
Policy/Framework	Year	Lead Department / Institution	Description	Status
National Climate Change Response Policy (NCCRP)	2011	Department of Environmental Affairs (now DFFE)	Foundational policy integrating climate considerations across sectors, including health	Implemented but no sector-specific mandates
National Climate Change and Health Adaptation Plan, 2014-2019 (NCCHAP)	2014	National Department of Health	Health-specific adaptation measures (e.g., vulnerability assessments)	Expired 2019, no replacement yet
National Climate Change Adaptation Strategy (NCCAS)	2019	DFFE	Ten-year roadmap for cross-sectoral adaptation efforts, including health	Active but limited implementation levers
National Heat Health Action Guidelines	2020	National Department of Health	Detailed guidance on health responses to extreme heat	Finalized but underutilized and poorly disseminated
Just Transition Framework	2022	Presidential Climate Commission	Roadmap for transitioning to a low-carbon, climate-resilient economy; health referenced as sector requiring resilience	Implementation underway through JET IP but no investment pathways for health
Climate Change Act (CCA)	2024	DFFE	Legal framework for enforcing compliance w/l climate policies	Promulgated, enforcement not yet defined

Provincial Strategies: Variable Uptake, Patchy Implementation

Building on national frameworks, this section examines how climate-health policy is interpreted and implemented at the provincial level, highlighting both promising strategies and critical gaps. At the provincial level, climate response strategies vary widely in both ambition and implementation. Overall, only three of South Africa's nine provinces (Western Cape, KwaZulu-Natal, and Mpumalanga) have developed health-specific adaptation plans under NCCAS (Health Systems Trust, 2023).

The Western Cape has demonstrated leadership through its Western Cape Climate Change Response Strategy (WCCCRS), a comprehensive framework that addresses climate adaptation and mitigation across multiple sectors, including health. The strategy includes incremental five-year horizons under its Vision 2050, aiming to achieve net-zero emissions by 2050 through renewable energy adoption and climate-resilient infrastructure (Department of Environmental Affairs and Development Planning, 2022). It emphasizes resilience to droughts, floods, and heatwaves, advocating for strengthening community health worker networks and integrating early warning systems to improve responses to extreme weather events. However, it lacks detailed health-specific adaptation plans and explicit monitoring frameworks.

These health-specific adaptation plans are set out in the Western Cape Department of Health and Wellness' dedicated Race to Net Zero 50 Strategy. Grounded in the ten Global Green and Healthy Hospitals goals (Irlam et al., 2022), the strategy sets a target to reduce carbon emissions by 30% by 2030 through solar energy adoption, waste management reforms, and staff training, and is supported by implementation structures such as a departmental Climate Change Committee and a Deputy Director for Climate Change.

> *"They're the only province, really, that has something like a Race to Net Zero strategy. They've pulled it together in a much more systematic way than what we're seeing nationally." (senior climate and health researcher)*

These health-specific adaptations plans are set out in the Western Cape Department of Health and Wellness' dedicated Race to Net Zero 50 Strategy**.** Grounded in the ten Global Green and Healthy Hospitals goals (Irlam et al., 2022), the strategy sets a target to reduce carbon emissions by 30% by 2030 through solar energy adoption, waste management reforms, and staff training. The strategy is supported by implementation structures, such as a departmental Climate Change Committee and a new Deputy Director for Climate Change. A senior climate and health researcher highlighted the coherence and strategic focus of the Western Cape approach:

> *"They're the only province, really, that has something like a Race to Net Zero strategy. They've pulled it together in a much more systematic way than what we're seeing nationally."*

Other provinces have also taken steps to address climate-related health vulnerabilities, though their strategies vary in focus, scope, and degree of integration. Mpumalanga's plan focuses on air pollution mitigation in the Highveld Priority Area and prioritizes respiratory health screenings in mining communities but lacks funding for clinic upgrades. KwaZulu-Natal's provincial response has thus far focused on retrofitting 23 flood-damaged clinics with solar power and stormwater drainage systems post-2022 floods (KZN Department of Health, 2022).

Table 7: Provincial policy frameworks			
Province	**Policy**	**Key Features**	**Gaps**
Western Cape	Climate Change Response Strategy (2022)	- Focuses on resilience to droughts, floods, and heatwaves. - Strengthens community health worker networks for extreme weather responses. - Aims for net-zero emissions by 2050 through renewable energy adoption.	- Health-specific adaptation measures lack detail - No dedicated funding for healthcare decarbonization.
	Department of Health and Wellness – Race to Net Zero 50 Strategy (2024)	- Active implementation with governance structures, including Climate Change Committee and dedicated deputy director role - Emissions reduction target (30% by 2030), alignment with GGHH goals	Limited national replication or formal integration into national reporting or funding mechanisms
Mpumalanga	Climate Change Adaptation Strategy (2020)	- Addresses air pollution-related illnesses from coal mining. - Prioritizes rural healthcare resilience to extreme weather. - Includes air quality monitoring.	- Limited integration of renewable energy in healthcare facilities. - No climate-health vulnerability assessments.
KwaZulu-Natal	Post-Flood Disaster Interventions (2022)	- Flood-resilient clinics with elevated foundations and stormwater systems. - Emergency protocols for patient evacuations during floods.	- Reactive measures only; no proactive provincial climate-health strategy. - Limited rural coverage.
Gauteng	City Region Climate Change Response Strategy (2020)	- Addresses health, agriculture, water, and energy sectors. - Includes 11 targeted programs with measurable goals (e.g., disaster risk reduction).	- No explicit link between climate adaptation and health outcomes (e.g., heat stress). - Urban bias in resource allocation.
Limpopo	Drought Resilience Programs (2023)	- Rainwater harvesting systems in rural clinics. - Community-led water conservation initiatives.	- Limited scalability due to funding constraints. - No integration with renewable energy projects.

Gaps in Integration, Accountability, and Resourcing

Despite these provincial efforts, the absence of a coherent, updated national framework has left the health sector without a unifying reference point. This lack of national coherence is perhaps most evident in the failure to update and renew South Africa's only dedicated climate-health plan. A number of stakeholders we interviewed, many of whom sit on the National Climate Change and Health Adaptation Steering Committee, reflected on the slow pace of progress toward updating the NCCHAP. While the committee still technically exists, it has not convened in over a year, and several members described it as inactive and lacking a clear mandate.

> *"The NCCHAP was meant to be updated, but it's been in limbo. I think there's a lack of clarity on who's meant to be driving it now. The Steering Committee still exists on paper, but there's no budget, no convening power."* (PCC stakeholder)

Others pointed to the loss of institutional memory, with a provincial health department official remarking that *"it's not clear who's driving it anymore or where the process stands"* following transitions in appointed officials and limited handover. A climate and health researcher observed that the plan has *"fallen off the radar,"* and another noted that although everyone agrees it should be renewed, political will has not translated into action: *"It just sits."*

Some stakeholders also indicated that a draft of the updated NCCHAP exists, but it has not been finalized or signed. Its current status remains unclear, with little communication about next steps. As a result, even as related frameworks like the NCCAS continue to evolve, the absence of an updated, health-specific plan represents a missed opportunity for sectoral alignment and operational guidance.

The NCCHAP gap reflects broader implementation inconsistencies between national and sub-national actors, raising questions about how climate-health responsibilities are communicated, resourced, and acted on at provincial level. For example, several stakeholders reported that provincial health officials had not seen key national guidance documents, such as the national heatwave guidelines.

> *"Heatwave guidelines came from national, but provinces didn't know about them. There was no feedback loop." (Senior health researcher)*

Stakeholders argued that revitalizing climate-health planning will require clearer ownership, sustained financing, and institutional continuity. They also emphasized that even when national frameworks are in place, provincial departments retain discretion over what actually gets implemented, and in many cases, health is not prioritized due to budgetary constraints and competing service delivery pressures.

> *"What you see is that even though National sets the strategy, provinces decide what gets implemented, and climate-health often gets dropped." (Senior climate and health researcher)*

Further, stakeholders noted that many frameworks reference health without including measurable indicators, funding pathways, or institutional mandates, factors necessary for implementation.

These examples reinforce a pattern of disconnected mandates, fragmented communication, and exclusion from co-design processes at the local level. Without measurable performance indicators, climate-health integration remains difficult to track, let alone improve, at the service delivery level.

The contrast between policy ambition and on-the-ground realities becomes even starker when we consider who is most affected by these gaps. As emphasized in chapter 4, the lack of implementation mechanisms disproportionately burdens rural, under-resourced, and vulnerable populations, amplifying existing health inequities and limiting adaptive capacity in high-risk communities.

International Guidance and Adaptation Tools

Alongside national and sub-national policy developments, a range of international frameworks and tools offer structured guidance, but their uptake and localization remain limited. South Africa is a signatory to the 2015 Paris agreement and the UNFCCC Cancun Agreement, both of which provide high-level guidance for national adaptation planning, including the integration of health into climate resilience strategies (UNFCCC, 2010; UNFCCC, 2015). The COP28 UAE Framework for Global Climate Resilience, also endorsed by South Africa, emphasizes the inclusion of measurable health metrics in adaptation assessments.

Historically, however, South Africa's engagement with international climate–health platforms has been fragmented, largely channelled through the environmental sector rather than health. This meant that health priorities were seldom represented in global climate negotiations.

> *"COP attendance has always been through Environmental Affairs… When you start saying, well, what about a health delegation, you start stepping on toes." (PCC stakeholder)*

South Africa's recent decision to join the WHO Alliance for Transformative Action on Climate and Health (ATACH) marks an important shift. Formal ATACH membership signals new political commitment to integrating health into climate action and aligns South Africa with global efforts to build low-carbon, climate-resilient health systems (ATACH, 2025).

South Africa has also engaged with WHO-led initiatives, including piloting the WHO operational framework for building climate-resilient and low-carbon health systems through risk and vulnerability assessments (dos Santos et al., 2022; WHO, 2021). Policymakers are

exploring the Water-Energy-Food-Health (WEF-H) nexus, an interdisciplinary framework that examines the interconnections between water, energy, food, and health systems, as an approach to integrated adaptation planning (Mutanga et al. 2024). However, stakeholders noted that participation remains uneven and is rarely institutionalised within provincial or municipal planning systems. Many global tools are still implemented as short-term, donor-supported projects rather than embedded in routine health planning or budget processes. As one civil society leader explained, *"A lot of these policies are created for the international space, not for the nurses in the Northern Cape."*

While international frameworks and tools offer structured guidance for climate-health planning, stakeholders emphasized that their impact remains limited unless adapted to South Africa's institutional realities. Many tools are introduced through short donor timelines and are not embedded into routine health planning or budgeting systems, which restricts their long-term value. A recurring concern was that global climate-health policies are often designed for international reporting spaces, rather than for local implementers such as provincial planners or frontline health workers. Stakeholders noted that limited participation of provincial and municipal actors in policy development further undermines relevance and uptake, leaving many tools "performative rather than transformative" unless they are contextualised and co-created with those responsible for delivery.

While these international tools offer structured approaches to planning, stakeholders and the literature warn that they are often driven by donor timelines and rarely institutionalized within local systems (dos Santos et al., 2022; Irlam et al., 2022). Moreover, stakeholders warned that global alignment does not guarantee local utility. Without contextualization and local buy-in, policies remain performative rather than transformative.

> *"These policies are created for the international space and not really for national stakeholders in South Africa. So what you did see is that the ways in which the policies were written were more like suggestions or guidance versus actual strategies that needed to be implemented. And people at province level and in the municipalities weren't involved in the policy creation or development." (Climate and health researcher)*

Key Insights, Gaps, and Areas for Learning

South Africa's climate–health policy landscape is broad and maturing, but implementation remains uneven and hindered by weak alignment between national intentions and subnational delivery. While frameworks acknowledge health, few provide enforceable mandates, dedicated funding, or operational guidance for those responsible for implementation. Stakeholders emphasized that the core barriers are structural—unclear ownership, fragmented accountability, and limited involvement of frontline or provincial actors in policy design. Strengthening climate–health governance now requires shifting from high-level commitments to practical, supported, and measurable mechanisms that enable action at provincial, district, and facility levels.

Key gaps and areas for learning include:

- **Clarity of mandates and accountability:** Climate–health responsibilities remain diffuse across departments and levels of government, with provincial and municipal actors often unaware of national guidance or unclear about their roles.

- **Operationalisation of national frameworks:** Policies such as the NCCAS and Climate Change Act reference health, but lack implementation levers, budget pathways, or performance indicators to drive sector-wide uptake.

- **Evidence and learning systems:** There is no coordinated mapping of how climate–health priorities cascade from national to district levels, nor evaluations of how existing frameworks are being used within the health sector.

- **Institutional memory and continuity:** Progress often depends on individual champions rather than embedded systems, making climate–health initiatives vulnerable to staff turnover and limiting long-term learning.

This analysis highlights that South Africa has the policy foundations for climate–health integration, but requires far stronger alignment, resourcing, and accountability mechanisms to translate these frameworks into practice. The next section examines the structural and operational constraints that shape implementation on the ground.

5.3 Barriers to Implementation: From Policy Gaps to System Constraints

While South Africa's policy frameworks increasingly acknowledge the links between climate change and health system vulnerability, stakeholders consistently emphasized that the core challenge is not a lack of policy ambition, but the absence of mechanisms, mandates, and institutional coherence to translate vision into sustained action. This section explores the structural and operational bottlenecks that prevent effective implementation of climate-health initiatives, surfacing the institutional and systemic issues that must be addressed to move from vision to delivery.

