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Climate Impact Report

Vanuatu National Eye Centre (NEC)

THE FRED HOLLOWS FOUNDATION NZ | APRIL 2025

PROJECT DELIVERED FOR

Vanuatu National Eye Centre

Vila Central Hospital, Port Vila, Vanuatu

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Revision	Revision Details	Author	Approved by	Date Approved
V1.0	Draft 1	Matthew Peck, Pok Wei Heng, Ivan Yancic	Mark Siebentritt	28/02/2025
V2.0	Final 1	Matthew Peck, Pok Wei Heng, Ivan Yancic	Mark Siebentritt	08/04/2025

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1 Executive Summary

The Fred Hollows Foundation NZ (The Foundation) is a non-profit organisation dedicated to ending avoidable blindness in the Pacific. Founded by eye surgeon Fred Hollows, the Foundation operates across three strategic pillars: restoring and preserving sight for people in the Pacific, training the next generation of eye health workers, and supporting the development of locally managed eye health systems. The Foundation currently partners with eight eye clinics across seven countries: Papua New Guinea, Solomon Islands, Vanuatu, Fiji, Tonga, Samoa, and Kiribati.

The Foundation, in partnership with Pacific eye clinics and Ministries of Health, has contracted Edge Impact to support the completion of a Climate Impact Assessment (CIA) at three Foundation-supported clinics aligning with WHO guidelines to assess sites for Climate Resilience and Environmental Sustainability interventions. This report focuses on the assessment of the Vanuatu National Eye Centre (NEC) in Port Vila, Vanuatu, as part of the "Building Community-Level Climate Resilience in the Pacific" (BCCR) project, supported by the New Zealand Ministry of Foreign Affairs and Trade's (MFAT) Climate Finance for Community Resilience Programme. The aim is to identify climate risks and propose adaptation strategies to strengthen the resilience of healthcare facilities and the communities they serve.

By the end of the century and under a high emissions future, climate projections for Vanuatu indicate a 3.5°C increase in daily maximum temperatures, a significant rise in the frequency of heatwaves and extremely hot days, more intense and frequent heavy rainfall events, and a sea level rise of up to 73 cm, along with increased impacts from tropical cyclones (CSIRO and SPREP, 2021). These changes pose risks to the National Eye Centre (NEC) in Port Vila, and to the outreach services, which both play a key role in providing eye care to the community.

The NEC's resilience and sustainability initiatives enhance operational reliability, improve patient care, and increase cost efficiency in response to local climate challenges. This resilience was recently demonstrated during the Vanuatu earthquake, which, while not a climate-driven event, highlighted the Centre's ability to maintain operations under extreme conditions. Notably, the facility remained operational for four days solely on its solar and battery system, underscoring the effectiveness of its diversified energy supply.

By integrating a mix of renewable energy, natural ventilation, and rainwater harvesting, the NEC reduces its reliance on external resources, lowers costs, and minimises the risk of service disruptions. Specifically, the Net Present Value (NPV) of electricity cost savings from solar PV installations between 2020 and 2043, discounted at 5%, is estimated at $130,454 USD. This also translates to approximately 320 additional medical interventions per year for community members accessing NEC services.

The Centre's resilient design provides protection against climate risks such as pluvial flooding, storms, and cyclones, while sustainable waste management protocols enhance safety for staff and patients. Furthermore, the recent earthquake reinforced the Centre's existing resilience, demonstrating the robustness of its infrastructure and preparedness. These strategies collectively ensure that the NEC continues to provide consistent, climate-resilient eye care for the community.

The key findings of this assessment provide an understanding of the risks identified in this CIA and opportunities associated with climate change and are used to inform tailored adaptation strategies that prioritise the climate resilience of each asset. The following are the key findings from the CIA for the National Eye Centre (NEC) in Vanuatu:

- Heat Impacts: Rising temperatures will affect the health workforce, patients, and community members, more so than the NEC structure itself. The facility's design is currently sufficient, but measures are needed to mitigate future heat-related risks, particularly those posed to impact the health workforce.
- Flooding and Sea Level Rise (SLR): The NEC's location on an easterly facing slope minimises the risk of both localised flooding and SLR. It is unlikely in the near and far future that either of these climate hazards would impact the facility.
- Storm and High Wind Impacts: Storms and strong winds pose a risk to outreach activities, limiting accessibility and reducing the effectiveness of eye care services in remote areas.
- Cyclonic Activity: Cyclonic activity poses an extreme acute threat to operational function. Although the NEC was able to withstand the double cyclone of 2024, it is highly likely that the frequency and intensity of higher category cyclones increases in the future, threatening the operational functionality of the NEC during the wet season.
- Cumulative Climate Change Impacts: The interaction of multiple climate-related factors, such as adverse sea conditions, is one of the highest risks to the NEC's operational capacity. This impacts both service delivery and the safety of staff and patient when conducting outreach clinics.

Recommended adaptation actions were generated throughout the report. All are collated in Appendix E. Collated recommendations, with key findings including:

- Infrastructure Adaptation: To strengthen resilience and sustainability, the NEC should prioritise infrastructure improvements through regular maintenance schedules, enhanced air quality measures, and workforce resource optimisation. Formalising maintenance protocols with climate resilience considerations will reduce reliance on external contractors and ensure operational consistency. Upgrading HVAC systems to mitigate smoke infiltration from the VCH incinerator will protect staff and patient health. Additionally, a Water Consumption Assessment (WCA) will optimise water use, reduce inefficiencies, and support long-term environmental sustainability.
- Strengthening emergency response and disaster preparedness: Opportunities exist to enhance emergency response and disaster resilience across Foundation-supported clinics and centres in the Pacific, including the NEC. A thorough review of current emergency response and disaster management plans is recommended to assess their alignment with best practices and their effectiveness in ensuring operational continuity, workforce communication, and critical system functionality during adverse events. Where appropriate and handled with care, the recent Vanuatu earthquake can serve as a case study to evaluate the clarity, execution, and outcomes of these protocols.

  Additionally, the NEC's existing plans, while comprehensive in scope, lack the actionable detail necessary for effective crisis management. Developing specific procedures for critical areas or utilising best practice tools (e.g. the Sphere Handbook), such as contingency planning for potable water access during WASH disruptions, will enhance operational readiness and safeguard health and safety. These refinements aim to ensure that the NEC and its workforce are equipped to respond promptly and effectively to emergencies, strengthening resilience and setting a model for broader healthcare systems across the region.
- Capacity building across healthcare: Significant opportunities were identified to enhance operational capacity not only within the NEC but also across the broader hospital and healthcare system, ultimately improving community health outcomes. Collaborative efforts with the Ministry of Health (MoH) could advocate for the inclusion of climate change and public health topics in nursing programs offered by partner institutions. Additionally, the NEC's advanced and well-executed clinical governance protocols, particularly in relation to WASH, could serve as a benchmark or gold standard for the broader healthcare system. Overall, these initiatives present a clear pathway to strengthen the capacity of the health workforce across multiple health sectors in Vanuatu.

To ensure the NEC's resilience and operational continuity, The Foundation should implement a phased adaptation strategy that prioritises immediate risks while planning for long-term infrastructure and operational adjustments based on evolving climate projections. Collaboration with local stakeholders, including government bodies and community organisations, is essential to strengthen these efforts and safeguard the NEC's ability to deliver vital health services amid future climate challenges. Furthermore, capacity development across the broader health system at Vila Central Hospital (VCH) must be an integral part of this strategy, with direct consultation and alignment with key VCH stakeholders to ensure cohesive and sustainable implementation.

2 Project overview

2.1 Project context

The Fred Hollows Foundation NZ (The Foundation) is a non-profit organisation dedicated to reducing avoidable blindness and vision impairment across the Pacific. Through the strengthening of Pacific-led eye health systems and advocating for equitable access to high-quality, affordable eye care, The Foundation's mission supports some of the most climate-vulnerable communities.

With a strong commitment to environmental sustainability, The Foundation has worked with partners to integrate climate resilience into the design of facilities. The Vanuatu National Eye Centre (NEC) exemplifies this approach, incorporating a solar energy system and rainwater harvesting as part of its operational design. The Centre serves as a model for effective mitigation and adaptation measures in the face of climate change, both within the Vila Central Hospital landscape, and broadly across healthcare facilities throughout the islands of Vanuatu.

In 2019, the NEC underwent a significant upgrade, featuring an enhanced clinical workspace that included the integration of a solar energy system and the use of low-carbon building materials. The facility is designed to have greater resilience to cyclones and earthquakes, exemplifying a forward-thinking approach to climate-resilient infrastructure. These advancements underscore The Foundation's commitment to embedding sustainability and resilience into healthcare infrastructure and operations.

In February 2024, The Foundation secured funding through the New Zealand Ministry of Foreign Affairs and Trade's (MFAT) Climate Finance for Community Resilience Programme to further its climate adaptation work. This funding supports the "Building Community-Level Climate Resilience in the Pacific" (BCCR) Project, which seeks to enhance the resilience of health care facilities and surrounding communities to climate change impacts.

As part of this initiative, The Foundation has partnered with Edge Impact to perform Climate Impact Assessments (CIA) at three Foundation-supported eye clinics/centres in Papua New Guinea (PNG), Solomon Islands, and Vanuatu. These assessments aim to identify climate risks, evaluate on-site mitigation measures, and link these interventions to health and community resilience outcomes. The findings will inform tailored adaptation strategies and be shared with key health and climate stakeholders through a Knowledge Share session, ensuring widespread dissemination and engagement with the results.

2.2 Introduction

This technical report presents the findings of the Climate Impact Assessment for the NEC, located in Port Vila, the capital city of Vanuatu, on the island of Efate. Vanuatu faces significant climate-related challenges, including rising sea levels, increasingly frequent extreme weather events such as cyclones and tropical lows, greater variability in rainfall patterns, and extreme heat. These factors pose substantial risks to critical infrastructure like the NEC and its operations.

