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Resilient Health Systems under Environmental Stress : Policy Lessons from Mauritius and Madagascar

Jacob Ntsholeng Segale[1*], Moses Eustace Danai Magaza[2], Poorneeka Ramjuttun Juglall[3], Munashe Tofa[4] and Boemo Sekgoma[5]

[1]*Programme Manager SRHR and M&E SADC Parliamentary Forum.*

[2]*Communications Manager SADC Parliamentary Forum*

[3]*Researcher (Mauritius) SADC Parliamentary Forum*

[4]*Programme Manger Climate Change, Environment, Health and SADC Parliamentary Forum*

[5]*Secretary General SADC Parliamentary Forum*

***Corresponding author**

Jacob Ntsholeng Segale,
Programme Manager SRHR M&E SADC Parliamentary Forum,
E-mail : jsegale@sadcpf.org

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Abstract

This study presents a comparative review of health system resilience in Mauritius and Madagascar amid growing environmental stressors driven by climate change. As small island developing states in sub-Saharan Africa, both countries face increased health risks from extreme weather events, shifting disease patterns, and food insecurity. This review highlights the disproportionate impact on vulnerable populations, particularly women and girls, emphasising the need for anticipatory and flexible health systems to manage these challenges effectively.

Methodologically, the study synthesises evidence from government and international agency assessments, peer-reviewed literature, and recent policy reports focused on health system adaptation frameworks. Special attention was paid to the World Health Organisation's Vulnerability and Adaptation Assessment applied in Mauritius and the Climate-Smart Public Health model piloted in Madagascar. Thematic document analysis was conducted to assess governance, surveillance, infrastructure, community engagement, and equity. The results reveal contrasting yet complementary approaches.

- *Mauritius benefits from robust institutional capacity, universal health coverage, and an advanced Early Warning Alert and Response System anchored in an equally robust multi-sectoral partnership framework.*
- *Despite resource limitations, Madagascar has demonstrated innovation through data-driven surveillance, artificial intelligence, and targeted infrastructure upgrades, supported by international cooperation. However, both countries share key lessons on the importance of predictive surveillance, multi-sectoral governance, and community participation in building resilient health systems.*

In conclusion, this review highlights that effective adaptation requires context-specific, equity-focused strategies that merge strong governance with technological innovation. Additionally, sustained financing, gender-responsive policies, and enhanced inter-sectoral collaboration are critical for future resilience. These insights offer valuable guidance for health systems in vulnerable settings that face escalating climate hazards.

Keywords: Climate-resilient health systems, Environmental stress, Mauritius, Madagascar, Early warning systems, Health system adaptation

Introduction

Sub-Saharan Africa is home to a substantial portion of the world's low- and middle-income countries, many of which, such as Mauritius and Madagascar, are acutely vulnerable to the negative effects of climate change (Stimson Center, 2024). This situation has been exacerbated by geographic isolation, limited resource bases, and fragile economies (World Bank, 2019; Stimson Center, 2024). Mauritius, with a population of approximately 1.2 million, is a densely populated, small island state. Madagascar, one of the world's largest islands, is home to over 28 million people who continue to face high levels of poverty and limited infrastructure (World Bank, 2019; IMF, 2023). Both nations are significantly dependent on subsistence agriculture, the fishing industry, and sectors related to tourism, which are highly responsive to climatic change and environmental disasters (Stimson Centre, 2024). These demographic facts exacerbate their susceptibility, causing health consequences related to environmental stress to be significantly worse among their populations.

Over the past decades, countries have been facing recurrent and severe weather events, such as cyclones, flash floods, long-lasting droughts, and rising sea levels (Tunley, 2025; CORVI, 2024). Coastline communities in Mauritius are increasingly challenged by erosion and saltwater intrusion, while in Madagascar, extreme weather and unpredictable rainfall have led to crop failure. Consequently, both nations have been directly affected in terms of food security and nutrition for millions (World Bank, 2019; IMF, 2023). Notably, 100% of the population in Mauritius will face hazardous levels related to wet-bulb temperatures and extreme heat by the turn of the century if carbon emissions persist (World Bank, 2025). In addition, outbreaks related to diseases, heat stress, food insecurity, and decreased access to safe water are turning out to be severe issues in the health sector, creating significant socio-economic impacts.