Institutional Fragmentation and the "Missing Middle"

Institutional fragmentation emerged as one of the most significant barriers to implementation. Stakeholders described persistent vertical misalignment between national, provincial, and municipal levels, with provinces expected to act on national directives despite lacking climate-health mandates, performance metrics, or dedicated budget lines. Only two of South Africa's nine provinces allocate more than 1% of their health budgets to climate adaptation (National Treasury, 2024), and a 2023 study found that 78% of rural clinics lack any form of climate risk assessment (Chersich et al., 2023). This misalignment has resulted in widespread inertia, even where interest or technical capacity exist.

> *"There's a policy-practice chasm. National doesn't talk to provinces, and provinces aren't resourced to act." (Senior climate and health researcher)*

Stakeholders repeatedly noted that although climate appears in national strategies, these commitments rarely translate into enforceable mandates. Without regulations requiring climate risk plans or performance indicators linked to adaptation, provincial and local actors treat climate as outside their formal responsibilities. This symbolic inclusion—policies without pathways—was described as a key reason for weak operational uptake.

> *"There are no regulations that say this hospital has to have a climate risk plan. So nobody does it." (Provincial official)*

Horizontal fragmentation across sectors further compounds these gaps. Stakeholders described climate–health work as a fractured space without a centre of gravity, with multiple departments running parallel programmes with minimal alignment or shared ownership. Coordination platforms exist in name, but often lack authority or consistent participation. Local officials frequently misunderstand or under-prioritise their climate responsibilities, leaving mandates diffuse and accountability weak.

> *"We've got a dozen different sectors running parallel programmes, none of which align. Everyone's ticking their own boxes." (Provincial health official)*

These governance weaknesses are particularly detrimental to climate–health integration, which depends on joint planning across sectors and levels of government. Stakeholders emphasized that without institutionalised mechanisms for coordination and accountability, national policy intent becomes progressively diluted as it moves downward into provincial and municipal systems.

> *"Climate policy gets diluted at every step from national to municipal. By the time it hits the ground, there's nothing left." (Civil society organisation manager)*

This fragmentation also encourages reactive rather than proactive action. Multi-sector collaboration tends to surge only during crises like floods, droughts, or outbreaks, rather than being established as a routine governance function.

> *"When there's a crisis, like floods or drought, we respond. But there's no standing platform to do this before the fact." (Climate and health researcher)*

Despite these institutional challenges, promising innovations are emerging at facility and municipal levels, including solar installations, rainwater harvesting, and alternative waste technologies. Yet these remain isolated proof-of-concepts because the system lacks mechanisms to evaluate, scale, or integrate lessons into national planning. As one senior researcher noted, pilots often generate evidence that never reaches policymakers, leading to duplication rather than cumulative progress.

Multiple stakeholders also pointed to an over-reliance on donor-funded assessments, many of which conclude without follow-through, reinforcing fragmented planning cycles and weakening institutional learning.

> *"We've had multiple donor-funded assessments, but very little follow-up. Reports get produced, but systemic change doesn't follow." (Senior finance expert)*

Concrete examples illustrate how governance fragmentation slows climate-health implementation. In KwaZulu-Natal, repairs to flood-damaged facilities were delayed for months due to unresolved funding disputes between provincial health departments and municipal authorities. Although disaster relief funds were available from National Treasury, bureaucratic misalignment and unclear accountability stalled access, prolonging service disruptions after the April 2022 floods (Naidoo, et al., 2022; Health Systems Trust, 2023).

Similarly, in the Western Cape, municipal initiatives to install solar systems in clinics, including in Khayelitsha, were delayed due to misalignment between municipal planning processes and provincial energy procurement regulations. These delays highlight how differing mandates and procurement rules across spheres of government complicate efforts to build climate-resilient infrastructure (Western Cape Provincial Parliament, 2024).

Even where promising innovations emerge at facility or municipal levels, such as solar installations, rainwater harvesting, and alternative waste technologies, they remain isolated examples rather than systemwide solutions. Provinces and municipalities lack mechanisms to document lessons, evaluate impacts, or scale successful models nationally.

Cultural Inertia: A System Built to Stay Still

Cultural inertia emerged as a major obstacle to climate-health implementation. Stakeholders described a system that responds creatively during crises but quickly reverts to established routines once the immediate pressure fades. Innovation is episodic rather than embedded, and lessons from emergencies often fail to translate into institutional practice.

> *"You learn in crisis and figure it out — but then the lesson ends because the funding stops, or COVID arrives, and the system resets." (Health systems analyst)*

This cyclical pattern of innovation followed by reversion to norm was a recurrent theme. Another recurring theme was the absence of mandates or performance metrics linking climate responsiveness to accountability structures. Without clear responsibility, climate-health integration is often treated as outside anyone's formal role.

Facilities and districts lack climate-related KPIs, meaning that even motivated staff receive little institutional support or recognition for proactive action. Institutional knowledge is also fragile, with expertise often concentrated in one or two individuals and easily lost during turnover. This reinforces person-dependent progress rather than institutionalized systems.

Operational timelines can also undermine uptake. Local officials often receive tools or guidance after the relevant crisis has passed, resulting in incomplete rollouts, missed learning, and fatigue among implementers.

Rigid Systems, Missed Opportunities

Rigid procurement and public finance systems emerged as some of the most significant barriers to climate-smart health system reform. Stakeholders repeatedly emphasized that procurement processes are designed for cost containment and risk avoidance, rather than sustainability, flexibility, or resilience. This means that even when facility managers identify viable solutions, such as solar installations, smart meters, or more efficient building materials, the system is not structured to support their adoption.

> *"Procurement teams don't see climate in their terms of reference. If you ask for something climate-resilient, they'll say it's not part of the bid spec." (Civil society organisation manager)*

This rigidity is compounded by budgetary processes that delay or obstruct investment in adaptive infrastructure. Stakeholders described approval cycles of **12–18 months** for basic upgrades, even when funding exists and technologies are well-established.

> *"Trying to get solar panels on a clinic can take 18 months because the process doesn't recognize innovation." (Health systems researcher)*

These structural constraints leave managers with nominal responsibility but limited authority over financial or strategic decisions:

> *"We have managers, but they're managing nothing. They don't control the money or the strategy." (Provincial health researcher)*

Ultimately, procurement and finance systems were described as optimized for control, not innovation, creating a system in which promising pilots succeed locally but rarely scale. Without mechanisms to replicate or institutionalize what works, climate-responsive solutions struggle to move beyond isolated proof-of-concept projects.

Data Poverty: Blind Spots in Planning and Accountability

Persistent weaknesses in data systems emerged as one of the most significant barriers to climate-health action. Stakeholders highlighted that most health facilities lack timely, reliable, or disaggregated data on climate exposure, service disruptions, and health outcomes. For example, only an estimated 12% of clinics integrate climate alerts into operational protocols, and national mortality data is often delayed by years, hindering timely SDG reporting (Stats SA, 2023; Health Systems Trust, 2023). These gaps create what stakeholders repeatedly described as *data poverty*: a critical constraint on anticipatory planning, resource allocation, and adaptive learning.

Early warning systems illustrate the gap between policy intent and operational readiness. While national frameworks emphasize predictive tools and cross-sector data sharing, most facilities lack clear escalation pathways, staffing triggers, or response protocols. As a result, climate alerts, when received, rarely translate into actionable steps at the frontline. This reflects a broader institutional gap: environmental intelligence is not formally linked to health system decision-making.

> *"Even when alerts come through, nothing happens on the ground." (Climate and health researcher)*

Stakeholders also emphasized the lack of timely, interoperable, and disaggregated datasets linking environmental risks to health outcomes. Even where monitoring stations or surveillance platforms exist, their outputs are often inaccessible, unreliable, or poorly integrated with health information systems. This weakens both strategic planning and day-to-day facility management, leaving vulnerable groups effectively invisible in national datasets.

> *"Some of the monitoring equipment is like a BMW parked outside your house—but it doesn't drive." (Climate and health researcher)*

Critically, the absence of disaggregated data, by geography, age, gender, income level, or underlying health status, undermines the ability to track who is most affected by climate shocks. Without visibility of vulnerable populations, both political urgency and targeted adaptation remain limited. Strengthening climate-linked health surveillance is therefore essential for evidence-based planning and equitable resource allocation.

Key Insights, Gaps, and Areas for Learning

Implementation barriers identified across the literature and stakeholder engagements point to deeply institutional, not technical, constraints. Fragmented governance, rigid procurement and budgeting systems, over-reliance on individual champions, and persistent data weaknesses prevent climate-health policies from translating into sustained action. While innovation exists, it remains isolated and difficult to scale because the system lacks the mechanisms, incentives, and accountability structures to embed climate readiness into routine operations.

Key Gaps and Areas for Learning

- **Governance and Coordination Gaps:** Fragmentation across national, provincial, and municipal levels creates unclear mandates and weak accountability, limiting the translation of policy into operational practice.
- **Procurement and Financing Barriers:** Procurement systems optimized for compliance, not innovation, prevent the uptake of climate-resilient technologies and delay adaptive infrastructure investments.
- **Over-Reliance on Individual Champions:** Climate-health progress often depends on individuals rather than institutionalised roles or systems, making gains vulnerable to turnover and limiting continuity of learning.
- **Data and Early Warning System Weaknesses:** Lack of disaggregated, timely, and interoperable data, and the absence of facility-level action protocols, undermines anticipatory planning and obscures how climate risks impact vulnerable populations.

5.4 Implementation pathways: Local Innovations and Scalable Solutions

South Africa's climate–health landscape is marked by systemic constraints, yet meaningful innovation is emerging where leadership, resources, and institutional alignment converge. From solar-powered clinics to climate-resilient infrastructure retrofits, local actors are demonstrating viable pathways for adaptation and mitigation, even within a challenging governance environment. These examples highlight what is possible and where scalable solutions may lie.

Infrastructure and Energy Innovations

Across provinces, a growing set of infrastructure and energy innovations illustrates how local actors are reducing emissions and improving service reliability. In the Western Cape, solar-hybrid systems have been installed in more than 50 clinics, reducing diesel reliance and limiting service disruptions during load-shedding (Western Cape Government, 2024). Similar efforts are underway in Khayelitsha and George Hospital, where energy-efficient lighting, HVAC upgrades, and alternative waste treatment technologies have lowered emissions and operating costs. In Gauteng, the City of Tshwane has piloted a carbon-footprinting tool to guide procurement decisions and infrastructure planning, supported by partnerships with academic institutions. Private sector actors, particularly within the Global Green and Healthy Hospitals (GGHH) network, have adopted comparable models, demonstrating strong mitigation and co-benefit potential.

> *"GGHH connected us to peers globally who were already doing this work. It gave us confidence and tools" (facilities director at a private hospital)*

These infrastructure-focused examples are complemented by a second set of climate-responsive design strategies, many of which emerged in response to acute climate shocks and were led by provincial and municipal governments, with support from community-based actors and researchers.

Climate-Responsive Design and Disaster Adaptation

Climate-responsive design has also strengthened resilience during extreme events. During the 2017–2018 Western Cape drought, clinics installed boreholes, water tanks, leak repairs, and hygiene adaptations (Padarath and Moeti, 2023). Additionally, a triage system was implemented to prioritize interventions in areas with the greatest vulnerabilities, informing long-term strategies for water conservation and climate-resilient infrastructure.

After the 2022 floods, KwaZulu-Natal retrofitted damaged clinics with elevated foundations and improved drainage, reducing storm-related closures by 45% (Naidoo, Manyangadze, and Lokolota, 2022).

> *"We had to make sure they stay open, even during extreme events." (municipal health planner)*

These upgrades are now part of the municipality's broader Integrated Development Plan and demonstrate how climate risk awareness can be institutionalized at the municipal level.

In Limpopo and the Northern Cape, rainwater harvesting systems have helped maintain service continuity during repeated droughts. Pilot studies such as High Horizons and Happy in Gauteng demonstrated the effectiveness of shading, ventilation improvements, and heat-health protocols, reducing indoor temperatures by up to 5°C and lowering heat-related clinical presentations (Scott et al., 2024).

Organisations like groundWork and the Rural Health Advocacy Project have partnered with clinics to implement low-tech but effective interventions: better ventilation, passive cooling, and community education on heat stress. Their approach has focused on empowerment rather than technology alone. "We work with the community to define the problem and co-create the response," explained one programme manager.

From Pilots to Policy and Governance Innovation

The Western Cape's One Health platform, bringing together Departments of Health, Agriculture, and Environment, stands out as an example of functional multisectoral governance. *"We don't just meet, we build joint workstreams and follow through,"* explained a provincial leader. Though still provincial in scope, this model shows what's possible with the right incentives and leadership.

Several stakeholders also highlighted the Presidential Climate Commission (PCC) as a potential national convenor.

> *"PCC could be a gamechanger if it gets health at the table. It has the mandate, but it's not yet fully engaged with the sector." (National health policy advisor)*

Despite these promising examples, systemic barriers remain. Stakeholders pointed to the need for institutional mechanisms to evaluate, scale, and finance these local solutions.