The report begins by outlining the methodology used to assess the site's climate risks and resilience measures. It then provides an overview of Vanuatu's broader climate context, followed by a detailed analysis of the key findings. Finally, the report presents a series of recommendations designed to enhance the resilience of the NEC and the community it serves.

2.2.1 Objectives

- Understand the exposure and vulnerability of the National Eye Centre (NEC) to the impacts of climate change.
- Assess climate risks at the NEC to develop a high-level understanding of how these risks may affect its operations.
- Evaluate the NEC and its operations in alignment with World Health Organization (WHO) guidance for climate-resilient and environmentally sustainable healthcare facilities, where applicable.
- Analyse the connections between community health outcomes and climate risk mitigation initiatives.
- Develop a suite of recommendations, including adaptation measures, to enhance the climate resilience of the NEC and its operations to improve community outcomes.
- Identify key learning points to be shared with stakeholders in future workshops, contributing to the BCCR Project's objectives.

- Ensure that the communication of findings is aligned with the broader objectives of The Foundation within the BCCR Project.

2.3 Site details and location

The Vanuatu National Eye Centre (NEC) is located within Vila Central Hospital (VCH) in Port Vila, Vanuatu (Figure 1), elevated approximately 40m above sea level (JICA 2012). The NEC consists of three buildings: two newly constructed buildings with a combined gross floor area of 366 square metres, commissioned in 2017 and completed in 2019, and an older blockwork building that houses the administration and consultation rooms, which forms part of the original hospital infrastructure. The two new buildings feature a concrete and timber pile foundation, timber wall and roof framing, aluminium window systems with louvres, plasterboard linings, long-run metal cladding, and long-run metal roofing. The design thoughtfully incorporates essential elements for its medical function while reflecting local architectural practices.

Port Vila, the capital of Vanuatu, is located on the southern coast of Efate Island and is the country's largest city. Vanuatu's climate is tropical, featuring a wet season from November to April and a dry season from May to October. The construction of the NEC reflects careful consideration of local environmental conditions, with climate-resilient features designed to address the region's climatic challenges. Its location within VCH highlights the NEC's critical role in delivering advanced eye care services to the local population and surrounding communities.

Figure 1: NEC location (red polygon) within VCH.

2.4 Methodology

Edge Impact employed an adapted risk-based methodology for this climate impact assessment, drawing on its extensive experience with traditional risk-based approaches. This method aligns with the Australian Standard 5334-2013: Climate Change Adaptation for Settlements and Infrastructure and utilises the *WHO guidance for climate resilient and environmentally*

sustainable health care facilities. The approach aims to assess climate resilience and environmental sustainability while also capturing social and community outcomes.

The methodology was reviewed following the completion of the Solomon Islands Climate Impact Assessment, which occurred first. Minor adjustments were made to Task 2 (subsection 2.4.2 below), specifically regarding the stakeholders engaged. These adjustments aimed to ensure that key information on the four WHO guidance areas was captured, enabling effective comparison of external challenges across these areas with the operations of The Foundation-managed facilities.

The risk and adaptation assessment included the three key tasks outlined below (summarised in Figure 2).

Figure 2 Summary of project approach (adapted from ISO31000:2018).

2.4.1 Task 1 - Define scope, context and criteria

Location-specific climate projections were gathered employing the RCP 8.5 high emissions scenario. This was combined with a review of documentation provided by The Foundation to inform a preliminary risk assessment aligning to The Foundation Risk Management Policy (refer to Appendix A). Preliminary risks were based on a review of key themes identified through an assessment of the *WHO guidance for climate resilient and environmentally sustainable health care facilities*.

2.4.2 Task 2 - Risk identification, assessment and evaluation

From December 1st to December 5th, 2024, Matthew Peck from Edge Impact conducted a series of stakeholder meetings to assess climate-related risks affecting healthcare facilities in Vanuatu. Notably, this visit took place 12 days before the earthquake that struck Port Vila and Vanuatu on December 17th. While the earthquake is classified as a geophysical event, additional insights were gathered in February 2025 to capture relevant information on climate resilience.

During the in-country visit, stakeholder meetings began with an introduction to the project and were structured around participants' understanding of climate and community health outcomes relevant to the NEC. Risk identification and assessment were tailored to each discussion, ensuring comprehensive coverage of key themes from Task 1. A climate lens was applied throughout to capture insights and potential changes under future climate scenarios. A list of all stakeholders engaged is provided in Appendix B (Table 5).

Following the site assessment, identified risks were evaluated across specified timeframes (2050 and 2090), aligned with available climate projections for Vanuatu. Additionally, climate hazards with the highest risk ratings were assessed against medical intervention data collected during the site assessment. This analysis aimed to evaluate how climate impacts affect the work of The Foundation across Vanuatu. The assessment, referred to as the 'MVP Model' in this report, involved modelling Centre and outreach performance data to identify instances where climate conditions likely reduced performance. Performance metrics included visits, consultations, doctor screenings, total referrals, and spectacles dispensed.

2.4.3 Task 3 – Development of adaptation actions

A combination of identified risks captured through the risk register and the WHO checklist, and modelled data, were used to identify high priority risk areas that require adaptation actions. Adaptation actions included both design and operational initiatives that aimed to reduce either the likelihood or consequence of risks.

The outcomes of the above tasks were reviewed and incorporated into an assessment tool. The key findings are summarised in this report.

3 Climate change summary: Vanuatu

3.1 Historic climate

To establish a comprehensive understanding of climate change impacts in Vanuatu, it is essential to examine projected climate data alongside shifting trends under a changing climate. This assessment focuses on primary climate elements, including temperature trends, rainfall patterns, and sea-level rise, as well as secondary effects such as relative humidity, flooding, wind patterns, and heatwaves. These elements are categorized to align with *WHO guidance for climate-resilient and environmentally sustainable healthcare facilities*, ensuring that the project objectives are met.

Extreme climate phenomena relevant to this study are detailed in Table 1. Historical climate information was sourced from regional climate databases, including the Pacific Climate Change Data Portal and the *NextGen' Projections for the Western Tropical Pacific: Current and Future Climate for Vanuatu Technical Report*. This data provides essential insights into past weather events and their potential implications for the NEC facility.

Table 1 Key extreme climate phenomena and related risks.

Hazard	Description and potential impacts
Extreme Heat	Periods of unusually high temperatures in Vanuatu, including hot days and heatwaves, exceeding normal seasonal averages. They pose risks to health, agriculture, and infrastructure, and their frequency and severity are intensified by climate change.
Precipitation changes	Shifts in rainfall patterns in Vanuatu, including changes in intensity, timing, and distribution of precipitation. These can lead to water scarcity, affect agriculture, and disrupt ecosystems, with urban impacts such as drainage system overload in Port Vila.
Floods	Instances of excessive water overflow in Vanuatu caused by heavy rainfall, river overflow, or coastal inundation. These include riverine, coastal, and flash floods, as well as secondary hazards like mudslides and erosion, particularly impactful in Port Vila.
Storms	Severe weather events in Vanuatu, including tropical cyclones, characterised by strong winds, heavy rainfall, lightning, storm surges, and potential flooding. These events can cause widespread damage to infrastructure, ecosystems, and communities, with Port Vila being highly vulnerable.
Sea-Level Rise	Increases in average ocean levels around Vanuatu due to global warming, threatening low-lying islands and coastal areas with flooding, erosion, and saltwater intrusion. Port Vila's coastal infrastructure and nearby agricultural land are particularly at risk.
Droughts	Periods of below-average rainfall in Vanuatu, leading to stressed vegetation, reduced agricultural productivity, and limited water availability. In Port Vila, droughts can strain water supply systems and increase heat stress, impacting health and food security.

Note: Earthquakes, volcanic activity, landslides and tsunamis are not covered by this assessment. Although the assessment may be applied to these hazard types, they were not considered for assessment as they did not fit within framework of assessing for climate risk.

3.2 Future climate

3.2.1 'NextGen' Climate Projections

Table 2 below summarises the key projected climate changes under the Representative Concentration Scenario (RCP) 8.5, which represents a high greenhouse gas emissions climate change future (IPCC 2021). The climate projections are based on 'NextGen' projections for the Western Tropical Pacific and looks specifically at current and future climate for the Vanuatu using the CMIP5 model (CSIRO & SPREP 2021). The projections show two scenarios including, warmer and drier or hotter and wetter. A worst-case approach was followed for the projections in Table 2.

Table 2. Summary of key climate changes projected for Vanuatu.

Climate Impact Description		Data					
Icon	Description	Historic	Baseline period (years)	Current (2030)	2050	2090	Trend Summary
	Increased daily average temperatures	24.3 °C	1986-2005	+0.6	+1.3	+2.0	Projected to **increase.**
	Increase in daily maximum temperature*	28.9°C	1986-2005	+0.7	+1.4	+2.9	Projected to **increase.**
	Increased maximum duration and temperature of heatwaves	NA	1986-2005	More heatwaves	More heatwaves	Many more heatwaves	Projected to **increase.**
	Increase in frequency of very hot days (above 35°C)	NA	NA	More very hot days	More very hot days	More very hot days	Projected to **increase.**
	More frequent and severe droughts (rainfall average months below 10th percentile)	NA	NA	NA	NA	NA	No projections were found to show drought in future.
	Reduced average annual rainfall	**1886 mm/yr**	1986-2005	-12 to +14	-19 to +16	-16 to +15	High variability, projection shows it could increase or decrease.
	Increased annual rainfall, days of heavier rainfall intensity and potential resultant flooding	NA	NA	Heavier rainfall events	Heavier rainfall events	Much heavier rainfall events	Projected to **increase.**
	Sea level rise	0 m	1986-2005	+0.14	+0.28	+0.74	Projected to **increase.**
	Increased intensity of storm events, tropical cyclones, and lightning	33 TCs per decade**	NA	Greater tropical cyclone impacts	Greater tropical cyclone impacts	Greater tropical cyclone impacts	Projected to **increase** in intensity but slightly **decrease** in frequency.
	Cumulative climate change impacts	NA. Not data available from NextGen					Projected to **increase.** As other hazards are projected to increase, cumulative ones are likely to increase

*Climate projections data was sourced from the *'NextGen' Projections for the Western Tropical Pacific: Current and Future Climate for Vanuatu Technical Report*. Historic climate data was sourced from the *National Oceanic and Atmospheric Administration* (*NOAA) Port Vila weather station data with the data range January 1st, 1986, to December 31st, 2005.*

**This data is based on Vanuatu National and Sub-national projections technical report (Kirono DGC et al, 2023).*

***There is an average of 33 tropical cyclones (TCs) per decade in Vanuatu (Kirono DGC et al, 2023).*

3.2.2 AR6 update

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6), published in 2021, builds on the findings of the Fifth Assessment Report (AR5) from 2014. For Vanuatu, AR6 highlights escalating climate risks that are particularly severe for this archipelagic nation. The report forecasts more pronounced warming trends, heightened variability in rainfall patterns, and accelerated sea-level rise compared to AR5. These changes significantly increase the risks of coastal and inland flooding, saltwater intrusion, and coastal erosion, threatening both livelihoods and critical infrastructure across the islands.