The impacts of these environmental shocks are unequally shouldered by girls and women, as they are more likely to be burdened with the responsibility of providing food and water to their families as a result of the variable availability of resources, something that was exacerbated by climate-related floods and droughts (WHO, 2022; IMF, 2023). Girls are often pulled from school during climate emergencies to help at home, reducing their educational attainment and economic prospects (Unwomen, 2023). Moreover, following disasters, health systems are disrupted, extending to reproductive health services, thereby increasing the risk of maternal and infant morbidity and mortality. This observation is corroborated by studies from other climate-vulnerable regions, especially in small island developing states (SIDS) worldwide, where women experience heightened psychological distress, exposure to gender-based violence, and obstacles to healthcare access in the aftermath of environmental disasters (WHO, 2022).

Addressing these multi-faceted health threats requires more than just reactive emergency management. Instead, building resilient health systems involves developing anticipatory, flexible infrastructure that can withstand, recover from, and adapt to shocks (Harvard T.H. Chan School of Public Health, 2025). Critical measures must include strengthening disease surveillance and early warning systems, integrating climate adaptation into public health planning, and ensuring that health facilities are designed or retrofitted to remain operational in the face of disasters (Tunley, 2025; WHO, 2025). International evidence further posits the effectiveness of cross-sectoral interventions which include programmes linking health, the environment, education, and social protection to better meet community needs and reduce long-term vulnerability (WHO, 2022; Harvard T.H. Chan School of Public Health (2025).

The Institutional Framework for Strengthening Health System Resilience

Strategic stakeholders, in an effort to strengthen health system resilience in Mauritius and Madagascar, comprise the national Ministries of Health, disaster management authorities, and ministries responsible for the Environment, Agriculture, and Education (WHO, 2025). Regional and international organisations, including the World Health Organisation, World Bank, and United Nations agencies, play essential roles in providing technical expertise, funding, and policy coordination (World Bank, 2019; WHO, 2022). Civil society groups, especially those focusing on women's empowerment and community health, are needed to ensure that adaptation strategies address grassroots realities and are inclusive of the needs of the most vulnerable (Unwomen, 2023). Academic and research institutions provide vital data and innovation, particularly in climate forecasting, public health surveillance, and impact assessment (Harvard T.H. Chan School of Public Health (2025).

Figure 1: Illustration of Strategic Stakeholders contributing to the Institutional Framework for Strengthening Health System Resilience in Mauritius and Madagascar

The escalating health threats posed by climate change in sub-Saharan Africa, as exemplified by Mauritius and Madagascar, cannot be addressed by traditional health systems alone. The intersection of environmental vulnerability, demographic pressures, and deep-rooted social inequalities, particularly for women and girls, necessitates a new model of resilient and anticipatory public health (WHO, 2025; Tunley, 2025). Lessons from international studies make it clear that progress will require not only infrastructure investments but also robust multi-sectoral policies, targeted support for marginalised populations, and coordination among a wide spectrum of local and global actors to safeguard health in an era of unprecedented environmental stress.

Methods

The Materials and Methods section of this review details the rigorous and systematic approach employed to synthesise evidence on health system adaptation under environmental stress in Mauritius and Madagascar. Basing itself on a vast pool of sources, ranging from government publications to international agency evaluations, peer-reviewed articles, and policy reports, this approach endeavours to undertake a multi-faceted, grounded-in-context analysis of adaptation paradigms and policy measures (Frontiers in Marine Science, 2019; WHO, 2021). Document analysis is complemented here by a selective consideration of the most widely recognised adaptation prototypes, the World Health Organisation (WHO) Vulnerability and Adaptation Assessment (V&A), and the Climate-Smart Public Health (CSPH) pilot-tested in Madagascar, to keep the approach methodological parallel to international best practices (WHO, 2021; Iyaloo et al., 2024).

To capture robust evidence, the review began by identifying and sourcing key strategic documents, notably the Mauritius Health Sector Strategic Plan (2020–2024) and the Madagascar Health and Climate Change Adaptation Strategic Plan. The collection included published policy frameworks, government progress reports, WHO regional action plans, international project evaluations, and relevant peer-reviewed articles on regional adaptation efforts (Health.govmu.org, 2023; WHO, 2021; ReliefWeb, 2021). The initial inclusion criterion was established to ensure that each source provided insights into policy direction, implementation challenges, systemic resilience, stakeholder engagement, and equity outcomes.