> *"We need a national platform to track and share these innovations. Right now, success is anecdotal and often lost when champions move on." (Climate-health researcher)*

Others emphasized the need to embed climate-health indicators into facility assessments and financing tools.

Across cases, stakeholders consistently identified a common set of enabling factors: strong local champions; flexible funding for experimentation; cross-departmental collaboration, especially between energy, infrastructure, and health; and access to technical expertise from research partners or global networks. Where these conditions are present, implementation advances even in the absence of strong national mandates.

Despite promising examples, however, most local innovations remain isolated pilots rather than system-wide solutions. The absence of a national learning platform, rigid procurement and financing rules, weak feedback loops between local actors and national policymakers, and a lack of performance indicators for climate-responsive facility management all limit replication. A 2023 review found that 80% of South African climate-health pilots lack pathways to scale due to fragmented funding and data systems (Health Systems Trust, 2023). Furthermore, research-led adaptations struggle to feed into procurement systems or infrastructure grants, and facility managers rarely receive performance incentives for climate-smart upgrades.

Key Insights, Gaps, and Areas for Learning

Local innovations demonstrate clear potential for advancing climate-health integration. They also reveal the gap between national ambition and operational delivery. To transform scattered pilots into system-wide strategies, South Africa will need mechanisms that support replication, align financing with local realities, and embed climate-health metrics into governance structures.

Key gaps and areas for learning include:

- **Missing Evidence on Cost and Impact:** There is limited analysis of the cost-effectiveness, return on investment, or long-term savings associated with adaptation and mitigation pilots, constraining the development of scalable business cases.
- **Unclear Pathways for Scale-Up:** Little is known about which enabling conditions, procurement flexibility, technical capacity, cross-sector collaboration, allow pilots to transition into province-wide or national programmes.
- **Weak Integration Into Financing Instruments:** Innovations often sit outside formal budget structures; evidence is needed on how to embed climate-health upgrades into infrastructure grants, conditional grants, or public finance reforms.
- **Limited Cross-Sector Coordination Models:** There is insufficient documentation of effective leadership structures and cross-departmental collaboration mechanisms that support integrated delivery across health, environment, energy, and disaster management.

Conclusion

South Africa's climate–health governance landscape is characterised by strong policy intent but weak operational alignment. While climate change is increasingly recognised across national strategies and legal frameworks, health remains marginal in decision-making spaces, and mandates, resources, and accountability systems are inconsistently defined across levels of government. Fragmented coordination, between departments, between spheres of government, and between policy designers and implementers, continues to undermine the translation of frameworks into action. The result is a system in which responsibilities are diffuse, innovation depends heavily on individual champions, and learning is rarely institutionalised.

At the same time, local experimentation across provinces, municipalities, and health facilities shows what is possible under enabling conditions: committed leadership, cross-sector collaboration, flexible funding, and access to technical expertise. These pilots, spanning solar energy, climate-resilient infrastructure, alternative waste treatment, and heat-health adaptation, provide proof of concept, but scaling them requires structural reform. Strengthening governance will mean embedding climate-health roles within institutions, aligning procurement and financing mechanisms with adaptation needs, and establishing platforms for learning, coordination, and accountability. South Africa's opportunity now lies in building the architecture that enables replication: a governance system that is coherent, inclusive, and capable of moving local successes into national strategy.

6. Financing for Climate-Resilient Health System

South Africa cannot build a climate-resilient health system without reshaping how health infrastructure is financed. The previous chapters highlighted how climate risks intersect with existing health system inequities and how governance gaps slow implementation, even when policies are in place. This chapter turns to the money: who pays, through which instruments, and under what conditions adaptation and decarbonisation in the health sector can actually be scaled.

We begin by mapping the current financing landscape for climate–health investments, including public budgets, private sector initiatives, international finance, and donor support We then examine a set of emerging financing tools (public–private partnerships, blended finance, green bonds, and impact bonds) and consider their potential and limitations in the South African health context. Finally, we analyse the structural barriers that prevent resources from flowing to where they are most needed and distil key lessons and gaps for future action and learning. Together, these insights point to the need for a more coherent climate–health finance architecture that links policy ambition, investment readiness, and equitable service delivery.

6.1 Current climate-health financing landscape

The current financing landscape for climate-resilient health infrastructure in South Africa is fragmented and underdeveloped, with limited alignment between climate adaptation goals and health system needs. As described in Section 4, climate change is already disrupting health and health systems through extreme weather, disease outbreaks, and interruptions to water and electricity supply. Yet health infrastructure remains a marginal focus in national and global climate finance. Stakeholders repeatedly emphasized that even where climate–health linkages are recognised, they are rarely translated into financeable project pipelines or actionable planning at facility level.

Globally, initiatives like the Global Framework for Climate Services (GFCS) and the Green Climate Fund (GCF) have recognised the health sector's vulnerability to climate change. Yet less than 1.5 percent of tracked adaptation finance is directed toward health (Watts et al., 2023). The World Health Organization (WHO) estimates that only 0.5% of multilateral climate funds are allocated to health, despite health systems contributing 5% of global emissions (WHO, 2023).

In South Africa, as described in chapter 3, the primary mechanism for funding health infrastructure is through public budgets. The National Climate Change Adaptation Strategy (NCCAS) and Climate Change Act set out national adaptation priorities, but these are not consistently integrated into infrastructure planning by the National Department of Health. Public capital investment remains heavily focused on reactive maintenance rather than

proactive resilience building (Manamela et al., 2024). The Health Facility Revitalisation Grant (HFRG) supports infrastructure renewal, but does not require climate-proofing or adaptation measures. A 2023 National Treasury audit confirmed that no HFRG allocations included explicit climate-resilience criteria, with funds prioritised for urgent repairs over long-term adaptation (National Treasury, 2023)

> *“To my knowledge, I don’t think any of the provinces have used this grant for alternate energy solutions… and I don’t know why that is.” (National Treasury stakeholder)*

Stakeholders highlighted the lack of diagnostic tools, including emissions baselines and energy audits, which hinders effective planning and blocks climate fund eligibility.

> *"They expect us to come with ready-made projects, but there's no funding for the diagnostics or baseline data that would make them eligible. Our priorities don’t match their templates, and we keep missing out." (Civil society representative)*

Private sector involvement also remains fragmented. Some large hospital groups, including Netcare and Mediclinic, have introduced solar energy systems and water-saving technologies. Netcare’s 2024 Sustainability Report highlights a 30% reduction in emissions through solar installations (Netcare, 2024). However, independent analyses note these efforts focus on cost-saving, not systemic decarbonization (Chersich et al., 2023).

Stakeholders emphasized that there are no coordinated incentives or policy frameworks to facilitate widespread adoption. As a result, a climate and health leader reflected that much of the current private sector effort could be seen as greenwashing, rather than genuine efforts to transform their practice.

> *“They're using PVC drip bags and recycling it and calling that really green... but it's better to not use PVC at all." (Climate and health researcher)*

International financial institutions such as the World Bank, African Development Bank (AfDB), and Agence Française de Développement (AFD) have engaged in energy resilience work. AFD, for instance, funded assessments of energy supply risks in public health facilities, providing valuable diagnostics. However, stakeholders noted a major gap: there is no mechanism to translate these diagnostics into a pipeline of funded projects.

Donor funding has been instrumental in other areas of the health system, especially HIV and TB, but has rarely targeted climate resilience. As described in chapter 3, the withdrawal of PEPFAR funding from several service platforms in 2025 demonstrated the risks of relying on external partners. This shift exposed critical service gaps and underscored the need for domestic resource mobilisation. Stakeholders referenced the fragility of donor-dependent systems and warned that climate-health financing must not repeat these patterns.

Overall, there is little coordination between actors in climate finance and those in the health system. Health infrastructure planning occurs in silos, with few mechanisms to align budgets, strategies, and programmes across sectors.

"There is no national clearinghouse for climate-health infrastructure investment, no project registry, and no standard tools to guide replication. Blended finance is something we talk about, but we don't have a platform to actually operationalize it " (Climate finance expert)

Stakeholders called for the creation of a climate-health investment registry, harmonization of resilience standards across grants like the HFRG and NHI, and a centralised project preparation facility to support subnational implementation. This would allow South Africa to access climate funds more effectively, support public-private partnerships, and scale up investment in health facilities that are prepared for the realities of a changing climate.

Key Insights, Gaps, and Areas for Learning

The financing landscape for climate-resilient health systems in South Africa remains fragmented and underdeveloped. Health receives a negligible share of global climate finance and, domestically, climate priorities are not embedded in infrastructure grants or capital planning. Diagnostic gaps, limited project preparation capacity, and weak coordination across public, private, and donor actors prevent the translation of climate-health ambition into financeable project pipelines. While emerging private-sector and DFI-supported initiatives show potential, their impact is constrained by the absence of national mechanisms to align standards, consolidate pipelines, and support scale-up.

Key gaps and areas for learning include:

- **Misalignment Between Climate Finance and Health Sector Mandates:** Climate finance frameworks rarely recognise health infrastructure needs, and national health grants lack climate-resilience criteria. Understanding how to integrate climate-risk metrics into public budgeting & infrastructure tools remains a key gap.
- **Lack of Diagnostics and Project Preparation Capacity:** Facilities seldom have emissions baselines, energy audits, or climate-risk assessments, which are core prerequisites for climate-finance eligibility. Tools and financing for diagnostics and project preparation are urgently needed.
- **Fragmented Actors and Missing Coordination Platforms:** Public budgets, private hospital investments, DFIs, and donors operate in silos with no shared incentives or mechanisms to align planning.
- **Limited Evidence on Scalable Financing Pathways:** There is little applied research on how climate-resilient health projects can be financed at district or facility level, or how successful private-sector or DFI pilots could be adapted for the public system. More work is needed on models that address subnational capacity constraints and support scale-up.

6.2 Innovative financing models (PPPs, green bonds, blended finance)

Mobilising finance for climate-resilient health infrastructure requires moving beyond traditional grant-based models. As the climate-health nexus gains global visibility, new financing instruments, ranging from public-private partnerships to blended and results-based finance, are being explored to support sustainability goals in health systems. This section explores four innovative models of financing that have potential relevance in the South African context: public-private partnerships (PPPs), blended finance, green bonds, and impact bonds. Drawing on literature and stakeholder input, we examine how these mechanisms are being piloted, what barriers remain, and what adaptations might be needed to ensure these tools are accessible, equitable, and fit-for-purpose in the health sector.

Public-private partnerships (PPPs)

Public–private partnerships (PPPs) enable governments to work with private companies to deliver public infrastructure or services, sharing risks, responsibilities, and financing. In principle, PPPs allow governments to retain strategic control while leveraging private-sector capital, technical expertise, and project management capacity Bhattacharyya (2019). This model can accelerate infrastructure delivery, improve efficiency, and reduce upfront public expenditure, particularly when long-term resilience or sustainability upgrades are needed. For climate-resilient health systems, PPPs offer potential pathways to finance energy, water, and infrastructure solutions that public budgets alone cannot meet.

South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is widely cited as a flagship PPP success. By 2021 it had mobilised over ZAR 209 billion in private investment and procured 6,328 MW of renewable energy capacity, diversifying the energy mix and reducing coal dependence (Independent Power Producer Office, 2022; Eberhard and Naude, 2016). REIPPPP demonstrates how transparent procurement, competitive bidding, and clear rules can attract capital and drive down technology costs (Kruger and Eberhard, 2016).

At the same time, REIPPPP has notable limitations. Analyses highlight an urban and utility bias, with benefits concentrated in industrial and metropolitan areas, while rural and underserved communities see fewer direct gains (Price (2022). This exacerbates systemic inequities in energy distribution. Smaller independent power producers (IPPs) often struggle to compete, raising concerns around inclusivity and equity. Crucially for this review, REIPPPP has not explicitly targeted health infrastructure, despite the sector's high energy dependence and vulnerability to power disruption.

Stakeholders interviewed for this review echoed these concerns. PPPs were described by a climate finance expert as "*too complex and time-intensive for many health departments to*

navigate." Others pointed out that health departments often lack standardised procurement pathways or legal frameworks to implement PPPs.

> *"We don't even have a procurement template for this kind of infrastructure. That's a major bottleneck." (Health financing expert)*

Complex contracting, long preparation timelines, and limited departmental capacity make PPPs difficult for health planners to use. Transparency and accountability risks were also flagged, particularly where contracts are difficult to oversee or where long-term financial liabilities fall on provincial departments.

Alternative models such as Energy Services Companies (ESCOs) are being trialled as more accessible PPP variants. In the Western Cape, an ESCO model financed energy-efficiency upgrades in health facilities, with repayments linked to verified cost savings.

> *"ESCOs allowed us to move quickly on upgrades that would otherwise have taken years through conventional procurement." (Provincial official)*

These contracts have enabled no-upfront-cost retrofits in lighting and cooling systems, but questions remain about asset ownership, accountability, and regulatory alignment. Stakeholders stressed that sector-specific PPP and ESCO frameworks for healthcare infrastructure, including clear procurement templates, risk-sharing arrangements, performance indicators, and social safeguards, are essential preconditions for scale.

> *"Who should own the solar system: the province or the contractor?" (Treasury official)*

PPPs therefore hold significant potential for strengthening climate-resilient health systems but remain underdeveloped in practice. Their relevance will depend on whether national and provincial governments can build the enabling conditions (including policy clarity, institutional capacity, technical support, and coordinated leadership) necessary to ensure equitable and effective implementation.