AR6 also underscores the intensification of extreme weather events, particularly tropical cyclones, which have long posed significant challenges to Vanuatu. The increasing intensity and frequency of these events exacerbate vulnerabilities for communities dependent on agriculture and fisheries, disrupt water security, and strain healthcare and disaster response systems. Rising temperatures and changing rainfall patterns also heighten the risks of vector-borne diseases, further impacting health systems.

To address these growing challenges, AR6 emphasises the need for comprehensive adaptation strategies tailored to Vanuatu's unique context. These include the integration of traditional knowledge into climate resilience planning, strengthening climate-resilient infrastructure, and enhancing disaster preparedness and early warning systems. The report also stresses the urgency of robust local and global mitigation efforts to limit further warming and reduce the compounding impacts of climate change on this highly vulnerable nation.

4 Key findings & recommendations

This section summarises the key findings of the climate impact assessment of the NEC and its operations.

4.1 Climate Resilience and Capacity-Building Initiatives

This subsection analyses the resilience and sustainability measures in place at the NEC with Centre and outreach performance metrics (visits, consultations, screenings, and surgeries).

The resilience and sustainability measures implemented at the NEC have significantly improved operational continuity, patient care, and cost efficiency. Key measures include:

- Solar PV / Energy Supply: The solar PV system significantly reduces reliance on both grid power and the VCH diesel generators, enhancing energy resilience and sustainability. By partitioning energy demand into essential and non-essential loads, the system efficiently allocates power across the solar PV supply, grid power, and diesel generators. This strategic distribution ensures a stable and reliable power supply, maintaining critical operations for essential loads while optimising the use of renewable energy for non-essential demands
- Financial Reduction Benefit – Energy Supply: The Net Present Value (NPV) of electricity cost savings from solar PV installations between 2020 and 2043, discounted at 5%, is estimated at $130,454 USD. Calculations for the NPV of electricity cost savings are provided in Appendix D.
- Climate Proofing related Patient Outcomes: The NEC operates approximately 8 hours a day, 5 days a week, delivering in-clinic services. Dr. Nico and the URA reported that power supply issues at the NEC site were minimal, with extended outages lasting only a few hours and occurring infrequently. Based on this, it was estimated that the NEC maintains 95% continual power supply, while the broader VCH site experiences around 90% continual supply. This 5% difference translates to approximately 2 hours of operational power interruptions per week. Over a year, this equates to 96 operational hours affected by power supply issues. These 96 hours correspond to 12.5 full 8-hour business days per calendar year.
    - From February 2019 (when the Solar PV system was completed) through to the end of 2024 — spanning 70 months — the NEC saw 37,514 patients in the clinic. This averages to 536 patients per month, 124 patients per week, or approximately 3.1 patients per operating hour. Without the Solar PV system, the estimated 100 hours of annual power interruptions would result in 310 fewer medical interventions for community members attending the NEC at VCH each year.[1]
- Strategic Outreach: Since its opening in 2019, the NEC has conducted 11 outreach operations, reaching 2,284 community members by the end of 2024. Collaborating with external partner agencies has significantly enhanced the outreach efforts, with specialist ophthalmology teams providing care to over a quarter of the patients (596 out of 2,284). This partnership has expanded the NEC's capacity to deliver specialised services, ultimately improving healthcare outcomes within the community.
- Natural Ventilation and Adjustable Flaps: Passive ventilation, achieved through louvred walls, adjustable flaps, and cross-ventilating roof design, minimises air conditioning needs. This approach optimises energy use, lowers maintenance costs, and maintains suitable conditions for patients and staff during high temperatures without relying on mechanical cooling.
- Insulated Roofing and Exterior Shading: Light-coloured insulated roofing and exterior shading reduce internal heat gain, decreasing cooling demands and electricity costs. This design is particularly beneficial given the high and variable electricity costs in the region.
- The NEC's design incorporates robust protective measures against significant climate risks, including severe storms, cyclones, and earthquakes. The facility is strategically built into the east-facing slope, with the two newer buildings elevated above the levelled ground to a minimum height of 350mm at the front (west) and 1850mm at the rear (east). The older building, originally part of the VCH, is positioned level with the modified ground, which has been cut into the slope. Notably, critical infrastructure essential to the facility's operation - such as the water treatment and energy supply systems - is located at the rear of the site, elevated well above ground level (1850mm). These informed

[1] Statistical assumptions were made, including that a 40-hour weekly sample may not fully represent historical power outage timing due to unavailable data from VCH, UNELCO, or URA. Additionally, the NEC is assumed non-operational for 4 weeks annually: 2 during holidays (Dec/Jan) and 2 for outreach activities.

infrastructure design choices underscore the resilience of the NEC, effectively mitigating risks associated with the identified climate hazards.

- Rainwater Collection: The NEC employs a 10,000L plastic tank for rainwater harvesting, providing a sustainable and cost-efficient solution that reduces reliance on municipal water supplies while enhancing water security. The system includes a filtration process designed to soften the water, improving filtration efficiency and lowering maintenance and repair costs. A dedicated, isolated water filtration system enables precise monitoring and control of the Centre's water supply, significantly reducing the risk of contamination commonly associated with broader distribution networks, such as those of the VCH. This infrastructure ensures a safer, more reliable, and operationally efficient water supply for the Centre
- Waste Management: The NEC adheres to stringent waste management protocols to protect staff and patients, minimising exposure to both medical and general waste. Comprehensive policies guide staff in securely storing waste in designated on-site areas. Waste is managed through two primary pathways: incineration at the VCH incinerator, located at the rear of the site, or removal by external contractors as part of the broader VCH waste system. Incineration occurs daily at approximately 1600 hours, with incinerated waste expelled via drainage pipes into the Erakor Lagoon. Non-incinerated waste is transported off-site by VCH hospital contractors to the Bouffa Landfill site.
- Wastewater Treatment: The NEC systems are linked into the wastewater treatment of (VCH). As such, wastewater treatment practices do not differ from the broader VCH. This process involves the collection and discharge of effluent into the existing sewerage system, which has historically faced challenges in adequately treating wastewater. Due to outdated infrastructure, untreated or inadequately treated wastewater has been released into the Erakor Lagoon and Port Vila Harbour, contributing to environmental pollution and public health risks. However, efforts are currently underway to address these issues. A rehabilitation plan, supported by the National Wastewater Taskforce and international stakeholders, is focused on upgrading the hospital's treatment system to meet national wastewater standards. This includes the design and installation of more effective treatment facilities to ensure the proper treatment of wastewater before it is discharged, thereby reducing its impact on the local environment and improving the health and resilience of the surrounding communities. The ongoing improvements are part of a broader initiative to enhance wastewater management practices across the region, aiming for sustainable and environmentally responsible outcomes.

Using the VCH as a baseline, the NEC's sustainability measures offer a more stable and cost-effective alternative. In contrast to the NEC, VCH relies on private energy and water supply through UNELCO, administered by the Utilities Regulatory Authority (URA). While diesel generators serve as an effective backup power source, there remains a significant risk of energy and water supply disruptions during extreme climate events. Waste management at VCH involves high diesel consumption for incineration and external waste removal, while the sewage system discharges directly into the Erakor Lagoon, contributing to health and environmental risks.

Overall, the resilience strategies implemented at the NEC promote long-term cost savings, operational stability, and environmental objectives, effectively addressing the challenges posed by local climate and energy conditions. Although there are challenges associated with the NEC's reliance on VCH services for waste and wastewater treatment and disposal, the broader objectives of improving climate resilience and environmental sustainability, while reducing operational costs and enhancing operational stability, are significantly more advanced when compared to VCH.

4.2 Climate Change Risk Assessment

Priority areas have been developed that focus on key risks (including both high risks), their current controls and proposed intervention actions in relation to specific climate change impacts. Proposed adaptation actions aimed to reduce the residual risk rating and were developed in consultation and should be reviewed for feasibility by both The Foundation team as well as the on-ground The Foundation team and NEC staff where appropriate.

The risk assessment process identified a total of 31 risks for the site. Risks were formulated from the WHO checklist, utilising a broader approach to identify the impact area. Risks were identified across a range of asset and operational components relating to different climate variables. Identified risks returning ratings of Very High (25) for future time horizons are included in this Climate Impact Report and are summarised in the

Table 3. A risk summary for each climate impact area is outlined in the subsections below.

4.2.1 The impacts of heat

Extreme heat was found to have a greater impact on the health workforce, patients, and community members than on the NEC itself and its physical structure, a trend observed across all sites. While there is evidence of increasing average temperatures, high temperatures are already being experienced at the NEC and throughout the jurisdiction within Vanuatu. The facility is designed to withstand rising average temperatures; however, ongoing improvements to maintenance practices are crucial for ensuring operational functionality. It is recommended that the physical infrastructure continues to be maintained to a high standard, enabling it to perform effectively as temperatures increase.