Document analysis was conducted using a structured thematic coding framework based on the principles of comparative health systems research. The coding categories reflect the core domains of adaptation, including governance structures, surveillance and early warning systems, inter-sectoral coordination, infrastructure upgrades, data integration, financing, and capacity building (WHO, 2024; Cochrane, 2019). In Mauritius, reviewer attention is focused on the implementation of the WHO V&A Assessment, especially in integrating climate risk into strategic planning and surveillance. In Madagascar, the process focuses on the application and outcomes of the CSPH model, highlighting data-driven adaptation, community participation, and mobilisation of local and international partners (Cochrane, 2019; PreventionWeb, 2025).

International studies were systematically reviewed to benchmark the adaptation frameworks in Mauritius and Madagascar against global standards and regional experiences (WHO, 2024; UNDP, 2023). This process involved cross-referencing similar island and African settings, drawing on comparative analyses of adaptation initiatives, such as the One Health multi-sectoral surveillance approach used for vector control in Mauritius and participatory climate vulnerability assessments applied in Madagascar (Iyaloo et al., 2024; Cochrane, 2019). Literature from UN agencies and academic sources further supplemented the review, providing a broader understanding of equity issues, especially as they pertain to vulnerable groups, such as women and girls, whose health and livelihoods are particularly at risk in climate emergencies (Unwomen, 2023; WHO, 2022).

Stakeholder inclusion is a fundamental aspect of this methodology. Policy documents from both countries demonstrate participatory approaches involving the ministries of health, environment, agriculture, education, civil society organisations, community leaders, and international donors (Health.govmu.org, 2023; WHO, 2021). Societal dialogue methods, expert and thematic working groups, and feedback loops with local service providers and patient groups have been highlighted as mechanisms for capturing diverse perspectives and ensuring policy relevance (Health. govmu. org, 2023). Madagascar's experience served as a reference for inclusive local expert involvement in vulnerability assessments, whereas Mauritius' inter-ministerial coordination exemplified merged planning processes (WHO, 2021).

Data extraction emphasised the use of both qualitative and quantitative evidence. In Mauritius, reports on integrated disease surveillance, electronic health projects, and early warning systems have been triangulated using statistical data on health system performance and climate exposure (Health. govmu.org, 2023; ReliefWeb, 2021). In Madagascar, the review incorporated findings from multi-country participatory workshops, community surveys, and climate risk modelling exercises, ensuring that the outputs reflected both lived experiences and scientific projections (Cochrane, 2019). International assessments have provided validated tools for ecological risk assessment, supply chain resilience, and social impact modelling, which have been applied to case studies (Frontiers in Marine Science, 2019; WHO, 2024).

To ensure methodological rigor and transparency, each stage of the review process was documented with clearly outlined inclusion and exclusion criteria, coding structures, and synthesis methods. Triangulation was used, where feasible, to confirm the results on various sources of government reports, international standard-setting organisations, and peer-reviewed journals, making the results more trustworthy and the analysis more generalisable (WHO, 2021; UNDP, 2023).

These methodologies provide an integrative and balanced summarisation of adaptation actions across Mauritius and Madagascar through the application of global models and local realities. This holistic approach to methodologies assures

that the following analysis is representative of the existing policy landscape, takes advantage of global lessons, and gaps representing future strategic priorities in the planning of health-system resilience.

Results

The findings remove therefore accentuate two clearly defined yet mutually complementing strategies for enhancing the resilience of the health system to environmental stress in Mauritius and Madagascar. Mauritius has high institutional capability as part of an advanced early warning system that is the foundation of its climate adaptation plan. From the Vulnerability and Adaptation (V&A) analysis carried out by the Mauritius Ministry of Health and Wellness, together with the WHO and the Green Climate Fund, some of the most important risk factors included the aging population, the universal rise in non-communicable diseases (NCDs), and extensive exposure to severe weather-related events, such as cyclones and floods (WHO, 2025; ReliefWeb, 2021). These epidemiological and demographic patterns cumulatively aggravate the climate-health danger by making the population more susceptible to heat stress, vector-borne infections, and other climate-responsive disorders. The V&A analysis underscored the need to urgently undertake proactive health system transformation and catalyse political will towards climate-resilient health infrastructure and delivery services.