A number of stakeholders emphasised that the next phase of PPP development should include a deliberate shift toward underserved geographies and sectors—particularly public healthcare. REIPPPP's architecture offers a strong foundation: transparent bidding, clear rules, and strong investor appetite. But its current design largely bypasses health, despite the sector's acute dependence on reliable energy and its exposure to climate-related disruptions.

Adapting REIPPPP-style frameworks to explicitly include health facility energy and resilience projects, especially in rural and high-risk areas, could expand access to clean energy while addressing systemic inequities. With the right enabling conditions (including subsidies, capacity-building, and technical support for smaller independent power producers), they can become far more inclusive.

> *"Reliable energy is not optional for a clinic. It's critical infrastructure." (Climate–health researcher)*

There is already precedent for this direction. Energy-efficiency upgrades at facilities such as Groote Schuur Hospital, implemented under PPP arrangements, have demonstrated meaningful reductions in operational vulnerability and long-term cost. These examples suggest that with appropriate safeguards and health-specific governance templates, PPPs could become a central vehicle for delivering resilient, low-carbon health infrastructure nationwide.

Blended finance

Blended finance plays a critical role in addressing the energy challenges faced by rural healthcare facilities by combining public, private, and philanthropic funds to reduce investment risks. This approach enables resource-constrained regions to access the financial and technical support required for renewable energy adoption. By leveraging these diverse funding sources, blended finance aligns investment goals with social and environmental objectives, creating opportunities for impactful change in underserved communities.

Case studies from rural clinics demonstrate the effectiveness of blended finance in facilitating the adoption of solar photovoltaic (PV) systems. Izuka (2023) highlights the transformative impact of these systems in improving energy reliability, which directly enhances healthcare service delivery in regions with limited grid access. Solar PV installations supported by blended finance have reduced reliance on expensive and polluting diesel generators, offering a cost-effective and sustainable alternative to traditional energy sources. These interventions underscore the potential of blended finance to address both operational challenges and long-term sustainability goals in healthcare (Izuka et, 2023).

However, stakeholders repeatedly emphasized that there is no dedicated platform to operationalize blended finance at the facility level.

> *"Blended finance is something we talk about, but we don't have a platform to actually operationalize it at the district or facility level." (Climate finance expert)*

Others pointed to the need for intermediaries that can provide technical assistance, bundle smaller projects, and navigate financial due diligence requirements.

> *"Facilities don't have the skills or people to put these deals together. That's where a national intermediary could help." (Climate finance expert)*

The Green Climate Fund has been instrumental in developing scalable models that integrate renewable energy into healthcare systems, particularly in vulnerable and underserved regions. Through strategic investments, the fund de-risks renewable energy projects, ensuring that financial barriers do not prevent the implementation of innovative energy solutions. This support is particularly valuable for healthcare facilities, where reliable energy

is critical for operating medical equipment, storing vaccines, and maintaining overall service continuity. Scalable models backed by the Green Climate Fund provide a framework for replicating these successes across multiple regions, amplifying their impact. However, health projects often struggle to meet eligibility thresholds.

> *"Health systems aren't set up to generate the kind of pipeline that climate financiers want to see. They don't speak the same language." (global finance advisor)*

Addressing the challenges of energy transitions in healthcare facilities requires more than just financial support; it necessitates a coordinated approach that blends investment with capacity building and community engagement. By ensuring that financial mechanisms are both inclusive and scalable, blended finance can help bridge the energy gap in rural healthcare facilities while contributing to broader socio-economic and climate resilience goals.

While global evidence points to the potential of blended finance, stakeholders and the literature also highlight important constraints. Structuring multi-stakeholder deals carries high transaction costs, smaller rural facilities are often overlooked in favour of higher-return urban projects, and weak "additionality" and impact measurement frameworks raise concerns about whether concessional resources are being used where they are most needed (Attridge & Engen, 2019; Savoy, Carter, & Lemma, 2016; Kenny, 2019; Reboredo, 2018). Without dedicated intermediaries, standardised metrics, and safeguards against urban and commercial bias, blended finance risks bypassing precisely the clinics and districts most in need of climate-resilient investment.

Green bonds

Green bonds have emerged as an innovative financial instrument, enabling municipalities and institutions to fund renewable energy and energy-efficient infrastructure projects while aligning with sustainability goals. Notably, the City of Cape Town issued a ZAR 1 billion green bond to finance renewable energy initiatives and energy-efficient upgrades in public facilities, setting a precedent for other municipalities. This initiative highlights the potential of green bonds to address climate resilience through dedicated funding for environmentally sustainable projects, as documented in the Green Bond Report (2017).

One of the key advantages of green bonds is their ability to attract environmentally conscious investors, creating a stable and predictable funding source for long-term sustainability projects. These instruments also provide issuers with an opportunity to improve their credit ratings by demonstrating fiscal responsibility and commitment to addressing climate challenges. For example, the City of Cape Town's green bond not only financed critical energy projects but also bolstered investor confidence, showcasing the municipality's proactive approach to sustainability (KPG Difference Document, 2017).

However, stakeholders emphasized that such instruments are not yet viable for most provincial health departments or smaller municipalities.

> *"The process of issuing a green bond isn't something health departments even know how to start. There's a perception that it's only for metros with Treasury capacity. (Senior public health official)*

Stakeholders described administrative burden, verification requirements, and weak credit ratings as major barriers to uptake. Moreover, the absence of a standardized framework for health-sector green bonds contributes to limited engagement.

Literature and stakeholder perspectives converge on several structural constraints. Issuing green bonds requires complex verification and reporting processes, often involving third-party certification, which drives up transaction costs and places them beyond the reach of most provinces and smaller municipalities (Flammer, 2021; Banga, 2018). Issuing green bonds often involves a "greenium," a premium paid by issuers to align with sustainability goals, discouraging some investor groups and reducing the overall capital available for green initiatives (Tolliver et, 2019). Weak and inconsistent definitions of what counts as "green" fuel concerns about greenwashing and undermine investor confidence (Immel, 2021). In practice, issuances tend to be concentrated in metros and financially stronger entities, reinforcing an urban bias and leaving rural and under-resourced health facilities largely excluded from this instrument (Bachelet et al., 2019; Herrera, 2024). In developing countries, green bonds face challenges such as underdeveloped capital markets, currency risks, and limited technical expertise for structuring and issuing bonds, which can hinder the growth of green bond markets in regions that most need climate-resilient infrastructure financing, including healthcare facilities (OECD, 2023). Green bonds also often focus on short-term financing objectives, which may not align with the long-term sustainability goals of projects like decarbonizing healthcare systems. This misalignment can reduce their effectiveness in achieving systemic environmental and social transformation (Campiglio, 2016). Inconsistent policies or changes in political leadership can weaken investor confidence and disrupt the growth of the green bond market (Dave, 2024).

Despite these barriers, several stakeholders expressed interest in exploring pooled or aggregated bond mechanisms tailored for social infrastructure.

> *"We need a framework or facility that helps us package smaller energy projects into something bondable." (Climate finance expert)*

To unlock the potential of green bonds for climate-health investments, new national guidance will be needed, alongside capacity-building, simplified certification protocols, and possibly sovereign guarantees to improve creditworthiness.

Impact bonds

Impact bonds are innovative financing mechanisms that mobilise private capital to achieve measurable social and environmental outcomes (Social Finance, 2023). Unlike traditional bonds, they do not offer upfront repayment guarantees to investors. Instead, repayment is

contingent upon the achievement of predefined outcomes, which are independently verified (OECD, 2016). This results-based approach ensures that funds are directed toward effective and impactful interventions (OECD, 2024).

There are two primary types of impact bonds. *Social Impact Bonds (SIBs)* are used to fund social services such as healthcare, education, and employment initiatives, with governments or donors repaying investors upon achieving specified targets (Attridge & Engen, 2019). *Development Impact Bonds* (DIBs) function similarly but are typically financed by development agencies or philanthropic organisations rather than government entities (Center for Global Development, 2013.).

Impact bonds shift financial risk away from governments and service providers to investors, who are only repaid if the agreed outcomes are successfully met (Kenny, 2019). By aligning financial incentives with measurable success, impact bonds create a sustainable and accountable approach to funding development initiatives (Deloitte, 2013).

This model involves three key stakeholders:

1. Investors (private investors, impact funds, or development finance institutions) who provide upfront capital).
2. Service providers (NGOs and private entities) who implement programmes to achieve the desired outcomes.
3. Outcome payers (governments, development agencies, or donors) who disburse repayments based on verified impact results (World Bank, 2017).

South Africa has explored impact bonds as a financing tool to address key social and economic challenges, particularly in healthcare, education, employment, and renewable energy (Gustafsson-Wright, 2019). While the market is still emerging, there are notable examples and ongoing discussions around expanding their use (OECD, 2023).

South Africa launched Africa's first Social Impact Bond (SIB) in 2018, known as the Impact Bond Innovation Fund (IBIF). This initiative, backed by investors including UBS Optimus Foundation, aimed to improve early childhood development (ECD) in disadvantaged communities (Department of Health, 2024). Implemented in the Western Cape, the programme specifically targeted at-risk children aged 3–5, ensuring access to quality early learning programmes (National Treasury, 2014). Private investors provided upfront capital to finance these initiatives, with repayment contingent on the achievement of pre-agreed educational and cognitive development outcomes (Intellidex, 2021). If these outcomes were met, the Western Cape government and donors reimbursed the investors, demonstrating a results-based approach to financing social impact (Bertha Centre, nd).

Key lessons from IBIF include demonstration of proof of concept for SIBs in South Africa, the centrality of strong data systems to measure outcomes, and the importance of multi-stakeholder partnerships for success (Intellidex, 2021; Brookings Institution, 2018; Government Outcomes Lab, n.d.).

Given South Africa's pressing healthcare and energy challenges, there is growing interest in using impact bonds to finance climate-resilient health systems (OECD, 2023).

> *"There's interest in applying outcome-based models like impact bonds, especially if they can be used for things like improving energy security at clinics. But we need clearer metrics and strong data systems." (Development bank economist)*

However, stakeholders also cautioned that without a robust system of indicators and strong political will, impact bonds risk being seen as overly technical or detached from local realities.

> *"We need simple, real-world examples. Health managers need to know what success looks like before they'll commit." (Climate and health researcher)*

One key area of potential application is healthcare decarbonisation and energy resilience, where impact bonds could fund solar PV installations in public hospitals and clinics, ensuring a reliable power supply while reducing carbon emissions (SEforALL, 2023). Investors would be repaid based on measurable outcomes such as energy cost savings, improved healthcare service continuity, and reduced dependence on fossil fuels (SEforALL, 2023). Similar financing models have been successfully implemented internationally, with climate impact bonds being used to support green infrastructure (Flammer, 2021).

Another potential application is in universal healthcare expansion and NHI reforms (National Department of Health, 2021). Impact bonds could be leveraged to improve healthcare access in rural and underserved areas, aligning with South Africa's push for equitable health services (Intellidex, 2021). By using a results-based financing approach, impact bonds offer a sustainable mechanism to address both healthcare infrastructure gaps and climate resilience, ensuring that public resources are effectively allocated to high-impact interventions (Tolliver et, 2019).

Stakeholders and international reviews caution that expanding impact bonds in South Africa will require robust data and outcome measurement systems, alignment with national frameworks such as NHI and just transition policies, a deeper impact investing market, and strong government commitment to outcome-based payments (Reboredo, 2018; Sovacool et al., 2020). Without these foundations, impact bonds risk remaining niche instruments perceived as overly technical and poorly matched to frontline realities.

Overall, innovative finance mechanisms hold significant promise but must be tailored to the realities of the health sector. Without targeted technical support, institutional capacity-building, and simplified pathways for participation, they risk reinforcing existing disparities in infrastructure investment. Future efforts should focus on scaling successful pilots, embedding health into national green finance strategies, and creating enabling environments for cross-sectoral investment.

Key Insights, Gaps, and Areas for Learning

Across PPPs, blended finance, green bonds, and impact bonds, the analysis suggests that innovative instruments can mobilise meaningful capital for climate-resilient health infrastructure – but only where there is strong technical support, clear rules, and the ability to aggregate projects into bankable pipelines. In their current form, most mechanisms remain poorly aligned with provincial health department capacity and tend to favour larger, urban or commercially attractive projects, risking the reinforcement of existing spatial and equity gaps. Intermediaries, sector-specific frameworks, and robust measurement systems are critical preconditions if these tools are to move from niche pilots to practical options for public health facilities.

Key gaps and areas for learning include:

- **Health-specific financing frameworks:** There is no dedicated guidance for applying PPPs, ESCO models, blended finance, green bonds, or impact bonds in the health sector.
- **Project preparation and aggregation capacity:** Provinces and districts lack technical support to develop feasibility studies, baselines, and bundled project pipelines that meet the requirements of DFIs, climate funds, or impact investors.
- **Eligibility and "investment-readiness" of health projects:** Many facilities do not have basic diagnostics (energy audits, emissions baselines, asset registers, climate-risk assessments), limiting eligibility for climate finance and constraining pipeline development.
- **Evidence on cost-effectiveness and co-benefits:** There is limited documented evidence on the costs, savings, and resilience benefits of pilots (e.g. ESCOs, solar clinics, efficiency retrofits) to inform replication, pricing, and risk allocation.
- **Equity and rural inclusion in instrument design:** Little is known about how to adapt PPPs, blended finance, green bonds, and impact bonds so that they work for rural, low-capacity districts rather than concentrating benefits in metropolitan or high-revenue settings.
- **Outcome metrics and data systems:** All four instruments depend on robust, health-relevant indicators (e.g. continuity of care, avoided diesel costs, reduced emissions) and routine data systems that do not yet exist at facility level.
- **Governance and cross-sector coordination:** Roles and responsibilities across Health, Treasury, Energy, Infrastructure, and Environment remain diffuse, with no clear institutional "home" for climate-health financing strategy or for stewarding these instruments in the sector.