Overall, none of the assessed risks were rated as “25 Very High”, due to the resilience of the NEC and its operations to extreme heat, as evaluated across the four key intervention sectors.

4.2.2 The impacts of flooding

Flooding at the NEC was assessed as either unlikely or a moderate threat due to the facility's location on an easterly-facing slope. While the site's slope and elevation help mitigate the risk of fluvial flooding, there is still a potential for ponding caused by the cut-and-fill method used in the facility's foundation construction. The primary area of concern lies at the rear of the site (east), where the ground level aligns with the modified cut surface between the NEC and neighbouring building (Appendix C - Figure 5). However, the likelihood of flooding here remains moderate, thanks to several mitigating factors, including effective drainage infrastructure, slope, guttering, and infiltration capacity. Critical infrastructure at the rear of the site (east) is elevated 1850mm above the surrounding ground level, where no fill has been added, preserving the original slope gradient and further reducing the risk of flooding.

4.2.3 The impacts of sea level rise

Sea level rise poses minimal threats to the NEC and its operations. All five assessed areas have been categorised as unlikely or lower in terms of risk likelihood (Appendix A. Risk Management Framework). Future projections indicate that, under the Representative Concentration Pathway 8.5 (RCP8.5) scenario, sea levels in Vanuatu are expected to rise by approximately 73 cm by 2090. Given these projections, it is highly unlikely that the NEC will be impacted by sea level rise under future climate scenarios due to its elevated position approximately 40m above current mean sea level (MSL) (JICA 2012).

4.2.4 The impacts of storms

Storms and storm-related weather events, including cyclones, were identified as the most significant climate-related threat to the NEC. Of the six assessed risks associated with storm-related weather, two were rated as "25 Very High" under future projections, with the remaining four receiving ratings of at least "23 High" for 2090 projections. These findings highlight the severe threat that storms and cyclonic weather pose to the NEC's ongoing operations. Although the operational resilience of the NEC is quite high, concerns remain about its capacity to withstand more frequent and intense cyclonic events. The most affected areas were identified as the health workforce, infrastructure, and energy systems. Significant risks include the physical threat to staff wellbeing, restricted accessibility to the NEC, and the potential inability to conduct outreach clinics. Additionally, the risk of severe damage to the NEC itself was deemed very high due to projections of increased storm and cyclone intensity and frequency under future climatic conditions. This risk is exacerbated by inconsistent maintenance schedules for some of the NEC’s infrastructure (e.g. water filtration, guttering inspections). Key recommendations include enhancing planning and procedures, ensuring all staff are well-trained in operational protocols, and maintaining readiness to ensure continuity during such events.

4.2.5 Cumulative climate change impacts

Cumulative climate change impacts refer to hazards that arise from the interaction of two or more climate-related factors. During the assessment, 10 such impacts were identified, including risks associated with climate-related health issues, governance, government responses to climate change, health workforce climate awareness, overcast conditions, and general climate-driven asset deterioration. Risk ratings varied significantly, with adverse sea conditions and increased climate-driven health impacts on the workforce both receiving "25 Very High" ratings under The Foundation’s Risk Management Framework (Appendix A). These high-risk factors directly threaten the NEC’s operational capacity. Proposed interventions are specific and diverse, requiring tailored strategies to strengthen the NEC’s resilience and ensure the continuity of its operations in the face of these cumulative climate challenges.

Table 3: Summary of sources of Very High risk to the NEC and its operations. RR – risk rating.

Climate Change Impact	Risk Description	The Foundation Risk	WHO Intervention Sector	The Foundation Impacts	RR Current	RR 2050	RR 2090	Baseline Controls	Proposed Intervention
Cumulative Climate Change Impact(s)	Changes to regular climate conditions impacting the ability of the NEC to operate	Reputational	**Energy**	Changes to the climate may result in an increase in the number of overcast days, leading to a reduction in exposure time for power generation.	21 High	25 Very High	25 Very High	During intense weather events, the Centre remains operational. However, the NEC may not remain open if conditions to access the site are not safe. Senior staff at the NEC are responsible for checking on staff during such events/conditions. There are also system and emergency plans which are in place, with emergency and hazard management plans curated by the VCH. Due to its ability to stay online, and design elements (cyclone proofing), the NEC is utilised by the VCH as the meeting point for decision-makers at the hospital when emergency response plan(s) are triggered.	Expand operational knowledge of the energy supply system beyond Dr Nico, Danstan and Monique to ensure a broader understanding among key personnel. This will strengthen the NEC's capacity to manage and maintain energy systems effectively during routine operations and emergencies. Conduct a comprehensive audit of key systems, including energy and water supply, to assess their performance during the recent earthquake. Evaluate the effectiveness of emergency response planning and identify areas for improvement to enhance operational continuity. This assessment should also inform resilience planning for the broader VCH, ensuring that critical systems and protocols are better equipped to withstand future disruptions.
Storm	Building's exterior, including roofs, walls, and windows damage, potentially leading to structural failure due to strong winds and severe storms / cyclones	Health and Safety	**Infrastructure, technology and products interventions**	Severe damage could make the building unsafe, requiring repairs or closure.	24 High	25 Very High	25 Very High	The NEC is utilised by the VCH as a central point for communication and coordination their emergency response plan. The robust design of the facility, with isolated energy and water supply provide the most resilient facility across the site to execute disaster management and emergency response protocol. The building is rated as cyclone proof. This is considered in the building design and construction (e.g. Colorsteel MAXX Styleline Roof Lining with Cyclone FixingSs & Flashings).	Conduct a pre-wet/cyclone season audit of the facility. Ensure every structural element is assessed and maintained up to documented standards. Review emergency preparedness plans to ensure they include updated procedures for responding to severe weather events. This should involve assigning roles for key personnel, ensuring evacuation routes and shelters are accessible, and establishing a communication plan with backup power for critical systems. Ensure that essential materials like sandbags, water, and first aid kits are easily accessible. Also, confirm that vulnerable structural elements, such as roofs, walls, and windows, are reinforced to withstand severe weather.

Climate Change Impact	Risk Description	The Foundation Risk	WHO Intervention Sector	The Foundation Impacts	RR Current	RR 2050	RR 2090	Baseline Controls	Proposed Intervention
Storm	Electrical components damage and power outages due to strong winds and severe storms	Reputational	**Energy**	Power outages caused by storms / cyclones could halt surgeries and emergency care services.	18 Significant	21 High	25 Very High	Power supply is provided by a mix of grid power and solar PV storage. Energy is partitioned between essential services and non-essential services. Essential services include the operating theatre, and key medical equipment and are powered by the solar and battery system. Non-essential services include HVAC systems for consultation rooms and general power in these areas.	Introduce training sessions alongside health and safety briefings to ensure more NEC staff are aware of key system functionality. Prepare contingency plans for these systems - i.e. outline roles and responsibilities. Make sure these are recorded in process systems and are not purely a verbal designation of role.
Cumulative Climate Change Impacts	Increased frequency and intensity of adverse sea conditions	Clinical	**Infrastructure, technology and products interventions**	Inability to conduct outreach clinics due to accessibility issues for both The Foundation / MoH staff to attend and for community members to attend outreach clinics. Reduction in attendance numbers of scheduled outreach appointments.	24 High	25 Very High	25 Very High	Outreach is condensed during late Autumn, Winter, and early Spring (April to October) to avoid cyclone season. The Foundation staff coordinate with the health service providers across the other islands to ensure outreach clinics are as effective and efficient as possible.	Investigate coordination opportunities with other third-party health providers / NGOs. Continue to coordinate with Helper One, investigate opportunities for support during outreach clinics. Determine, if appropriate, to establish a threshold assessment of weather / sea conditions, to ensure health workforce safety. Assess possibility of utilising online health services (telehealth) for screening prior to outreach.
Cumulative Climate Change Impacts	Increased health impacts and stress on staff due to changing climate conditions	Health & Safety	**Health workforce**	The health workforce at the NEC may be directly or indirectly impacted by acute climate hazards (cyclones), that impact their ability to conduct their work.	24 High	25 Very High	25 Very High	Dr. Nico, Danstan and Monique serve as the senior leadership team at the NEC, overseeing staff rostering and ensuring accessibility to services. They are responsible for developing SOPs, which are based on guidance from The Foundation and align with both general and clinical governance practices. Their approach ensures consistency and compliance with the MoH SOPs.	Investigate opportunity with Dr. Nico for the addition of nurse at the Centre to enhance the resilience of the workforce. Coordinate with other Foundation partnered clinics, particularly the PNG team, to ensure the cluster model of communication is transferred to the NEC. This allows for designated and assigned team members to coordinate response mechanisms during disaster events and for general wellbeing checks. Audit current process and determine success level and shortcomings of this process during the recent earthquake.

4.3 WHO Checklist

This section summarises the results of the modified WHO checklist assessment (Table 4), which evaluates the integration and completion of interventions across key sectors. Each intervention was classified as low, medium, or high, based on its level of implementation:

- **Low** indicates limited progress or insufficient data.
- **Medium** reflects partial implementation or ongoing efforts.
- **High** denotes full integration and successful completion.

Approximately 35% of the assessed interventions were rated as high, signifying strong performance in these areas. Conversely, around 22% of interventions were classified as low, primarily due to factors such as gaps in the health workforce's understanding of plans, protocols, and systems, as well as reliance on the broader VCH for certain systems and planning processes. These challenges were particularly evident when evaluated through a climate resilience and environmentally sustainable lens for healthcare facilities.

The findings are outlined below, categorised across the four key intervention sectors defined by the WHO. Additionally, insights post the Vanuatu earthquake are included at the end of this section.

Table 4: Summary of WHO checklist results, low indicating limited progress or lack of data, medium indicating partial implementation or ongoing efforts, and high indicating full integration and successful completion of interventions.