One of the key policy responses among those observed in Mauritius is the construction and forthcoming release of the Early Warning Alert and Response System (EWARS), a predictive surveillance system that shall be used to make forecasts, up to 4–12 weeks ahead, about the outbreaks of climate-sensitive diseases like chikungunya and dengue. The EWARS is based on complex weather-disease correlation models and uses real-time epidemiological, entomological, and meteorological data to facilitate early public health responses (WHO, 2025). This is a significant step forward in the integration of climate projections into preparedness for epidemics, making Mauritius ahead of many regional counterparts in anticipatory health management. To support the EWARS, Mauritius' convergence with the six building blocks of the WHO, including strengthened governance, trained health workforce, infrastructure, and sustainable financing mechanisms, all designed with a specific climate risk focus (WHO, 2025). Mauritius has pioneered a multi-sectoral process to integrate climate and health, mindful that adaptation cannot come from the health sector alone. Even the ministries of Environment, Social Security, Tourism, and Finance are included as partners so that health inequity targets are part of the broader socioeconomic agenda (WHO, 2025). Community engagement and targeted intervention among the most vulnerable, namely the elderly and disadvantaged populations most vulnerable to heat waves and exposure to floods, are central to this plan. Capital expenditure on the climate resilience of health infrastructure encompasses building upgrades, which make the infrastructure flood-proof, and the incorporation of clean energy sources so that services are restored during severe weather (Tunley, 2025). This institutional and operational robustness, supported by international partnerships and funding, enables Mauritius to maintain universal health, even in the face of escalating climate threats.

In contrast, Madagascar exemplifies the innovative application of data-driven and technology-enabled adaptation in resource-constrained settings. Despite facing challenges such as severe poverty, limited infrastructure, and frequent environmental shocks, Madagascar's health system leverages the Climate-Smart Public Health (CSPH) framework to harness integrated data streams for precision risk management (Golden, 2025; IMF, 2023). Thousands of health clinic datasets have been merged with satellite environmental and climate records to enable real-time disease trend mapping and vector hotspot identification. The deployment of artificial intelligence (AI) tools and high-resolution satellite imagery facilitates the early detection of risks, such as drought-induced malnutrition and toxic algal blooms, which affect water quality (Golden, 2025). Madagascar's development of detailed vulnerability and risk maps is a cornerstone achievement that guides targeted food aid, vaccination campaigns, and health resource allocation with unprecedented spatial specificity (Golden, 2025). These maps incorporate indices of climatic variables, socioeconomic status, and health system capacity, allowing stakeholders to prioritise interventions in the most at-risk communities. Infrastructure investments synchronised with this data-driven approach include upgrading rural clinics to be climate-resilient, expanding cold chain capacity, and launching continuous climate-related disease training programmes for healthcare workers (Golden, 2025). This strategy has facilitated not only emergency responses but also strengthened long-term system adaptability and community resilience.

Despite their differing contexts, Mauritius and Madagascar share several convergent lessons on health system resilience. Both countries demonstrate that effective adaptation necessitates blending traditional public health infrastructure with innovative surveillance and data analysis. Mauritius' use of EWARS shows the value of predictive early warning, while Madagascar's advanced utilisation of AI and satellite data highlights the power of technology to overcome information gaps. Additionally, multi-sectoral governance is vital; coordinated policy implementation that bridges the health, environment, social protection, and economic sectors ensures a more comprehensive response to intertwined climatic and health challenges (WHO, 2025).

However, both countries have encountered persistent challenges. Mauritius must address rising challenges, such as antibiotic resistance and rising non-communicable disease rates amid environmental pressures, which require successive financial investments and adaptable health workforce actions (Tunley, 2025). Madagascar continues to struggle, including limited access to care in rural areas, fragile infrastructure, and financial unpredictability, which may undermine scaling up its data-informed responses (IMF, 2023). Moreover, equitable access to climate-resilient health services is a universal problem,

mostly affecting children, women, and socio-economically disadvantaged people who are also facing increasing excess exposure to climate (WHO, 2022).

The comparative review confirms that long-term resilience requires continuing political will, global cooperation, community empowerment, and technical innovation. Mauritius and Madagascar both enjoy the benefits of collaboration with the WHO, Green Climate Fund, and regional organisations that offer financial and technical assistance critical to building capacities as well as infrastructure investments. Integrating gender-responsive and equity-oriented lenses into climate-health policies bolsters the adaptive capability of health systems by including the recognition and responsiveness to the differential vulnerabilities among populations (Unwomen, 2023; WHO, 2022).