6.3 Barriers to financing and resource allocation

Despite growing recognition of climate change as a public health threat, South Africa's ability to finance climate-resilient health infrastructure remains constrained by systemic financial, institutional, and regulatory barriers. While Section 5.3 addressed operational challenges within health systems, this section focuses specifically on the structural constraints that hinder the mobilisation and deployment of climate-health investments at scale.

Fragmented Policy and Institutional Alignment

Policy fragmentation continues to impede climate-health financing. Health, climate, and finance sectors remain poorly aligned, with major policies, such as the NHI White Paper (National Department of Health, 2015) and National Adaptation Strategy, operating in parallel rather than as a coordinated system. As a result, health infrastructure proposals rarely meet climate-finance eligibility requirements.

Stakeholders also noted insufficient capacity within several provincial departments, where weak financial management systems and staff shortages undermine the development and execution of climate-resilient capital projects. Provincial departments in the Eastern Cape and Free State, for example, report difficulties in attracting and managing capital projects due to inadequate financial management systems and staff shortages. This affects their ability to design and execute climate-resilient infrastructure. Instruments such as the Health Facility Revitalisation Grant (HFRG) also remain underutilised in these regions.

Underdeveloped Market Ecosystem for Blended and Innovative Finance

South Africa's blended and impact investing markets remain nascent, limiting the country's ability to leverage innovative finance for health infrastructure. Local investors are risk-averse, and provincial or district health departments cannot typically prepare the bankable project pipelines required by DFIs or climate funds. High transaction costs and certification requirements further limit participation. Stakeholders emphasised the absence of a national project-preparation facility capable of aggregating small-scale health projects and providing technical support to meet investor standards.

> *"Blended finance is something we talk about, but we don't have a platform to actually operationalize it at the district or facility level." (Provincial health stakeholder)*

Instruments such as green bonds and impact bonds require third-party certification, impact audits, and regular performance monitoring. These processes carry high administrative costs, often beyond the capacity of smaller municipalities and healthcare providers. Without targeted support for technical assistance, these mechanisms remain inaccessible.

Over-Reliance on Donor-Driven Pilots

Stakeholders noted that many climate-related upgrades in health facilities, such as solar installations, water systems, and small-scale resilience retrofits, have been initiated through short-term donor programmes rather than domestic financing pathways. While these initiatives demonstrate feasibility, they rarely lead to longer-term scale or institutional uptake. Respondents described a familiar pattern: donor-funded projects are installed without budget lines for maintenance, without integration into provincial planning cycles, and without connection to the capital investment frameworks that determine long-term infrastructure priorities.

This dynamic creates an investment landscape shaped by external project timelines rather than system needs, limiting South Africa's ability to build a durable, locally owned pipeline for climate-resilient health infrastructure. The recent withdrawal of PEPFAR funding illustrated the fragility of donor-dependent models. Stakeholders warned that, unless domestic financing pathways are strengthened, climate-health programmes risk reproducing these vulnerabilities.

Fiscal Constraints and Competing Priorities

South Africa's fiscal context remains constrained by rising debt and sluggish economic growth. Budgetary pressures are intensified by major social expenditure items, including the proposed NHI, which is projected to cost between R450 and R500 billion annually by 2035 (Council for Medical Schemes, 2023). Without a defined investment framework linking health and climate priorities, resilient health infrastructure will struggle to secure consistent funding. Section 3.3.4 recommends embedding climate resilience criteria in national budget processes and linking capital grants to resilience indicators.

In summary, while South Africa has begun to articulate the policy ambition needed to address climate and health interlinkages, the financial and institutional infrastructure required to translate these goals into reality remains fragmented and underdeveloped. From coordination failures and subnational capacity gaps to the inaccessibility of climate finance instruments, these barriers must be tackled systematically. Strengthening national frameworks, creating dedicated project preparation facilities, and embedding resilience criteria into mainstream public finance processes are essential next steps.

Key Insights, Gaps and Areas for Learning

Financing barriers in South Africa's climate-health space are rooted not in the absence of resources, but in systemic misalignment across health, climate, and finance institutions. Provinces and districts lack the diagnostic tools, project-preparation capacity, and financial management systems required to develop investment-ready proposals. Climate finance instruments, whether PPPs, blended finance, or climate funds, are mismatched with current institutional capabilities. Where donor-funded pilots have succeeded, they have rarely transitioned into sustainable, domestically financed programmes. Strengthening the enabling environment, rather than introducing new instruments, is the most immediate priority.

Gaps and areas for learning include:

- **Financing Strategy Gap:** There is no national climate-health financing strategy or institutional "home" to coordinate actors across health, energy, finance, and climate portfolios.
- **Subnational Capacity Gap:** Provinces and districts lack the technical and financial management capabilities needed to design, cost, and prepare climate-resilient health infrastructure projects.
- **Diagnostic and Data Gap:** Most facilities lack energy audits, emissions baselines, climate-risk assessments, or asset registers – key prerequisites for investment readiness.
- **Market Ecosystem Gap:** South Africa lacks intermediaries or project-preparation facilities that can aggregate projects, conduct due diligence, and structure deals for DFIs or blended finance.
- **Equity and Inclusion Gap:** Urban-skewed financial instruments rarely reach rural or low-capacity provinces; models for pooled or cross-district investment remain underdeveloped.
- **Sustainability Gap:** Donor-driven pilots lack pathways for transition into domestic budgets, creating recurrent "pilot-rich, system-poor" patterns.
- **Metrics and Accountability Gap:** Financing instruments require robust KPIs (e.g., resilience outcomes, avoided diesel costs, service continuity), but climate-health metrics are not yet integrated into facility reporting or Treasury frameworks.

7. Strategic Opportunities and Levers

South Africa's health system is entering a period of profound climate stress. Building a climate-resilient, low-carbon, and equitable system requires coordinated action across multiple pillars of the health system as well as attention to the structural inequities and community dynamics that shape vulnerability and adaptation capacity. This chapter outlines a set of strategic pathways that bring these pillars together into a coherent agenda for system-wide transformation.

The pathways were developed through a phased process combining literature review, policy analysis, and stakeholder engagement. Initial insights emerged from the scoping review, which drew on documentary analysis, 22 semi-structured interviews, and a national stakeholder dialogue. As themes began to cluster around recurrent system challenges and opportunities, we applied the World Health Organization's **Operational Framework for Climate-Resilient Health Systems** (WHO, 2015) as an analytic structure to organise and interrogate the emerging ideas. This helped to surface gaps, identify system entry points, and shape the preliminary pathways.

To ensure practical relevance and reduce duplication, the pathways in this chapter follow an adapted structure that groups the WHO components into **six strategic pathways**, each corresponding to a core building block:

1. **Leadership & Governance**
2. **Health Workforce**
3. **Knowledge, Data, & Information Systems**
4. **Medicines, Technologies & Infrastructure**
5. **Service Delivery**
6. **Financing**

In addition, two **cross-cutting pathways**, strongly emphasised across interviews, literature, and dialogue sessions, were identified as essential enabling conditions without which progress in any building block will be limited:

- **Equity by Design** – Prioritising spatial justice, underserved populations, and inclusive planning mechanisms.
- **Community-Led Resilience** – Elevating communities as central actors in climate-health response through shared governance and local adaptation strategies.

The pathways were subsequently tested and refined through a multi-stakeholder sense-making workshop in May 2025. This workshop brought together participants from civil society organisations, academic institutions, and technical agencies to critically engage

with the proposed structure, surface implementation challenges, and contribute additional strategies. Their feedback helped validate the relevance of the WHO-aligned structure and sharpened the framing and focus of the final pathways presented here.

Together, these eight pathways offer a coherent, accessible set of strategic directions that reflect South Africa's climate-health realities while remaining grounded in internationally recognised frameworks. Each pathway includes: a concise summary of the issue, key insights from evidence and stakeholder engagement, and priority actions that illustrate how South Africa can operationalise climate-resilient and low-carbon health system transformation.

These pathways are not prescriptive solutions but rather **strategic entry points** to support coordinated action across government, civil society, academia, and development partners. They highlight where investment, collaboration, and reform are most likely to yield catalytic system-wide impact and ensure that climate-health action strengthens, not deepens, South Africa's longstanding inequities.

Figure 1: Six building blocks comprising the WHO operational framework for building climate resilient health systems and two cross-cutting pathways. Adapted from: WHO, 2015

7.1 Leadership and Governance

Strengthening climate-health leadership, accountability, and coherence

Leadership and governance are the foundations of a climate-resilient health system. Effective climate-health action depends on clear mandates, coordinated planning across government spheres, and institutions capable of turning policy intent into operational delivery. South Africa has strong national climate frameworks, including the Climate Change Act, National Climate Change Adaptation Strategy, and the Presidential Climate Commission's Just Transition Framework, but fragmented implementation, weak accountability, and inconsistent provincial uptake continue to limit progress.

Across the study, stakeholders repeatedly emphasised that climate commitments "exist on paper" but remain disconnected from routine planning, budgeting, and performance systems. Strengthening leadership and governance is therefore a prerequisite for enabling all other pathways.

Key Insights

- **Implementation gaps stem from fragmented mandates and weak accountability.**
  Climate-health responsibilities are diffused across multiple departments, leaving no single anchor institution. Provinces and districts often lack direction on how national climate priorities translate into their planning cycles, contributing to inconsistent implementation.
- **Coordination across sectors is essential but under-institutionalised.**
  Cross-sector structures are often ad hoc, dependent on individual champions, or disconnected from budgeting processes. This undermines follow-through and limits multisectoral action on climate-health risk.

- **Planning and budgeting cycles are misaligned across government spheres.** National climate-health ambitions rarely cascade into provincial and municipal IDPs, District Health Plans, or infrastructure plans. The separation of climate, health, and infrastructure planning remains a core barrier.
- **Leadership is strongest where governance models emphasise collaboration.** Examples such as the Western Cape's CALM model demonstrate the potential of network-based leadership approaches that prioritise alignment, shared problem-solving, and cross-sector learning.

Strategic Actions

1. **Establish clear climate–health mandates and accountability across all levels of government.**
   Define and formalise roles for national, provincial, and municipal actors within a shared accountability framework, linking mandates to annual planning, budgeting, and performance cycles.
2. **Create permanent, empowered climate–health coordination platforms.**
   Institutionalise multisector structures that bring together health, environment, disaster management, infrastructure, water, and finance, with authority to coordinate, monitor progress, and enforce follow-through.
3. **Align planning and budgeting instruments with climate–health priorities.**
   Embed climate resilience into IDPs, District Health Plans, service delivery agreements, and infrastructure plans, using vulnerability and service disruption data to guide prioritisation and resource allocation.
4. **Strengthen climate-informed planning capacity within existing institutions.**
   Equip provincial and district planning units with tools, training, and technical support to integrate climate risk into routine planning, avoiding the creation of parallel or ad hoc systems.
5. **Institutionalise peer learning and network-based leadership models.**
   Create mechanisms such as communities of practice, province-to-province exchanges, and cross-sector learning platforms to share innovations, reduce fragmentation, and strengthen collaborative leadership.

Why This Pathway Matters

Ultimately, building climate resilience requires more than policy commitments. It depends on clarifying roles, strengthening provincial leadership structures, and embedding climate-health priorities into the planning and budgeting systems that determine how work actually gets done. Supporting provincial task teams, aligning mandates across sectors, and integrating climate resilience into IDPs, District Health Plans, and service delivery agreements are essential steps toward bridging the persistent gap between strategy and implementation.

Operationalising this pathway will require investment in technical assistance, embedded advisory capacity, and practical tools that help provinces and districts translate national frameworks into coherent, locally grounded action. Peer learning platforms, cross-department coordination forums, and shared performance frameworks can help standardise good practice and reduce fragmentation across the system. Strengthening these governance mechanisms, and ensuring they are co-owned across spheres of government, is critical to moving from isolated initiatives to sustained, system-wide change.

By building the institutional foundations for coordination, accountability, and adaptive leadership, South Africa can ensure that climate-health governance becomes an operational reality, not just a strategic aspiration.

7.2 Health Workforce

Protecting and preparing frontline workers for a changing climate

A climate-resilient health system relies on a workforce that is adequately staffed, trained, and protected. Yet South Africa's health workforce is already overstretched, unevenly distributed, and operating under difficult conditions—especially in rural and underserved districts. Climate change magnifies these pressures through extreme heat, more frequent disease outbreaks, disrupted water and electricity supply, and damage to facility infrastructure.

These shocks affect both staff wellbeing and service continuity. Health workers often lack safe working conditions, reliable backup systems, or clear guidance for operating during climate-related emergencies, increasing burnout and reducing retention. Stakeholders emphasised that resilience requires more than technical training: it depends on safe facilities, strong management systems, psychosocial support, and clear operational protocols.