Intervention Sector	Description	Low, unavailable, unable	Medium, in progress, incomplete	High, completed, achieved	TOTALS
Health workforce interventions	Training, capacity building, and management of health staff to ensure they are prepared for climate-related impacts and can maintain healthcare services.	6	12	9	27
Water, sanitation and health care waste interventions	Management of water resources, sanitation, and healthcare waste systems to maintain hygiene and operational continuity during climate events.	8	14	6	28
Energy	Ensuring a reliable and sustainable energy supply to support healthcare operations, including backup power and energy efficiency measures.	3	4	8	15
Infrastructure, technology and products interventions	Physical infrastructure, technology systems, and healthcare products necessary for resilient healthcare service delivery, including building integrity and technological tools.	11	24	22	57
TOTALS		28	54	45	127

4.3.1 Health workforce interventions

The assessment against the WHO checklist highlighted several areas for improvement in the management of the health workforce, with 9 out of 27 checklist items marked as high, completed, or achieved (Table 4). While the workforce is well-trained in understanding the potential impacts of chronic and acute climate change on medical operations, the ability to effectively execute these plans is currently limited to a small group of individuals. Developing more robust contingency planning in this area is crucial to ensure a wider understanding and capability to implement these plans across the team.

Furthermore, PD for the workforce is largely managed by the MoH, which restricts the breadth of knowledge beyond their core competencies. This presents an opportunity to incorporate climate change and public health into the medical training programs offered by higher education institutions and community education partners. Such integration would strengthen

climate resilience within the NEC and extend to improving the broader community's capacity to address health-related climate impacts.

Recommendations

- Coordinate MoH staff PD: Ensure that PD opportunities are broadened to cover additional key areas, such as the relationship between climate change and public health, as well as community engagement. This will help expand the workforce's capacity to respond to climate-related health challenges and strengthen resilience across sectors.
- Organise information sessions on key operational systems: Facilitate regular sessions to enhance understanding of critical operational systems and their functions. This will ensure that these systems are well-understood by all staff, embedding the knowledge across the workforce and improving overall operational readiness.
- Assess the effectiveness of emergency response and disaster management plans: Conduct a comprehensive review of the execution and performance of these plans. This should include a detailed comparison of actual outcomes against the objectives set in the plan, identifying areas of success and opportunities for improvement.

4.3.2 Water, sanitation and health care waste interventions

The NEC has established various management systems for water, sanitation, and healthcare waste. As a result, only 8 of 28 assessment items in this area were classified as low, unavailable, or unable to be assessed (see Table 4). While the Centre demonstrates advanced practices in managing waste internally, improvements are needed in waste management beyond the NEC. Specifically, issues were observed with waste storage at the VCH, where the facility was overwhelmed by capacity constraints and rodent infestations (Appendix C - Figure 6 & Figure 7). Waste was poorly organised, with improper segregation. Furthermore, hygiene practices outside of the NEC have been identified as inadequate across the broader VCH health workforce, as noted by Dr. Sereana Natuman, Director of Hospitals & Curative Services for Vanuatu. Overall, while the NEC's internal practices are strong, the broader management of WASH outside the Centre is lacking, which has resulted in a modest assessment outcome when evaluated against the WHO framework.

Recommendations

- Evaluate the need for UV filter replacement: Investigate whether replacing the UV filter in the water quality treatment system is necessary.
    - Consult with Dr. Nico to assess if a water distiller could enhance water quality for operations and services.
- Assess water pipe infrastructure: Determine if the water supply pipes entering the facility are equipped with non-return valves to prevent contamination.
- Invest in a water quality testing kit: Acquire a testing kit to monitor the performance of the filtration system, ensuring its effectiveness, especially during hazardous events or emergencies.
    - This is particularly crucial if non-return valves are not in place.
- Collaborate with VCH for wastewater management: Work with the VCH to establish a proactive approach to managing and disposing of wastewater and sewage, shifting from the current reactive response when the system reaches capacity.

4.3.3 Energy

The energy system at the NEC recorded very high scores when assessed against the WHO checklist for climate resilience and environmentally sustainability (Table 4). The system is well-designed to ensure a reliable energy supply for both essential and non-essential services. While the system relies on external inputs, including grid power supplied by UNELCO and backup power from the VCH, the energy supply has proven to be steady, consistent, and minimally disrupted. Notably, the direct connection of the gridded power supply to the VCH further enhances the resilience of its energy infrastructure, ensuring continued service even during challenging conditions.

Recommendations

- Expand staff training on energy system management: Provide additional training for staff on the management, monitoring, and maintenance of the energy system to ensure contingency plans are in place in the event of staff unavailability. This will ensure continued system reliability even during staffing gaps.
- Consult with Henry Cassin for advanced training opportunities: Explore the possibility of offering high-level training for the health workforce to enhance their understanding of the energy supply system. Historic issues have arisen from a lack of in-depth knowledge of how the system functions, and addressing this gap will improve system management.

- Assess provincial energy systems and their limitations: Investigate the energy systems at the provincial level to understand their capacity to withstand chronic and acute climate hazards. This assessment will provide insights into how energy system limitations could impact operations during outreach clinics and inform potential improvements.

4.3.4 Infrastructure, technology and products interventions

Over 80% of the assessed interventions related to infrastructure, technology, and products were either in progress or completed, demonstrating that the healthcare facility is both well-designed and effectively operated. The seamless integration of critical services and strong coordination with the VCH reflect the facility's robust operational model. The NEC employs advanced infrastructure principles, ensuring that it is both climate-resilient and environmentally sustainable. However, there is room for improvement in the health workforce's understanding of key technological systems. There is also a reliance on the VCH to provide backup power as well as guidance during emergency situations. Although the integration between the VCH and NEC is clearly present, external reliance increases the risk rating associated with such systems and plans. Enhancing technical capabilities in this area presents a valuable opportunity to further strengthen the facility's operations and improve the overall assessment score for this intervention area

Recommendations

- Regularly inspect the alleyway at the rear of the facility (Appendix C - Figure 5): Conduct routine inspections of the alleyway along the east boundary to identify and address any instances of ponding water. Ensure that standing water is promptly removed or treated to prevent the spread of water-borne diseases.
- Ensure key personnel have a comprehensive understanding of resource provision: Make sure that key team members (Dr. Nico, Danstan and Monique) understand how critical resources, including backup power, are provided to the Centre. This knowledge is essential for effective response and continuity during emergencies.
- Evaluate infrastructure at the provincial level: Investigate the infrastructure at the provincial level to understand its limitations when facing chronic and acute climate hazards. Assess how these limitations might impact the operational capacity during outreach clinics and plan accordingly.
- Maintain accurate maintenance records: Ensure the accurate and consistent upkeep of maintenance records for key infrastructure elements to support long-term reliability and readiness.
- Assess need for greater access to operational infrastructure for contingency planning: Investigate whether increased access to, and understanding of, infrastructure and key operational elements is necessary to enhance contingency planning. This will strengthen the Centre's preparedness for emergencies.
- Invest in staff training to reduce reliance on external contractors: Provide training to NEC staff to build internal capacity for equipment assessment and upkeep. This will reduce the dependency on external contractors and ensure more efficient, timely maintenance.
- Utilise available space for improved storage: Explore the possibility of acquiring part of the physiotherapy clinic to use as a dedicated storage compound for equipment and materials. This would improve organisation and security of essential supplies (e.g. Appendix C - Figure 8, Figure 9 & Figure 10).

4.3.5 Insights from the Port Vila Earthquake

On 17 December 2024, at 12:47 PM local time, a 7.3 magnitude earthquake struck approximately 30 km west of Port Vila, Efate, causing widespread damage and disruption. Occurring just 12 days after the conclusion of our on-site assessment, the earthquake severely impacted infrastructure, essential services, and healthcare facilities, affecting both the health workforce and the communities they serve. While earthquakes are classified as geophysical disasters and fall outside the primary scope of this technical report, they activate emergency response mechanisms similar to those used for climate-related disasters. Given this overlap, discussions were held with the team at the NEC to understand how the disaster affected the clinic, its operational capacity, the health workforce, and the people relying on its services.

This subsection highlights key lessons from the event, organised by intervention sector as discussed with Dr. Andronico Ly and Joseph on 13th February 2025.

4.3.5.1 Health workforce

Both Dr. Nico and Joseph indicated that Monique was the only staff member on-site at the time of the earthquake. They reiterated that Monique had expressed confidence in the disaster management and emergency response plans enacted by VCH, the Ministry of Health (MoH), and the broader Government. According to Monique, the response was well-coordinated and effectively implemented with clear role allocation, ensuring continuity of operations at VCH.

Her reports highlighted clear direction and execution of the emergency plan, with well-coordinated staffing, resource allocation, patient triage, and communication pathways. Key elements of the response included rapid staff mobilisation, effective coordination between hospital departments, and prioritisation of critical healthcare services. Additionally, she noted that emergency protocols were clearly communicated, allowing staff to respond swiftly despite ongoing aftershocks and infrastructure disruptions.

Below are key observations from the team regarding staff roles and response efforts during and after the earthquake:

- The MoH has ensured staff counselling are available to all VCH staff on site, they are also conducting community outreach to provide mental health services to community members in response to the disaster.
- The NEC was used as a counselling service for staff and community members in the aftermath of the earthquake.
- Staff were immediately redirected to the emergency ward to assist with patient care.
- VCH held daily coordination meetings with hospital leadership to manage the response, although these meetings did not take place at the NEC.
- Minor procedural changes have been implemented to reduce patient exposure to potential aftershocks.
    - Due to ongoing aftershocks and the potential risks associated with the internal waiting room, the team at the NEC has decided that patients are to remain outside rather than inside the NEC when waiting for an appointment.
    - Opportunities to actively engage patients in "what to do" if an aftershock occurs during their appointment.

4.3.5.2 Water, sanitation and health care waste interventions

Water supply, sanitation, and waste management were effectively maintained by VCH throughout the disaster response, ensuring continuity of essential services. Reports from VCH indicated minimal cases of waterborne or airborne diseases, suggesting effective management of water security, sanitation, infection control, and waste disposal.