Mauritius demonstrated institutional fortitude and anticipatory early warning, combined with universal access and multi-sectoral policy convergence. Madagascar depicted the transformational role of data-driven adaptation under limitations, harnessing technology to optimise resource mobilisation and risk management. These cases underscore the imperative of flexible, locally specific, and equity-sensitive strategies as vital protectors of population health in the face of rapidly increasing sub-Saharan African sub-regional and small-island developing country regional climate hazards.

Discussion

Comparative Analysis

A comparative health system resilience analysis between Mauritius and Madagascar presents disparate strengths moderated by their respective socioeconomic realities and resource settings. Mauritius enjoys the advantage of institutionalised capability, further strengthened by strong country-based health architectures consistent with World Health Organisation (WHO) standards (WHO, 2025). This is underpinned by extensive international funding complemented by a coordinated leadership mechanism that allows Mauritius to integrate comprehensive climate health plans as part of the universal health coverage framework. Madagascar's resilience, on the other hand, comes about through innovative surveillance strategies, integration of digital data, and mobilisation of multilateral partners to offset restricted financial and infrastructure resources (Golden, 2025; IMF, 2024). This contrast indicates the restricted realities that encourage data-informed adaptation platforms, utilising the value of technology and partnerships to build responsiveness into the health system.

The institutional maturity of governance and policy mechanisms is strong in Mauritius. Climate resilience as a health priority is emphasised in the country's Health Sector Strategic Plan (2020-2024), bringing it into convergence throughout the ministries, aligning it with Mauritius Vision 2030, aiming towards an inclusive, high-income, and green economy (Health.govmu.org, 2023; WHO, 2025).

The Government's leadership is epitomised by the establishment of a Ministerial Committee on Health and Climate Change, which coordinates policy implementation, monitoring, and resource mobilisation. This integration extends horizontally to sectors such as the environment, tourism, and social affairs through multi-sectoral working groups and stakeholder engagement, embodying international recommendations for comprehensive climate-health strategies (WHO, 2022; Harvard T.H. Chan School of Public Health, 2025). In contrast, in Madagascar, structural adaptation within sectoral plans is constrained by budgetary limitations and competing development priorities (IMF, 2024). Its governance landscape is characterised by episodic international support programs, such as the MIONJO Project, which focuses on empowering local governments and communities to build resilience (World Bank, 2025). Although less institutionally consolidated, Madagascar's efforts reflect a pragmatic approach that emphasises community-led adaptation and data sharing across agencies.

Table 1: Comparative analysis of Mauritius and Madagascar Climate Response Systems.

Criteria	Mauritius	Madagascar
Governance and Policy	Strong national and WHO-aligned frameworks [WHO, 2025]	Sectoral plans; Vision for resilience, budget constraints [IMF, 2024]
Health Infrastructure	Universal coverage, EWARS, facility upgrades [WHO, 2025]	Climate-resilient design, capacity building [Golden, 2025]
Surveillance	EWARS, advanced V&A [WHO, 2025]	CSPH, integrated climate-health surveillance [Golden, 2025]
Community Engagement	Equity and vulnerability targeting [WHO, 2025]	Local knowledge for risk mapping [Golden, 2025]

Regarding health infrastructure, Mauritius has well-developed facility networks reinforced by innovations such as the Early Warning Alert and Response System (EWARS), predictive modelling for climate-sensitive diseases, and infrastructure upgrades designed to withstand climate shocks (WHO, 2025; Tunley, 2025). Universal health coverage ensures that climate adaptation benefits are equally distributed, thus minimising disparities in access to extreme weather events (Health.govmu.org, 2023). Madagascar's infrastructure strategy focuses on climate-resilient designs coupled with sustained capacity building in the health workforce's ability to manage climate-induced diseases (Golden, 2025). Despite the significant challenges of remoteness, poor facility conditions, and fragmented supply chains, Madagascar is advancing through

investments in rural clinic upgrades and community health worker training programs tailored to the impacts of climate change (WHO, 2021; Golden, 2025). These efforts align with regional imperatives to strengthen primary healthcare systems for climatic resilience in low-income settings (Pradhan et al., 2023).