Community Health Workers (CHWs) emerged as a particularly important yet underutilised resource. As trusted, embedded actors, they are well positioned to support climate-related outreach, surveillance, and continuity of care, if properly trained and integrated into climate-health strategies.

Key Insights

- **Workforce shortages and distribution gaps undermine climate resilience.**
  Rural and high-risk districts already operate with limited staffing, making it difficult to absorb additional pressure from climate-related shocks.

- **Training on climate-sensitive health risks is minimal and inconsistent.**
  Most health professionals receive little structured training on heat-related illness, vector expansion, waterborne disease risk, or service continuity during extreme weather.

- **Working conditions are not designed for climate risk.**
  Many facilities have inadequate cooling, ventilation, water supply, or backup energy systems, leaving staff unsafe and unable to sustain services during heatwaves or outages.

- **CHWs represent a high-impact, low-cost climate resilience resource.**
  With strong community ties, CHWs can monitor local risks, support early warnings, and maintain continuity of care, but they require training, integration, and support.

- **There is no national roadmap for a climate-ready health workforce.**
  Workforce planning, occupational health, emergency readiness, and climate preparedness remain siloed rather than strategically aligned.

Strategic Actions

1. **Institutionalise climate–health vulnerability and capacity assessments.**
   Develop and adopt national guidance and digital tools for climate–health risk and vulnerability assessments at provincial, district, and facility level. Ensure tools integrate social determinants, infrastructure readiness, and health worker vulnerability, not just hazard exposure. Embed RVA cycles into District Health Plans, infrastructure strategies, and budget submissions.

2. **Roll out facility-level climate readiness diagnostics.**
   Conduct routine energy, water, and hazard exposure audits in public facilities, prioritising high-risk districts and underserved areas. Use results to inform maintenance plans, emergency preparedness, and eligibility for climate and infrastructure financing.

3. **Build interoperable climate–health data platforms.**
   Strengthen data linkages between meteorological, environmental, and health information systems (e.g. DHIS2, NICD platforms, environmental monitoring). Develop simple dashboards and triggers that translate combined data into alerts and decision rules for district managers, facilities, and CHWs.

4. **Operationalise early warning systems (EWS) for health.**
   Define priority use cases (e.g. extreme heat, flooding, air pollution peaks, water contamination, vector-borne disease risk) and agreed response protocols for each. Ensure alerts are routed through channels that frontline workers and communities actually use (e.g. SMS, WhatsApp groups, local radio, CHW networks). Train health workers and managers to interpret alerts and act on them.

5. **Co-develop a national climate–health research and learning agenda.**
   Convene researchers, health departments, communities, and funders to agree on a shared, applied research agenda, focusing on: service continuity during floods, heatwaves, and blackouts; cost-effectiveness of adaptation and mitigation measures; and equity impacts of different climate–health interventions. Prioritise decision-oriented and implementation research in high-risk provinces and districts.

6. **Embed researchers and data specialists within health systems.**
   Pilot embedded research and data roles in provincial and district teams to support real-time analysis during climate shocks and to translate findings into adjustments in service delivery, infrastructure planning, and emergency protocols.

7. **Translate evidence into practical tools for managers and communities.**
   Package research and analytics into decision-ready products: vulnerability maps, toolkits, facility checklists, and short briefs aligned with existing planning cycles. Support community-facing tools that turn information into actionable advice (e.g. heat-health guidance, flood preparedness messages, air quality alerts).

8. **Create platforms for shared learning and innovation.**
   Establish national or provincial learning hubs or communities of practice where provinces, districts, and facilities can share lessons from pilots, failures, and adaptations. Incentivise documentation of local innovations (e.g. low-cost cooling strategies, community-based surveillance models) and make these accessible across the system.

Why this pathway matters

A climate-resilient health system cannot function without a workforce that is protected, prepared, and supported. Health workers are the system's first line of defence during heatwaves, floods, disease outbreaks, and infrastructure failures, yet they are also the most exposed when facilities lack cooling, water security, ventilation, or reliable power. Investing

in their safety and preparedness is not optional: it is a prerequisite for maintaining service continuity and safeguarding population health in a warming climate.

Strengthening the Community Health Worker (CHW) platform offers one of the highest-impact opportunities for building resilience. CHWs are deeply embedded in communities, uniquely positioned to monitor local risks, support early warning communication, and sustain care when clinics are disrupted. When equipped with training, tools, and clear mandates, they expand the reach of the health system precisely where climate vulnerability is greatest, particularly in rural and underserved districts.

Protecting the workforce also means recognising the physical and psychological toll of climate-related emergencies. Heat exposure, service disruptions, and traumatic events such as floods demand stronger occupational health systems, mental health support, and facility-level adaptations that keep staff safe. At the same time, creating district-level coordination roles ensures that climate priorities are operationalised where day-to-day decisions are made, bridging national strategies with frontline realities.

Ultimately, a climate-resilient health system is built on people. When health workers are informed, protected, and empowered, the system can anticipate shocks, maintain continuity of care, and deliver equitable services in the face of accelerating climate pressures.

7.3 Knowledge, Data, and Innovation Systems

Seeing climate–health risk clearly and learning in real time

Climate resilience depends on being able to see risk, act early, and learn quickly. In South Africa, that requires three things working together:

- robust, equity-sensitive vulnerability and capacity assessments
- integrated data and early warning systems that link environmental and health information

- a climate–health research and innovation ecosystem that answers real operational questions and feeds decisions at facility, district, and national levels.

Across the scoping review and stakeholder engagement, participants repeatedly described a form of "data poverty": environmental, demographic, and health datasets exist, but they are fragmented, delayed, or inaccessible; vulnerability assessments are ad hoc; and early warning systems rarely trigger clear action. At the same time, South Africa has strong research institutions and disease surveillance infrastructure but these assets are not yet systematically aligned with climate–health priorities or embedded in everyday planning.

This pathway focuses on building joined-up knowledge systems: from local risk diagnostics to national research agendas, and from early warning alerts to decision-ready tools for managers and communities.

Key Insights

- **Vulnerability is patterned, but not systematically mapped or used.**
  Climate–health risk closely follows South Africa's spatial and social inequalities, yet routine, standardised vulnerability and capacity assessments for populations, facilities, and systems are rare and underused in planning or budgeting.

- **Data systems exist but are fragmented and often "too late."**
  Weather, environmental, and health data streams sit in separate systems, with limited interoperability or shared governance. Mortality and morbidity data are often delayed, and early warning systems seldom trigger predefined health responses.

- **Facility-level diagnostics are a critical missing link.**
  Few public facilities have basic climate-relevant diagnostics – such as energy audits, water security assessments, or hazard exposure profiles – undermining service continuity planning and climate-finance readiness.

- **Climate–health research is active but poorly aligned with decision needs.**
  Existing research is often project-based, theoretical, or donor-driven, with limited coordination around a national agenda and weak translation into guidance, tools, or standards that can be used by planners and managers.

- **Local and community knowledge is under-recognised as a data source.**
  Communities, CHWs, and frontline workers are often the first to detect emerging risks and service disruptions, but their knowledge is seldom captured systematically or integrated into surveillance and planning systems.

Strategic Actions

1. **Institutionalise climate–health vulnerability and capacity assessments.**
   Develop and adopt national guidance and digital tools for climate–health risk and vulnerability assessments at provincial, district, and facility level. Ensure tools integrate social determinants, infrastructure readiness, and health worker vulnerability, not just hazard exposure. Embed RVA cycles into District Health Plans, infrastructure strategies, and budget submissions.

2. **Roll out facility-level climate readiness diagnostics.**
   Conduct routine energy, water, and hazard exposure audits in public facilities, prioritising high-risk districts and underserved areas. Use results to inform maintenance plans, emergency preparedness, and eligibility for climate and infrastructure financing.

3. **Build interoperable climate–health data platforms.**
   Strengthen data linkages between meteorological, environmental, and health information systems (e.g. DHIS2, NICD platforms, environmental monitoring). Develop simple dashboards and triggers that translate combined data into alerts and decision rules for district managers, facilities, and CHWs.

4. **Operationalise early warning systems (EWS) for health.**
   Define priority use cases (e.g. extreme heat, flooding, air pollution peaks, water contamination, vector-borne disease risk) and agreed response protocols for each.
   Ensure alerts are routed through channels that frontline workers and communities actually use (e.g. SMS, WhatsApp groups, local radio, CHW networks). Train health workers and managers to interpret alerts and act on them.

5. **Co-develop a national climate–health research and learning agenda.**
   Convene researchers, health departments, communities, and funders to agree on a shared, applied research agenda, focusing on: service continuity during floods, heatwaves, and blackouts; cost-effectiveness of adaptation and mitigation measures; and equity impacts of different climate–health interventions. Prioritise decision-oriented and implementation research in high-risk provinces and districts.

6. **Embed researchers and data specialists within health systems.**
   Pilot embedded research and data roles in provincial and district teams to support real-time analysis during climate shocks and to translate findings into adjustments in service delivery, infrastructure planning, and emergency protocols.

7. **Translate evidence into practical tools for managers and communities.**
   Package research and analytics into **decision-ready products**: vulnerability maps, toolkits, facility checklists, and short briefs aligned with existing planning cycles. Support community-facing tools that turn information into actionable advice (e.g. heat-health guidance, flood preparedness messages, air quality alerts).

8. **Create platforms for shared learning and innovation.**
   Establish national or provincial learning hubs or communities of practice where provinces, districts, and facilities can share lessons from pilots, failures, and adaptations. Incentivise documentation of local innovations (e.g. low-cost cooling strategies, community-based surveillance models) and make these accessible across the system.

Why this pathway matters

Without reliable, timely, and usable information, climate–health planning becomes either reactive or symbolic. Knowledge, data, and innovation systems are the backbone of every other pathway: they determine where infrastructure is upgraded, how emergencies are managed, which communities are prioritised, and whether scarce resources are used effectively.

Investing in this pathway means moving from isolated pilots and "data-rich but insight-poor" systems to joined-up, learning health systems that can anticipate risk, target resources to the most vulnerable, and adapt based on evidence. It also creates the foundations required to access and justify climate and development finance, by demonstrating vulnerability, tracking impact, and making the case for scale.

7.4 Medicines, Technologies & Infrastructure

Building sustainable, resilient systems that safeguard service delivery and reduce the sector's environmental footprint

A climate-resilient health system requires medicines, technologies, and physical infrastructure that can withstand climate stressors, support uninterrupted service delivery, and reduce environmental harms. This pathway brings together essential medical products,

health technologies, and facility infrastructure, recognising that resilience depends on the entire ecosystem functioning reliably, sustainably, and equitably.

South Africa's health system faces persistent vulnerabilities across these domains. Facilities, particularly in rural and peri-urban areas, struggle with water shortages, unreliable energy supply, poor ventilation, and ageing infrastructure. Climate change will intensify these pressures through more frequent heatwaves, flooding, and power disruptions that compromise cold chains, diagnostics, medicine storage, operating theatres, and supply chains.

At the same time, medicines and technologies account for a substantial share of the health sector's emissions and are increasingly exposed to global supply chain shocks. Import dependence, limited local production capacity, and insufficiently climate-aware procurement practices reduce continuity during crises. Stakeholders highlighted the need for more sustainable procurement models, robust waste management, energy-efficient technologies, and renewable-powered cold chains. They also stressed that climate-resilient facility design and technology deployment must prioritise underserved areas to avoid deepening historical inequities.

Promising innovations already exist, including solar-powered clinics in Mpumalanga, hybrid energy systems in Paarl, facility audits in the Western Cape, and small-scale circular economy initiatives, but scale-up has been slow, and decision-makers lack clear standards to guide investment.

Key Insights

- **Infrastructure vulnerabilities and unreliable utilities are major threats to service continuity.**
  Energy and water insecurity, poor ventilation, and ageing facilities undermine clinical safety, cold chains, diagnostics, and emergency response—problems that climate change will exacerbate.

- **Medicines and technology supply chains are highly exposed to climate and global market disruptions.**
  Import dependence, fragile logistics systems, and temperature-sensitive products increase the risk of stockouts, wastage, and loss of essential medicines during heatwaves, floods, or power failures.

- **Sustainable procurement and waste systems are underdeveloped.**
  Procurement rarely incorporates environmental or climate criteria, and health-care waste systems remain inconsistent, hazardous, and carbon-intensive, especially where incineration is the default.

- **Facility-level capacity and authority to invest in resilience are limited.**
  Facility managers and district engineers often lack the budget flexibility, technical tools, or decision-making power needed to adopt climate-smart technologies or address infrastructure risks proactively.

- **Emerging pilots demonstrate feasibility but lack the frameworks needed for scale.**
  Projects in renewable energy, energy-efficient technologies, facility audits, and local production remain fragmented without national standards, financing pathways, or mechanisms for shared learning.

Strategic Actions

1. **Strengthen sustainable procurement and supply chains.**
   Embed environmental, lifecycle-cost, and climate-resilience criteria into procurement policies for medicines, devices, consumables, and infrastructure. Prioritise energy-efficient technologies, sustainable materials, and low-carbon production practices.