Regarding the NEC, the following issues were identified:

- Monthly water filter replacements continued as scheduled, with the most recent assessment and replacement completed the week prior to the call.
- Two water tanks remain intact, though a full structural assessment is still pending.
- A micro-leak was identified in the water pump; while it does not affect water supply, the pump must be manually turned off after each use (located in server room).
    - The water pump requires replacement.
- Increased sewage discharge into the lagoon has been observed, though the underlying cause remains unknown.

4.3.5.3 Energy

The solar and battery system sustained power at the NEC for four days following the earthquake, ensuring continued operations until UNELCO, the utilities provider for Efate, restored mains power through the Utilities Regulatory Authority (URA). There were no direct disruptions to NEC's energy supply; however, telecommunication issues affected remote monitoring of the energy system.

Key insights from the team include:

- The NEC's solar power and battery system provided uninterrupted power for four days post-earthquake until hospital mains power was restored by UNELCO.
- Water supply can be gravity fed from the large water supply tank located at the top (highest point) of the VCH. As a result, there were no issues in water provision across VCH and the NEC.
- Telecommunication outages lasted for two weeks, with no phone connectivity; communication was only possible through the hospital's temporary Starlink system.
- The Starlink connection functioned reliably, enabling near-instant communication and significantly enhancing the response effort.
- Further investigation is needed to determine whether the hospital/NEC can integrate Starlink into its broader communication network – discussion should be held with the Ministry of Health's (MoH) IT department for feasibility.

4.3.5.4 Infrastructure, technology and products interventions

While minor issues were identified within NEC, no major structural damage was reported. However, ongoing assessments of infrastructure at the NEC, VCH, and across Port Vila remain necessary as response and recovery efforts continue. According to early government assessments, approximately 40% of buildings in Port Vila may require rebuilding with preliminary estimates suggesting the full recovery process could take up to 12 years. This highlights the scale of devastation experienced by the community.

Key findings regarding the NEC's infrastructure, technology and products, include:

- The NEC building remained structurally sound, with no visible cracks, though the roof has yet to be assessed.
- The solar hot water system is leaking due to a pipe issue, leaving the facility without hot water at the time of the discussion.
- Autoclaves were damaged and require repair or replacement; an older unit is currently in use, with parts salvaged from the damaged autoclave.
- The air conditioning unit in the server room was damaged and requires replacement (estimated cost: VUV 92,000).
- Two cabinets fell during the earthquake; a spare cabinet was available to replace one of the damaged units.
- The main hospital building was assessed and deemed structurally sound.

4.4 Modelling of Climate Change Impacts on NEC and Outreach Clinics

In the model below, the performance metrics were referred to as "encounters". The analysis focused on correlating clinic and outreach performance metrics (total visits, consultations, screenings, surgeries) with climate data to understand the impact of climate events on clinic and outreach performance. Due to the data being limited to annual encounters, the assessment relies on historical seasonal trends, climate data, and event data (news articles and weather station insights). The findings indicate that extreme climate events likely contributed to reduced patient attendance in a number of instances for the clinic (Figure 3). Although outreach numbers for Vanuatu are low, the assessment provides insights into potential challenges for outreach programs. This helps anticipate and address future issues. For the clinic, the control measures have contributed to improved performance metrics for the NEC, with encounters increasing from 1391 encounters in 2018 to 8940 in 2023. The key findings are:

- Heavy rainfall and flooding during the wet season (November to April) likely impacted patient attendance and disrupted clinic operations. Flooding and landslides may have caused road blockages and transportation disruptions, leading to lower patient turnout and cancellations of scheduled surgeries. Rough seas and strong winds may have affected inter-island travel, limiting access for patients from remote areas.
- Cyclones and storm surges occurring during the wet season may present future risks to outreach programs. In particular, outreach activities in coastal and remote areas could be impacted by cyclonic winds, heavy rainfall, and sea level rise, potentially limiting access to healthcare services.
- Rough seas and strong winds during the trade wind season (May to October) may affect inter-island travel, limiting access to outreach clinics in remote areas. Outreach activities in outer islands could experience logistical challenges, such as delayed transportation, cancellations, and reduced patient numbers due to unsafe sea conditions.
- Extreme heat and humidity during the hotter months may exacerbate operational challenges, such as equipment overheating, increased humidity and mould growth, and discomfort for patients and staff. These challenges could be more pronounced in outreach locations where air conditioning and ventilation are limited.
- The implementation of control measures has contributed to improved performance metrics for the NEC. While patient numbers fluctuated in certain years, such as a decline in 2022 likely due to Cyclone Dovi, they remained more stable in 2023. The interventions and upgrades likely played a role in increasing patient encounters at the clinic; however, the lack of monthly data makes it difficult to quantify their full impact.
- Port Vila experienced significant climate impacts from Cyclone Dovi in February 2022, which caused major flash flooding and evacuations, and Cyclones Judy and Kevin in March 2023, which severely damaged infrastructure, roads, and coastal fisheries, highlighting the region's vulnerability to extreme weather events.

Recommendations:

- Raise critical infrastructure to mitigate flooding risks and ensure continuity of operations.
- Plan outreach activities to avoid peak cyclone periods and extreme weather conditions.

- Enhance staff knowledge and preparedness for climate-related disruptions to minimise operational impacts.
- Improve ventilation and cooling for projected increases in average temperatures.

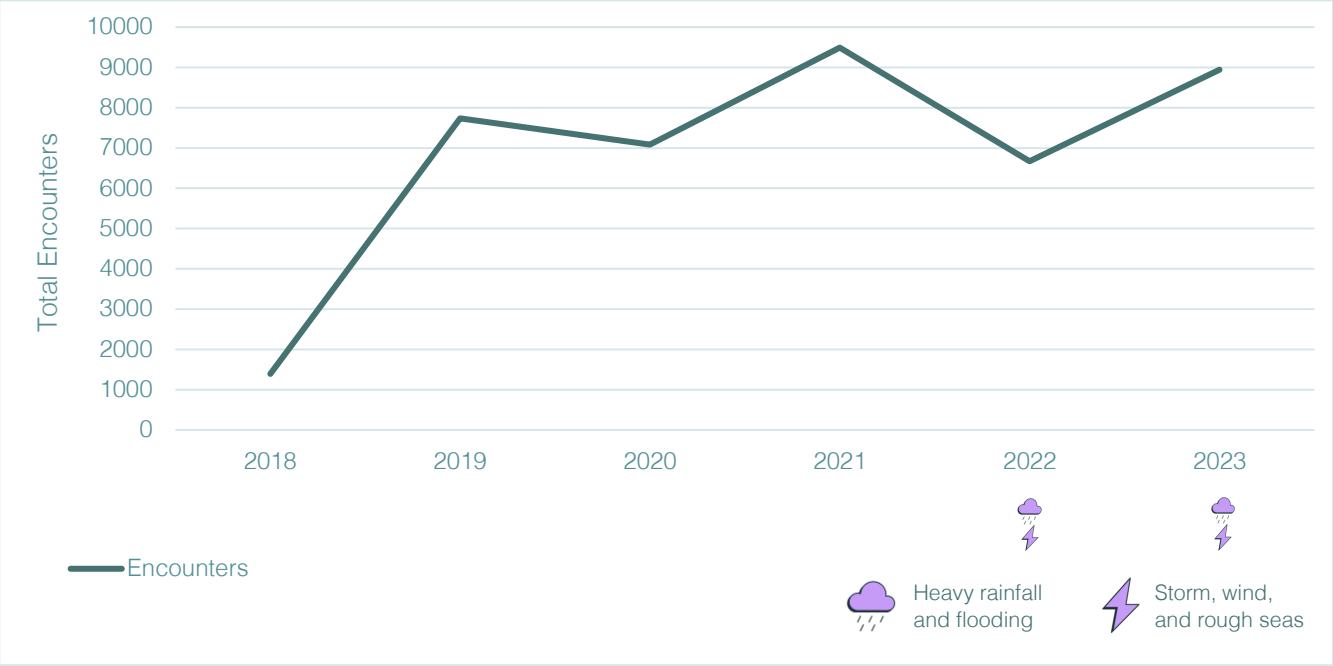

Figure 3 Total encounters and likely climate impacts for the Vanuatu NEC (The Foundation 2024).

5 Conclusion

This assessment identified a range of significant climate-related risks to the NEC site and its operations. It is recommended that these are carefully considered by The Foundation team in conjunction with the broader team at the NEC and implemented where appropriate to build resilience to the impacts of climate change. The recommendations provided in the above section (4) relate to adaptation planning strategy, ongoing risk management, as well as addressing broader climate-related risk at the organisational level. This section provides a summary of recommendations as well as guidance on implementation. Further, key insights from the assessment are also described. Further, key insights from the assessment are also described with all recommendations displayed in Appendix E. Collated recommendations.

5.1 Adaptation implementation

Importantly, the risk ratings developed in this assessment are based on the prescribed climate scenario eventuating in both 2050 and 2090 timeframes and do not necessarily represent current risks. The adaptation actions identified for the very high risks above should be considered for implementation, with a focus on addressing the short-term, current risks as a priority. Importantly, the scale and timing of adaptation implementation requires careful consideration, remaining cognisant that risks have been identified for both current and future time periods.

It is important that the adaptation action hierarchy (refer to Figure 4 below) is considered, recognising that engineering and infrastructure investments to mitigate climate risks may usefully be preceded, in the short term, by management approaches including updated communications and operational guidelines. Importantly, the optimal scale and timing of adaptation measures should also be considered, noting that actions should only be implemented once defined triggers or thresholds are reached. This approach, termed Adaptation Pathways, facilitates a more strategic and cost-effective approach that responds to issues once they become material.