The surveillance systems in the two countries also differ in terms of their sophistication and resource dependency. Mauritius utilises the EWARS complemented by V&A assessments that integrate climatic and epidemiological data for precise health risk anticipation and rapid response (WHO, 2025). This framework demonstrates international best practice approaches in small island developing states, where early warning capability is paramount because the environmental risk burden is high (WHO, 2022). Madagascar's Climate-Smart Public Health (CSPH) plan employs integrated climate-health surveillance with artificial intelligence and satellite imaging to monitor disease patterns, resource demands, and vulnerability hotspots at a very high spatial resolution (Golden, 2025). Such technological expertise provides significant intelligence to enable targeted responses, despite systemic constraints. This aligns with state-of-the-art surveillance approaches promoted by global health agencies as a necessary adaptation strategy based on resource-scarce environments (UNDP, 2023). Community involvement is a central component of both resilience situations and locally specific sociocultural processes.

Mauritius emphasises equity and vulnerability targeting within participatory governance structures, incorporating community feedback to inform adaptation priorities and health communication strategies (WHO, 2025). This approach ensures inclusivity, particularly for high-risk groups such as the elderly and residents of flood-prone urban localities. Madagascar relies heavily on indigenous knowledge and community participation in risk mapping and local adaptation actions, recognising the role of local leadership in fostering behavioural change and facilitating access to health services under environmental stress (Golden, 2025). Both settings exemplify the necessity of community-centred approaches supported by national frameworks for effective climate health governance, echoing findings from similar regions globally (Unwomen, 2023; WHO, 2022).

Despite these achievements, Mauritius and Madagascar face significant challenges, such as gaps in inter-sectoral coordination and sustained financing for climate-health integration (WHO, 2022). Although Mauritius has established inter-ministerial mechanisms, the operationalisation of seamless collaboration between the health, environment, agriculture, and social sectors remains complex, hindering holistic adaptation measures. Madagascar's fragmented governance architecture and reliance on donor funding create volatility in program continuity and scale-up potential. Both countries must also address their ongoing workforce development needs, ensuring that health professionals are equipped with the competencies to manage emerging climate-related health risks, including vector-borne diseases and mental health impacts (Tunley, 2025; Golden, 2025). Additionally, addressing equity and gender disparities remains essential; women and girls who are disproportionately vulnerable to climate shocks require targeted interventions embedded within broader social protection and health services (WHO, 2022; Unwomen, 2023).

The policy lessons from the two case studies reinforce the critical role of early warning systems and robust surveillance platforms for timely health threat detection and intervention (WHO, 2025; Golden, 2025). Multi-sectoral governance structures that incorporate equity-driven strategies are pivotal for comprehensive and sustainable adaptation, particularly in high-risk coastal and urban environments. Furthermore, international cooperation and financing form the backbone of long-term resilience development, but on-the-ground innovation, such as Madagascar's use of big data and AI, adds vital agility to responses tailored to local realities (Golden, 2025). The institutional and financial sustainability of such advances necessitates policy frameworks that incentivise cross-sector collaboration, facilitate technology adoption, and prioritise investments that target vulnerable demographics.

Recommendations

Recommendations for future policy

- Formalising and expanding existing inter-sectoral committees in Mauritius and Madagascar, with mandates to integrate climate, health, and social policy, while promoting decentralised decision-making to enhance local responsiveness.
- Governments should prioritise developing sustainable health financing models that incorporate climate risk considerations, including contingency funds earmarked for climate-related health emergencies (WHO, 2024; IMF, 2024). Simultaneously, embedding gender-responsive budgeting and programming can reduce health inequities exacerbated by climate stressors.
- Integrating climate risk into national health insurance and social protection schemes can safeguard access to health services during climate crises.

Recommendations for future practice

- Expanding technological innovations in disease surveillance and predictive analytics is critical. Investment in digital infrastructure, capacity building for AI-based health risk modelling, and community-based surveillance must be increased.
- Proactively incorporating climate resilience into health facility design and supply chain management can prevent service disruptions and maintain quality of care (Tunley, 2025; Pradhan et al., 2023).
- Training curricula for healthcare workers should integrate climate-health competencies and equip practitioners with skills in environmental risk assessment and management.
- Enhancing community engagement through participatory planning and leveraging Indigenous knowledge can enhance local adaptive capacity and social cohesion.