2. **Invest in renewable-powered and resilient medical technologies.**
   Scale hybrid and solar-powered cold chains, temperature-monitoring systems, energy-efficient medical equipment, and climate-resilient diagnostics. Ensure that procurement decisions align with facility risk profiles and projected climate conditions.

3. **Expand local production and circular-economy models.**
   Encourage local manufacturing of priority medicines, devices, and consumables to reduce import dependence and strengthen resilience during supply disruptions. Support repair, reuse, refurbishment, and recycling systems to decrease waste and emissions.

4. **Climate-proof health infrastructure through national standards and tools.**
   Develop and adopt standards for climate-resilient facility design, energy and water efficiency, ventilation, passive cooling, and hazard-resistant construction. Integrate these into capital planning, accreditation, and maintenance systems.

5. **Prioritise upgrades in high-risk and underserved facilities.**
   Use vulnerability and service disruption data to guide investment sequencing, ensuring that rural, peri-urban, and historically marginalised districts receive early and sustained improvements.

6. **Institutionalise facility-level risk and readiness diagnostics.**
   Conduct routine audits of energy, water, waste, and hazard exposure to inform

planning and unlock climate finance. Ensure facilities have clear pathways to address identified risks.

7. **Strengthen waste management and environmental health protections.** Improve segregation, treatment, and disposal systems, prioritising low-emission technologies over incineration. Embed waste management standards into facility operations and supply chain contracts.

8. **Build technical and managerial capacity across provinces and districts.** Provide training and tools for infrastructure planners, pharmacists, biomedical engineers, and procurement teams on climate-smart technologies, resilience planning, and sustainable systems management.

Why this pathway matters

Medicines, technologies, and infrastructure form the operational backbone of the health system. When cold chains fail, essential medicines spoil; when clinics lose power or water, lifesaving care stops; when supply chains break, programmes collapse. Strengthening these systems is therefore not only a climate imperative—it is fundamental to equity, continuity of care, and health system reliability.

By investing in sustainable procurement, resilient supply chains, and climate-smart infrastructure, South Africa can build a health system that is cleaner, more reliable, and better prepared for future shocks. These improvements also unlock co-benefits: reduced emissions, lower operating costs, and safer working conditions for frontline staff.

7.5 Service Delivery

Ensuring climate-responsive, equitable, and reliable health services across all levels of care

Service delivery is where climate impacts are felt most directly, through heat-related illness, waterborne disease outbreaks, medicine stockouts, disrupted transport routes, facility

closures, and failures in continuity of care. This pathway integrates three areas of system function that determine whether people receive safe, reliable care under climate stress:

- environmental determinants of health,
- climate-informed programme design, and
- emergency preparedness and response.

Across the scoping review and stakeholder engagements, service delivery emerged as one of the most vulnerable parts of the system. Climate-sensitive diseases are already rising in several provinces; heatwaves and water shortages interrupt clinical operations; floods damage roads and prevent patients and staff from reaching facilities; and communities face persistent environmental exposures (polluted air, unsafe water, poor sanitation, uncollected waste) that are amplified by climate change.

Stakeholders emphasised that while South Africa has strong programme platforms (e.g., HIV, TB, maternal health), these programmes have not yet integrated climate risk screening or adaptation protocols. As a result, climate disruptions propagate through service delivery in ways that reduce quality of care, increase inequity, and undermine public trust.

Finally, climate-related emergencies, including heatwaves, flooding, wildfires, water interruptions, are becoming more frequent and more severe, yet emergency preparedness remains fragmented across provinces and districts. Few facilities have operational extreme-weather protocols; simulation drills are rare; and climate scenarios are not routinely embedded in disaster planning.

Together, these gaps represent a major barrier to climate-resilient health systems but also an opportunity: integrating resilience into "core business" service delivery offers immediate and long-term benefits for health equity, continuity of care, and population health.

Key Insights

- **Environmental exposures drive climate-sensitive health risks, but are poorly integrated into health planning.**
  Air pollution, unsafe water, poor sanitation, vector expansion, and food insecurity are intensifying under climate change, yet coordination across the departments managing these systems remains weak.

- **Climate considerations are largely absent from vertical programmes and clinical guidelines.**
  Most national disease programmes, treatment protocols, referral pathways, and M&E tools do not account for climate shocks or environmental determinants, risking programme disruption.

- **Emergency preparedness is inconsistent and insufficiently climate-informed.**
  Few provinces and districts have updated emergency plans that incorporate climate

scenarios. Facility-level extreme-weather protocols and simulations are rare.

- **Service continuity is highly vulnerable to predictable climate hazards.**
  Heatwaves, floods, water interruptions, and hazardous air events repeatedly disrupt care, especially in rural and informal settlements, compounding existing inequities.

- **Communities often detect risks earlier than institutions, but lack formal channels to act or trigger response.**
  Without community-linked monitoring systems and trusted communication pathways, early warning signals are missed or not acted on.

Strategic Actions

1. **Integrate environmental health risks into routine planning and programme delivery.**
   Use hazard, water-quality, air-quality, and vector surveillance data to inform service planning at district and provincial levels. Embed health considerations into municipal water, waste, housing, and land-use planning.

2. **Adapt national health strategies and clinical guidelines for climate resilience.**
   Update HIV, TB, maternal and child health, chronic disease, and environmental health programmes to include climate risk screening, treatment continuity plans, and community-based adaptation mechanisms.

3. **Strengthen community-based environmental monitoring and response.**
   Equip CHWs, ward-based outreach teams, and local environmental officers with training and tools to detect and report water, waste, air-quality, and vector hazards, linked to district response mechanisms.

4. **Develop climate-responsive service delivery protocols.**
   Adapt facility and outreach protocols to address heat stress, waterborne disease risk, respiratory hazards, and medicine/cold-chain vulnerabilities. Integrate passive cooling, hydration, ventilation, and adjusted outreach schedules during heatwaves.

5. **Embed climate risk into emergency preparedness and response planning.**
   Update national, provincial, and district disaster plans to incorporate climate scenarios, including extreme heat, flooding, wildfire, and water shortages. Ensure plans include clear triggers, thresholds, and responsibilities.

6. **Institutionalise climate-related drills and simulations.**
   Conduct regular district-level and facility-level simulations focused on climate shocks (e.g., flood-induced service disruptions, heat-related patient surges) to test coordination and preparedness.

7. **Develop and disseminate facility-level extreme-weather protocols.**
   Provide tools and guidance for clinics and hospitals on heatwave response, flood

preparedness, service continuity during power/water interruptions, and patient triage modifications.

8. **Strengthen cross-sector coordination for climate-linked health risks.** Establish joint operational platforms between health, disaster management, water and sanitation, housing, transport, and environment to manage climate-linked hazards that affect service delivery.

Why this pathway matters

Service delivery is where climate change becomes tangible for communities and providers, through medicines that spoil, appointments missed due to flooded roads, clinics closed due to water shortages, or rising heat that makes care unsafe for both patients and staff. Strengthening this pathway ensures that care remains accessible, safe, and equitable despite escalating climate shocks.

By embedding climate considerations into programme design, environmental health action, and emergency preparedness, South Africa can build a system that anticipates risks, protects vulnerable populations, and maintains continuity of care during crises. This pathway is also a major opportunity to integrate communities more meaningfully into detection and response, strengthening the social foundations of resilience.

7.6 Climate and Health Financing

Aligning resources, incentives, and financial systems with climate resilience and sustainability

Financing is the backbone of every other pathway in this report. Without adaptive, forward-looking financing systems, climate-health ambitions cannot translate into practice. Transitioning to a climate-resilient and sustainable health system in South Africa requires more than increased funding. It demands a fundamental rethinking of how resources are allocated, tracked, and aligned with long-term resilience, mitigation, and equity goals.

Climate change introduces new cost pressures, including facility retrofits, cooling systems, strengthened supply chains, renewable energy upgrades, emergency preparedness, and community resilience. Yet South Africa's health financing mechanisms remain anchored in historical baselines, short-term service delivery priorities, and rigid budget structures that leave little room for climate adaptation or mitigation.

At the same time, the health sector holds significant untapped potential for mitigation finance. Hospitals and clinics, especially energy-intensive facilities, represent high-impact sites for decarbonisation through renewable energy, efficiency upgrades, and low-carbon technologies. Positioning these opportunities within South Africa's broader climate finance architecture (JET-IP, NCCAS, municipal climate plans, IDPs) can unlock funding sources not historically accessed by the health sector.

Interviews and stakeholder workshops highlighted how adaptation and mitigation needs, such as energy resilience, cooling systems, or climate-proofed service delivery, are often sidelined due to fragmented mandates, rigid public financial management rules, and complex or mismatched climate finance criteria.

To bridge this gap, South Africa must invest in climate-smart project preparation, costing methodologies, and financial modelling tools that can align health investments with national mitigation targets and international funding standards. Strengthening the technical and institutional architecture of health financing, particularly at the provincial and municipal level, is essential for unlocking both domestic resources and external climate finance. The pathways that follow prioritise decarbonisation opportunities while supporting resilience-building and equitable access, offering a roadmap for transforming the climate-health finance landscape.

Key Insights

- **Climate-health priorities are not integrated into budgeting and public financial management (PFM) systems.**
  Current budgets and grants are designed for short-term service delivery, leaving limited flexibility for adaptation, infrastructure resilience, or long-term investments.

- **Infrastructure decarbonisation is a major mitigation opportunity—but remains underfunded.**
  Hospitals and clinics could attract climate mitigation finance through renewable energy, energy efficiency, and green procurement, but lack the project pipelines and technical preparation required.

- **Project readiness is a critical bottleneck.**
  Provinces and municipalities lack tools, financial modelling capacity, and

intermediaries to structure bankable climate-health proposals suitable for national or international climate finance.

- **Financing responsibilities are fragmented across departments and spheres of government.**
  Climate, health, infrastructure, and finance entities operate in silos, limiting coordinated planning and investment.

- **Blended finance and partnership models are emerging but not yet systematised.**
  There is interest among DFIs, Treasury, provinces, and donors in co-financing climate-health investments, but mechanisms remain ad hoc and pilots small-scale.

Strategic Actions

1. **Embed climate resilience and sustainability into existing health-sector budgets and grants.**
   Integrate climate risk, adaptation needs, and mitigation opportunities into national health budget guidelines, conditional grants, infrastructure allocations, and provincial planning cycles. Ensure NHI rollout incorporates net-zero and resilience benchmarks in facility accreditation, capital grants, and service delivery contracts.

2. **Align health infrastructure planning with national climate finance strategies.**
   Position health facilities within JET-IP, NCCAS, provincial climate plans, and municipal IDPs to unlock eligibility for domestic and international finance.

3. **Develop a national climate-health investment framework.**
   Create a unified framework that defines priority investment areas, costing methodologies, financing instruments, and institutional roles across Treasury, Health, provincial departments, and local government.

4. **Strengthen project preparation and financial modelling capacity.**
   Establish technical support hubs that help provinces and municipalities prepare feasibility studies, emissions baselines, costing tools, and financing models for renewable energy, energy efficiency, cooling systems, and resilient infrastructure.

5. **Expand green procurement and life-cycle costing.**
   Introduce procurement rules that prioritise low-carbon materials, energy-efficient equipment, sustainable technologies, and waste reduction, supported by life-cycle cost assessments rather than upfront price comparisons.

6. **Develop blended finance and partnership-based models.**
   Enable co-financed investment structures that combine public funds with climate finance, philanthropic support, and DFI capital, particularly for renewable energy, cold-chain resilience, and facility retrofits.

7. **Localise green bond, climate bond, and pooled finance instruments.** Support municipalities and provinces to issue climate-health bonds or participate in pooled, aggregated investment vehicles that bundle small facility upgrades into scalable financing packages.

8. **Engage DFIs as Coordinators and Multipliers.** Mobilise DFIs to convene blended finance platforms, offer concessional funding, support technical capacity building, and set emissions benchmarks across the health sector investment landscape.

Why this pathway matters

Financing is not only about increasing resources. It is about transforming how resources flow. Climate resilience cannot depend on special projects or ad hoc donor support; it must be built into the financial architecture that governs everyday health-sector decision-making.

Aligning budgets, procurement systems, and investment frameworks with climate goals enables South Africa to protect critical health infrastructure from shocks; reduce long-term operating costs through efficiency and renewable energy; unlock new funding streams through climate finance; and build sustainable, equitable, and resilient services.

By financing differently, South Africa can accelerate systemic transformation across the health system and position climate resilience as a core component of health sector reform.

7.7 Prioritising Equity by Design

Embedding spatial justice, social inclusion, and historical redress at the core of climate–health action

Climate change does not affect everyone equally. In South Africa, its impacts intersect with longstanding structural inequities, shaped by apartheid spatial planning, chronic underinvestment in rural and peri-urban areas, and unequal access to environmental determinants of health. Populations living in informal settlements, remote rural districts, and climate-exposed regions face the dual burden of higher exposure to climate hazards and lower access to quality care and infrastructure. As one stakeholder reflected:

> *"Climate change is just another stress on a system already failing poor Black communities. Resilience has to start by correcting the historical design flaws in who gets access, where, and how." (Health policy researcher)*

This pathway emphasises that equity must be embedded from the outset in climate-health planning, not retrofitted later. It requires interrogating whose risks are prioritised, whose needs are visible in data systems, and whose voices shape investments and policies. Stakeholders repeatedly cautioned that without intentional design, technical adaptation solutions may entrench or even worsen inequities.