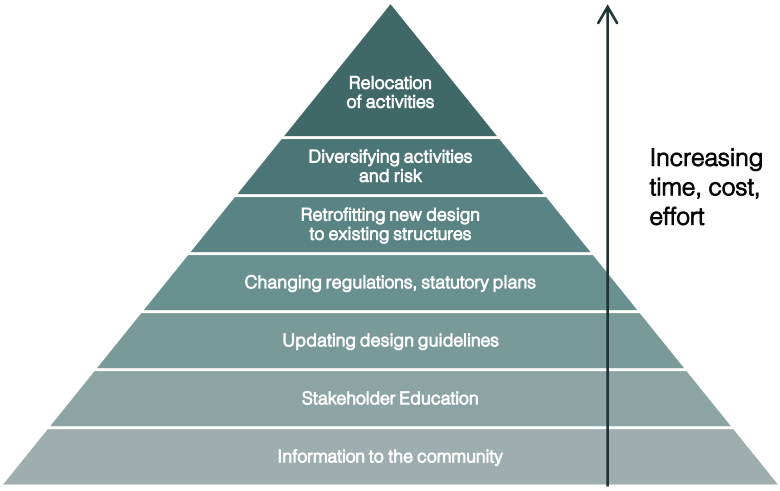

Figure 4: Adaptation planning hierarchy.

5.2 Ongoing climate risk management

The risks identified in this assessment should be included as a climate change specific annexure to the existing risk management framework for the NEC to ensure that risks can be monitored and reviewed as the impacts of climate change unfold. It is suggested that climate risks are reviewed on an annual basis by The Foundation team both on-ground and based in NZ to identify any changes in the climate risk profile.

5.3 Key insights and broader community implications

The recommendations presented in Section 4 above address specific climate risks identified through the assessment and align with the *WHO guidelines for climate-resilient and environmentally sustainable healthcare facilities*. The following summary highlights key insights from the risk assessment, WHO checklist, and MVP model, offering a consolidated overview of critical findings.

Recommendation: Advocate for improved waste management practices across the broader VCH site

- The NEC aligns strongly with the WASH (Water, Sanitation, and Hygiene) component of the WHO Guidance for Climate-Resilient and Environmentally Sustainable Health Care Facilities, demonstrating its commitment to safe and sustainable waste management practices. However, systemic improvements beyond the NEC's operations are necessary to address broader environmental health concerns, particularly regarding the VCH waste management facility (Appendix C - Figure 6 & Figure 7) and the Bouffa Landfill site. Strengthening these systems would mitigate environmental impacts associated with waste disposal and promote better long-term health outcomes for the surrounding community.

Recommendation: Advocacy for climate-resilient curriculum in nursing education

- There is a critical opportunity to advocate for the integration of climate change, climate resilience, adaptation planning, and environmental sustainability practices into Vanuatu's nursing program. The University of Technology Sydney (UTS) is currently leading a redesign of this program, set for implementation in 2025, in collaboration with the Ministry of Health (MoH).
- Dr. Sereana Natuman, Director of Vanuatu Hospitals and Curative Services, has highlighted this initiative, presenting a timely moment for The Foundation and on-ground staff to engage. Advocacy efforts should focus on embedding climate change and public health topics into the curriculum. This integration will strengthen the future health workforce's capacity to address the impacts of climate change, building resilience across healthcare services and improving community outcomes.

Recommendation: Addressing water supply challenges for outreach planning

- Water supply challenges posed by docked ships at ports across Vanuatu, particularly in Santo, must be factored into outreach planning for future years. During consultations with the URA, it was noted that docked ships consume a significant portion of available water, leaving limited supply for other services on the island.
- To mitigate this issue, outreach planning should incorporate strategies to ensure sufficient water availability for both healthcare operations and community needs during outreach activities. This may include coordinating with local water authorities, scheduling outreach during lower demand periods, or identifying alternative water sources to support uninterrupted services.

Recommendation: Mitigating weather-related impacts and optimising outreach operations

- Tropical storms and cyclones are frequent across Vanuatu, causing both direct impacts (such as asset damage) and indirect impacts (such as reduced accessibility by sea). Historical data indicates that two outreach operations have taken place during the wet season (October to April). To minimise risks associated with these adverse weather conditions, it is recommended that all future NEC outreach activities be scheduled primarily during the dry season, when risks of heavy rainfall, high winds, flooding, and rough seas are lower. This timing will ensure better accessibility and higher patient turnout.
- However, scheduling outreach during the dry season must also account for the increased demand at the NEC during this period, as historical patient data indicates a peak in in-clinic activity due to improved community accessibility. Conducting outreach during these months may divert staff and resources from meeting this heightened in-clinic demand.
- To address these challenges, outreach planning should:
    - Implement a flexible schedule that can be adjusted based on short-term weather forecasts and early warning systems.
    - Collaborate with local communities and stakeholders to align outreach schedules with local seasonal and climate knowledge.
    - Integrate climate forecasting tools into planning to avoid periods of anticipated severe weather, such as tropical cyclones or heatwaves.
    - Utilise data insights, including weather patterns and historical attendance records, to optimise outreach timing and resource allocation.

  Careful coordination and the integration of climate and operational data will help balance outreach efforts with maintaining functional capacity at the NEC, ensuring consistent and effective healthcare delivery.

Recommendation: Enhance community impact through collaboration for outreach clinics

- There are opportunities to amplify community impact by collaborating with organisations across the healthcare, public health, and climate change sectors during outreach clinics. As climate shifts reduce the seasonal window for these clinics, effective coordination with partners becomes increasingly critical. Such collaboration ensures that community members in remote provincial areas not only benefit from improved health outcomes but also develop a deeper understanding of how climate and weather changes may influence their health, both now and in the future.

Recommendation: Establishing regular maintenance schedules and integrating climate resilience protocols

- The current reliance on contractors for maintenance, with scheduling left to their discretion, presents a gap in operational consistency. To address this, the NEC senior leadership team should develop and implement regular, standardised maintenance schedules. These schedules should be formalised within the Standard Operating Procedures (SOPs) to ensure accountability and consistency. Additionally, maintenance protocols should align with VCH procedures while being adapted to meet the specific requirements of the NEC workforce. Integrating climate resilience and operational protocols into these processes will enhance the reliability of maintenance activities, improve system functionality, and ensure seamless integration with the broader NEC health system.

Recommendation: Repurpose older infrastructure for secure storage facility

- The older infrastructure located in front of the newer NEC buildings presents an opportunity for secure storage of supplies. Currently, supplies are stored in the corridor between the physiotherapy services building and the newer NEC buildings (Appendix C - Figure 8, Figure 9 & Figure 10). While this area is enclosed, the misalignment of roof structures creates potential for water ingress, which could damage the stored goods. Additionally, storing materials in this location poses a workplace hazard to the health workforce.
    - To address this, collaborate with the VCH and MoH to assess the feasibility of repurposing the older infrastructure for secure, weatherproof storage. Prioritising the creation of a dedicated storage facility will reduce the risk of damage to supplies and improve workplace safety.

Recommendation: Address smoke infiltration from VCH incinerator

- Currently, the use of the VCH incinerator in the afternoon causes smoke to infiltrate the NEC, as the incinerator is located immediately to the east of the Centre (Appendix C - Figure 7). To mitigate this issue, determine if these HVAC units are utilising the highest rating filters available. It is essential to investigate the MERV and HEPA ratings of the HVAC filters at the NEC and assess air intake pathways.
- Measures should be taken to reduce smoke infiltration and minimise the entry of particulate matter from incinerator burns. This will help improve air quality within the Centre and protect the health and safety of the workforce and patients.

Recommendation: Employ an additional nurse to enhance workforce resilience

- Dr. Nico has expressed a desire to strengthen the health workforce capacity at the NEC by adding an additional nurse. While the clinic is currently operational, the addition of a nurse would provide greater security and stability, ensuring the continuity of patient care and enhancing workforce resilience. By employing an additional nurse, the NEC can better support its staff and ensure a more secure and efficient healthcare environment for patients.

Recommendation: Strengthen health workforce capacity through advocacy for WASH and infection control practices

- There is a significant opportunity to advocate for improved infection control (IFC) and sanitation practices across the broader healthcare system, particularly among clinical staff. Dr. Sereana Natuman, the Director of Vanuatu Hospitals & Curative Services, has raised concerns about the lack of compliance with hygiene and IFC protocols among hospital staff.
- To address this, strong leadership is needed, and The Foundation, alongside its staff at the NEC, can play a pivotal role in advocating for better adherence to these essential practices. By championing these efforts, the Foundation can help build the capacity of the health workforce, ensuring improved hygiene and infection control across the system.

Recommendation: Conduct a Water Consumption Assessment (WCA) at the NEC

- It is recommended that the NEC conduct a comprehensive WCA to evaluate the total water usage across the facility. This assessment will provide valuable insights into current water consumption patterns, identify inefficiencies, and highlight potential areas for water conservation. By understanding the facility's water usage, the NEC can develop strategies to reduce waste, optimise water usage, and enhance sustainability practices. Additionally, this will contribute to improved environmental stewardship and better alignment with climate resilience goals, ensuring the long-term operational efficiency of the Centre.

Recommendation: Develop comprehensive procedures for emergency response and disaster management

- The current emergency response and disaster management plans at the NEC are overly generic and lack the specific, actionable detail needed to effectively address critical situations. There is a clear opportunity to enhance the operational capacity of key systems, ensuring their functionality and improving the health and safety of staff, patients, and the broader community during adverse conditions and climate events.
- By developing detailed procedures for critical areas, the NEC can improve its response readiness and strengthen resilience to unexpected disruptions. For example, within the broader WASH framework, the plan should include specific contingency procedures for securing an alternative source of potable water in the event of contamination or infrastructure failure. These procedures should identify key suppliers, distribution points, and immediate actions to enable a rapid and effective response.

Recommendation: Conduct review of emergency response and disaster management plans and execution

- Explore opportunities to strengthen disaster resilience planning and protocols across Foundation-supported clinics and centres in the Pacific. Assess whether current emergency preparedness plans – including operational continuity, workforce communication, critical systems, and role designation – align with best practices. If appropriate and handled sensitively, use the recent Vanuatu earthquake as a case study to audit these plans. This review should determine whether the protocols were effective, adhered to best practices, and whether the workforce clearly understood and successfully executed their responsibilities during the event.