Recommendations for future research

- Future research should focus on longitudinal impact assessments of climate-health adaptation interventions, particularly the effectiveness of early warning systems such as EWARS and CSPH in real-world conditions.
- Comparative studies exploring the influence of governance models on adaptation outcomes provide insights for optimising policy frameworks.
- Research on gender-specific vulnerabilities and the intersectional impacts of climate on health outcomes remains a priority, bridging the gaps to inform targeted interventions (Unwomen, 2023).
- Evaluations of the cost-effectiveness and scalability of digital health innovations in low-resource settings are also needed to inform investment decisions and policy design (WHO, 2024).

The experiences of Mauritius and Madagascar highlight the importance of tailored, context-sensitive approaches to health system resilience amid escalating climate threats. Integrating strong governance, innovative technology, equity-focused community engagement, and sustainable financing distinctly frames their adaptation journeys. Regional and international reports emphasise that improving adaptation responsiveness also requires attention to longstanding adaptation issues regarding coordination, financing, and building labour markets. As the influence of climate becomes even stronger, the development of strong health systems grounded in evidence, innovation, and targeted research will be key to the health of sub-Saharan Africa and Small Island Developing States.

Conclusion

In summary, the cases of Madagascar and Mauritius reflect that linking strong health systems to resilience under environmental stress demands a multi-faceted strategy that combines powerful institutional governance with innovative adaptation technologies. Mauritius enjoys the support of a strong health infrastructure based on universal health care and sophisticated early warning systems, such as the Early Warning Alert and Response System (EWARS), which collectively improve the country's preparedness to meet climate-induced health threats (WHO, 2025). Madagascar reveals the potential of data- and community-centric strategies even among the very restricted resources, borrowing the Climate-Smart Public Health (CSPH) framework to strengthen disease surveillance as well as the allocation of resources based on the integration of artificial intelligence and satellite data (Golden, 2025). These complementary strategies reflect that resilience must be place-specific, blending traditional systems as well as innovation to meet complex climate-related health issues.

This review highlights the critical roles of multi-sectoral cooperation, gender-responsive policies, and equity-focused interventions in enhancing health system resilience. Both countries face persistent challenges, including gaps in inter-sectoral collaboration and financing, which hinder the scaling and sustainability of adaptation efforts (WHO, 2022; Tunley, 2025). Importantly, women and girls bear a disproportionate burden of climate-related health vulnerabilities, necessitating targeted social protection measures and inclusive community engagement to ensure equitable access to adaptive health services (Unwomen 2023). Aligning with international evidence, the integration of climate adaptation within health, environmental, and social policies strengthens systemic capacity and supports vulnerable populations in coping with environmental shocks (Harvard T. H. Chan School of Public Health (2025).

Future resilience-building in Mauritius, Madagascar, and similar contexts will depend on sustained political will, innovative financing mechanisms, and ongoing investment in technical capacity and infrastructure. Policy recommendations include formalising inter-sectoral governance frameworks, developing sustainable health financing models that incorporate climate risks, and scaling up technological innovations such as predictive analytics and AI-enhanced surveillance (WHO, 2024; IMF, 2024). Additionally, research priorities should focus on the longitudinal evaluation of adaptation interventions, gender-specific vulnerabilities, and the cost-effectiveness of digital health solutions in low-resource environments (Unwomen, 2023; WHO, 2024). Ultimately, fostering resilient health systems requires a dynamic, anticipatory, and inclusive approach that integrates governance, innovation, and equity to safeguard health in the face of escalating climate pressures.

The Mauritius-Madagascar contrast reveals the value of effective institutional systems and reactive innovative responses to building health systems capable of responding to complex environmental challenges. While Mauritius emphasises the important role of effective governance, universal health coverage, and innovative anticipatory warning systems, Madagascar emphasises the mobilisable role of data-based community-based solutions for future climate threats where resources are limited. Together, these points distil the reality that strong health systems are constructed not just on resources themselves, but also on anticipatory government, equity-based constructs, and multi-sectoral alliances. Notably, the Mauritian experience demonstrates that active equity-based climate and health policies are financially within the capabilities of many small island developing countries, which are otherwise presumed to be resource-poor.

The inclusion of gender-responsive proactive anticipatory warning systems and cross-border coordination reveals the framework's applicability to other SADC states. It best optimises the regional and domestic focus of the analysis, optimising the universalisability of the results for other actors in policymaking.

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