> *"We talk about just transition at a high level. But what about implementation? If you put solar in urban hospitals first, because they're easier, and ignore rural clinics, what are you actually reinforcing?" (National government official)*

Equity considerations are also deeply gendered. The health workforce, especially nurses and community health workers (CHWs), is predominantly female, yet these workers often face greater exposure to heat, water shortages, and service disruptions. Their safety, wellbeing, and labour conditions are foundational to equitable climate-health responses.

Equity considerations are especially urgent in regions undergoing structural economic transition, such as Mpumalanga. As coal decommissioning advances, communities face layered health risks, from air pollution legacies to service disruptions tied to economic contraction. Health equity must be integrated into just transition strategies to ensure that decarbonisation efforts do not deepen existing disparities. This includes planning for resilient health infrastructure, protecting affected workers' health, and aligning climate-health investments with regional development priorities.

Stakeholders repeatedly emphasised that technical solutions alone will not build resilience. Without attention to who benefits, who is burdened, and whose voices shape priorities, adaptation efforts risk reinforcing or even exacerbating existing inequities. A commitment to "equity by design" requires embedding social and spatial equity indicators into vulnerability assessments, investment criteria, early warning systems, infrastructure planning, and workforce allocation.

Key Insights

- **Climate-health vulnerability is patterned by South Africa's history of spatial and social inequality**.

Rural districts, informal settlements, and climate-exposed provinces face the highest risks and the least capacity to adapt.

- **Equity indicators are not systematically embedded into planning, budgeting, or investment decisions.**
  Current systems rarely use spatial vulnerability data to guide allocation of infrastructure or service upgrades.

- **Marginalised groups remain underrepresented in decision-making & research.**
  Communities living with chronic illness, women-headed households, informal dwellers, and youth are often excluded from planning processes.

- **Climate action risks reinforcing inequity if investments favour easier-to-serve urban areas.**
  Renewable energy upgrades, technology pilots, and infrastructure retrofits often begin in metropolitan facilities.

- **Just transition regions face layered and compounding risks.**
  Economic restructuring, environmental degradation, and weak service systems intersect to heighten vulnerability in provinces like Mpumalanga.

Strategic Actions

1. **Embed equity criteria in all climate-health vulnerability assessments.**
   Ensure climate risk assessments include indicators for socio-economic marginalisation, spatial inequality, gendered labour patterns, disability, and chronic disease burden to guide priority-setting and resource allocation.

2. **Prioritise equity in climate-health investment decisions.**
   Develop investment criteria that proactively direct resources to under-served districts and historically marginalised communities. Track funding flows to assess whether inequities are being reduced.

3. **Integrate spatial justice metrics into infrastructure and service delivery planning.**
   Use tools such as vulnerability indices, access maps, climate exposure overlays, and service disruption data to prioritise locations for infrastructure upgrades, workforce deployment, and resilience interventions.

4. **Institutionalise equity impact assessments across policy and programme design.**
   Require climate-related policies, infrastructure projects, and digital systems to undergo equity impact assessments to identify unintended consequences and inform corrective action.

5. **Strengthen disaggregated data systems.**
   Collect, integrate, and use disaggregated data—by gender, geography, age, disability status, socioeconomic group, and health condition—to monitor equity outcomes and guide adaptive management.

Why this pathway matters

Equity must not be treated as a secondary consideration in climate-health planning, but as a core design principle that determines how problems are defined, how priorities are set, and how resources are allocated. This means embedding equity not only in programme goals, but in the systems that generate evidence, shape participation, and allocate investment. Equitable systems are built not just through new technologies, but through trust, access, and inclusion, particularly for historically marginalised communities and under-recognised care workers.

An equity-led approach ensures that:

- those most exposed to climate risk are prioritised
- adaptation efforts do not reinforce historical marginalisation
- investments reach communities with the least adaptive capacity
- gendered and labour-related vulnerabilities are addressed
- just transition regions are supported rather than further disadvantaged

Embedding equity by design strengthens not only climate resilience, but the legitimacy, effectiveness, and fairness of South Africa's health system transformation.

7.8 Advancing Community-Led Resilience

Strengthening local leadership, trust, and social systems as foundations of climate-health adaptation

Communities are often the first to detect climate impacts, the first to mobilise during crises, and the first to sustain service continuity when formal systems falter. Yet national and provincial climate-health strategies rarely recognise communities as co-producers of resilience. This pathway reframes resilience not only as a function of infrastructure, data, or emergency protocols, but as a social system dependent on trust, relationships, and locally embedded knowledge.

Across rural villages, informal settlements, and peri-urban areas, CHWs, traditional healers, religious leaders, ward councillors, and mutual aid groups frequently serve as de facto first responders during floods, heatwaves, fires, or service disruptions. Low-tech, trusted channels can generate rapid information flow and support local decision-making, often more effectively than formal systems.

Yet stakeholders highlighted that community actors remain structurally marginalised: rarely engaged in planning, insufficiently supported during emergencies, and excluded from early warning design, response protocols, and decision-making spaces. Trust deficits between institutions and communities, shaped by histories of exclusion, poor-quality services, or unmet promises, further undermine crisis response. During the 2022 KwaZulu-Natal floods, for example, some residents refused evacuation due to distrust in authorities and inadequate temporary shelter conditions, underscoring how social experience shapes uptake of public health interventions.

Community-led resilience requires mechanisms that enable local actors to shape priorities, contribute knowledge, and lead context-specific adaptation efforts. It also requires building the social infrastructure, including relationships, accountability loops, and participatory governance, that underpins effective and equitable climate-health action.

Key Insights

- **Local actors are often the earliest responders and most trusted messengers in climate-health crises.**
  CHWs, traditional healers, informal leaders, and mutual aid networks play central roles in detection, response, and recovery.

- **Implementation problems often stem from lack of buy-in or contextual fit—not from technical design flaws.**
  Programmes that overlook community realities or bypass local leadership fail to gain traction.

- **Trust is a critical determinant of risk communication and crisis behaviour.**
  People act on warnings when they come from sources they recognise and trust, not only when data is accurate.

- **Indigenous, informal, and lived knowledge systems remain underutilised.**
  Communities hold valuable insight on local risk patterns, coping strategies, and adaptation practices.

- **Mechanisms for participation and accountability are weak or tokenistic.**
  Communities are rarely empowered to influence climate-health planning, monitor risks, or shape service continuity strategies.

Strategic Actions

1. **Institutionalise community representation in climate-health planning.**
   Establish mechanisms such as ward-based climate-health forums, community advisory groups, and participatory budgeting processes to ensure local priorities shape planning and resource allocation.

2. **Support and fund local civil society and grassroots networks.**
   Provide flexible, multi-year financing and technical support to community-based organisations piloting adaptation models, social protection mechanisms, risk communication tools, and local response systems.

3. **Integrate trusted local actors into preparedness and response systems.**
   Formally include CHWs, traditional healers, religious leaders, youth organisations, and civic groups in emergency protocols, risk communication chains, and community-based surveillance systems.

4. **Strengthen CHWs as anchors of community resilience.**
   Expand training, resourcing, and formal mandates for CHWs to support climate-health education, local risk monitoring, service continuity, and two-way communication between communities and facilities.

5. **Embed community feedback and accountability mechanisms.**
   Use community scorecards, participatory monitoring, mobile surveys, and digital feedback tools to ensure programmes respond to lived experience and local needs. Integrate community-generated data into district health and surveillance systems.

6. **Develop local, low-tech two-way communication and surveillance platforms.**
   Support co-designed tools—SMS/USSD systems, WhatsApp-based reporting, local radio partnerships—that enable rapid detection, trusted communication, and context-sensitive response.

Why this pathway matters

Community-led resilience is not an add-on to technical adaptation efforts; it is a foundational determinant of whether climate-health interventions succeed. Resilience is built through trust, participation, and social cohesion—factors that determine whether people act on early warnings, access care during crises, or collaborate in local recovery.

When communities lead:

- warnings are more likely to be understood and acted upon
- adaptation strategies align with lived realities
- service continuity is sustained even during disruptions
- inequities are reduced rather than reinforced
- public health efforts become more legitimate, inclusive, and durable

Strengthening community-led resilience ensures climate-health strategies are not only technically sound, but socially grounded, equitable, and sustainable—anchored in the people and networks most directly affected by climate change and most invested in local solutions.

8. Conclusion: Towards an Integrated and Resilient Climate-Health Agenda

South Africa stands at a decisive moment. Climate change is already reshaping disease patterns, disrupting infrastructure, straining frontline services, and exacerbating longstanding inequities in health access and outcomes. At the same time, the country possesses significant foundations on which to build: a strong constitutional commitment to health, a robust public health tradition, active civil society organisations, pockets of innovation in provinces and municipalities, and an increasingly coherent national climate policy environment.

The findings of this scoping review show that climate resilience cannot be approached as a separate workstream or a technical add-on. Climate risks intersect with every function of the health system—governance, financing, workforce, medicines and technologies, information systems, service delivery, infrastructure, and community engagement. A facility without water cannot function, even with the best clinical guidance. A community that does not trust evacuation instructions cannot be protected by early warning systems. A health worker unsupported during heatwaves cannot sustain safe and compassionate care. These systemic interdependencies mean that climate resilience must be understood as a whole-of-system challenge requiring coordinated, long-term action.

Across Chapters 3–6, several themes recur with striking clarity. First, vulnerabilities in the health system mirror broader structural inequities rooted in spatial apartheid, under-investment, and uneven municipal capacity. Climate impacts fall hardest on communities already facing the greatest service deficits—rural districts, informal settlements, and areas with weak infrastructure or degraded environments. Second, fragmentation in governance and financing limits the ability of national, provincial, and local actors to plan proactively for climate risks. Climate responsibilities remain dispersed across multiple departments, with limited coordination or shared accountability mechanisms. Third, while South Africa has a strong scientific and policy foundation, operational systems—data flows, early warning mechanisms, procurement frameworks, maintenance regimes, and budgeting processes—are not yet aligned with climate needs. Finally, service delivery remains vulnerable to predictable climate shocks such as heatwaves, floods, and water shortages, in part because clinical guidelines, outreach models, and programme strategies have not been updated to reflect evolving risks.

Yet the study also highlights a significant opportunity. Many of the building blocks for a climate-resilient system already exist: provincial pilots on energy resilience and early warning; community-based surveillance models developed during COVID-19; strong networks of community health workers; emerging climate-finance mechanisms; and a growing ecosystem of researchers, civil society actors, and policy institutions committed to climate and health. What is missing is **an organising logic**, a coherent framework that aligns these scattered efforts, strengthens system capacity, and drives a shared vision of a climate-resilient health system.

This report proposes such a framework through a set of strategic pathways that cut across the health system. These pathways emphasise:

- coordinated governance and clear mandates;
- a protected, well-equipped workforce;
- robust, integrated data and early warning systems;
- resilient and low-carbon medicines, technologies, and infrastructure;
- climate-informed service delivery and programme design;
- financing aligned with long-term adaptation and mitigation goals;
- equity as a foundational design principle; and

- meaningful community leadership embedded in all stages of planning and implementation.

These pathways provide direction without prescription. They recognise that climate resilience cannot be achieved through a single reform or intervention, but through the cumulative strengthening of core system functions over time. They encourage provinces, districts, and municipalities to adapt the framework to their local realities, whether that means prioritising cooling and heat-health plans in the Northern Cape, strengthening flood preparedness in KwaZulu-Natal, improving air quality surveillance in Mpumalanga, or investing in water resilience in rural Eastern Cape facilities.

Central to this transformation is an understanding that climate resilience is inseparable from equity. Climate impacts mirror and magnify South Africa's structural inequalities; therefore, climate-health action must explicitly prioritise the communities, districts, and facilities experiencing the greatest risks and the least capacity to respond. This includes integrating equity indicators into vulnerability assessments, investment criteria, early warning systems, and service delivery planning. It also means enabling community actors—CHWs, traditional healers, local leaders, youth groups, civil society organisations—to shape, implement, and monitor climate-health strategies. Resilience cannot be imposed; it must be co-produced with those who experience climate impacts first and most intensely.

Achieving this agenda will require coordinated leadership across climate, health, finance, environment, water, energy, disaster management, and planning sectors, as well as strengthened capacity at provincial and district levels. It will also require adaptive systems that learn from pilots and scale what works; flexible and long-term financing aligned with resilience and sustainability goals; and sustained collaboration across government, civil society, researchers, and communities. No single actor can deliver this transition alone. Climate-health resilience demands a whole-of-society approach.

Looking Ahead: A Flexible and Evolving Roadmap

This report does not present a rigid blueprint. Instead, it offers a flexible, evolving roadmap intended to support planning, investment, and system learning. Climate risks will continue to change, and so must the strategies and structures of the health system. What should remain constant is the commitment to act with urgency, coherence, and equity.

A climate-resilient health system is one that protects the most vulnerable, supports the people who deliver care, strengthens the institutions that ensure continuity, and builds trust across society. It is a system where resilience is not a burden or an add-on, but a pathway to delivering better, fairer, more reliable health care for all.

By embracing the principles and pathways outlined in this report, South Africa can move decisively toward a more just and climate-resilient health future, one that is not only prepared for the climate challenges ahead, but is also more equitable, more responsive, and more sustainable for generations to come.

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