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Appendix A. Risk Management Framework

The Foundation Risk Management Framework and Overview of Incident Levels and Response

Risk Type	Substantive policy	Procedures	Committee
	Risk Management Policy Code of Conduct	Incident Management Procedures Country Security and Safety Protocols	Risk Management Committee
Risk Type	**Associated policies**	**Procedures**	**Committee**
Clinical	Clinical Governance Policy	Numerous Clinical procedures	Clinical Governance Committee
Fiduciary	Credit & Debit Card Policy Investment Policy Prevention of Wrongdoing and Terrorism Policy Reserves Policy Treasury Policy	Numerous Fiduciary procedures	
Health and Safety	Health & Safety Policy Whistleblower Policy	Health & Safety procedures	Health & Safety Committee
Information Security	Cyber Security Policy Privacy & Information Handling Policy		
Legal/Compliance	Child Safeguarding Policy		
Reputational	Content Gathering and Use Policy External Complaints Policy		
Security	Crisis Management Policy Travel Policy Vehicle Policy	Vehicle Inspection checklist	

The Foundation overall risk rating table

Risk Rating		Consequence				
		Negligible (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Likelihood	Almost Certain (5)	11 Medium	16 Significant	20 High	23 High	25 Very High
	Likely (4)	7 Low	12 Medium	17 Significant	21 High	24 High
	Moderate (3)	4 Low	9 Medium	13 Medium	18 Significant	22 High
	Unlikely (2)	2 Low	5 low	10 Medium	14 Medium	19 Significant
	Rare (1)	1 Low	3 Low	6 Low	8 Low	15 Medium

Appendix B. Engaged Stakeholders

Table 5: Stakeholders engaged through assessment.

Stakeholders			
Person/s	**Area / Position**	**Organisation**	**Date**
Joshua Kalhapi	Climate Change Officer	Vanuatu Department of Climate Change	02/12/2024
John	Acting Director	Vanuatu Department of Climate Change	02/12/2024
Julius Mala	Subsidy Officer	Vanuatu Department of Energy	02/12/2024
Danstan Tate	Vanuatu Program Coordinator	The Foundation NZ (Vanuatu)	02/12/2024
Monique Tahi	Nurse Practitioner	VCH Eye Clinic	02/12/2024
Dorothy Ericson	Acting Director Asset Management	Vanuatu Ministry of Health	03/12/2024
Rebecca	Environmental Health Director	Port Vila Local Level Government	03/12/2024
Nellie Ham	Director of Public & Environmental Health	Ministry of Health	03/12/2024
Louis Vakaran	Legal Advisor	Utilities Regulatory Authority	03/12/2024
Jesse Benjamin	CEO	Utilities Regulatory Authority	03/12/2024
Maureen Malas	Manager (technical)	Utilities Regulatory Authority	03/12/2024
Dr. Robert Vocor	Acting Medical Superintendent	Vila Central Hospital	03/12/2024
Joel	Head of Infrastructure & Services	Vila Central Hospital	03/12/2024
Dr. Sereana Natuman	Director Vanuatu Hospitals & Curative Services	Ministry of Health	04/12/2024
Dr. Andronico Ly	Senior Consultant Ophthalmologist	The Foundation NZ (Vanuatu)	04/12/2024
UNKNOWN	Senior Safeguards Officer	Ministry of Infrastructure & Public Utilities	04/12/2024
Mehaka Rountree	Deputy High Commissioner	New Zealand High Commission	04/12/2024

Appendix C. Site photos

Figure 5: Rear (east) of site, elevated rear of building - 1850mm above cut ground level.

Figure 6: Waste storage facility at the VCH.

Figure 7: Front (east) of waste storage facility and incinerator at the VCH.

Figure 8: Corridor between an old VCH building (left) and a new NEC building (right). Noting the storage of supplies in this corridor below adjoined box guttering.

Figure 9: Storage of supplies in access corridor between NEC and older VCH building.

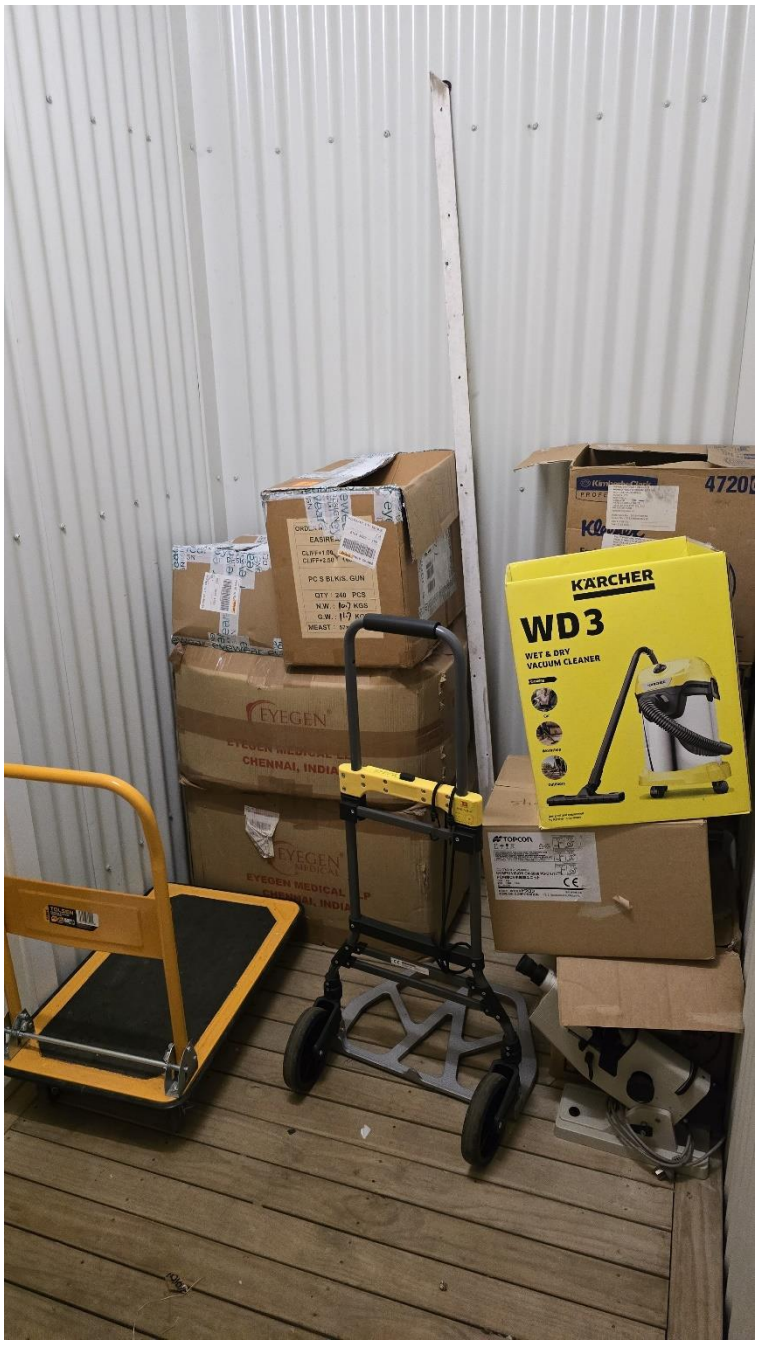

Figure 10: Stored supplies in indoor/outdoor corner of corridor between NEC and older VCH building.

Appendix D. Net Present Value (NPV) of cost savings from solar panels

The electricity data used actual data where available. For modelled data the average use in that month was used along with a degradation rate of 0.07% for solar panel efficiency.

The formula used to calculate the Discounted Cost Savings (at 5% per year from 2026 onwards) for each year was the Net Present Value (NPV) formula:

$$Discounted\ cost\ savings = \frac{Cost\ savings}{(1 + discount\ rate)^{(year - base\ year)}}$$

Total discounted cost savings (USD) = $130,454

Table 6 Discounted solar PV savings estimates

	Year	Electricity Generated (kWh)	Cost Savings ($VUV)	Discounted Cost Savings ($USD)
Actual Data	2020	29,399	1,469,971	12,250
	2021	29,492	1,474,581	11,703
	2022	27,956	1,397,815	10,565
	2023	26,827	1,341,329	9,656
	2024	26,934	1,346,721	9,232
Modelled Data	2025	28,087	1,404,356	9,169
	2026	28,116	1,405,796	8,742
	2027	26,148	1,307,390	7,743
	2028	24,317	1,215,873	6,858
	2029	22,615	1,130,762	6,074
	2030	21,032	1,051,608	5,380
	2031	19,560	977,996	4,765
	2032	18,191	909,536	4,220
	2033	16,917	845,869	3,738
	2034	15,733	786,658	3,311
	2035	14,632	731,592	2,932
	2036	13,608	680,380	2,597
	2037	12,655	632,754	2,301
	2038	11,769	588,461	2,038
	2039	10,945	547,269	1,806
	2040	10,179	508,960	1,599
	2041	9,467	473,333	1,414
	2042	8,804	440,199	1,251
	2043	8,188	409,386	1,111

Appendix E. Collated recommendations

	Section/Sub-Section Number	Section/Sub-Section Name	Recommendation
Sector / Intervention-specific recommendations	4.3.1	Health workforce interventions	Coordinate MoH staff PD: Ensure that PD opportunities are broadened to cover additional key areas, such as the relationship between climate change and public health, as well as community engagement. This will help expand the workforce's capacity to respond to climate-related health challenges and strengthen resilience across sectors.
			Organise information sessions on key operational systems: Facilitate regular sessions to enhance understanding of critical operational systems and their functions. This will ensure that these systems are well-understood by all staff, embedding the knowledge across the workforce and improving overall operational readiness.
			Assess the effectiveness of emergency response and disaster management plans: Conduct a comprehensive review of the execution and performance of these plans. This should include a detailed comparison of actual outcomes against the objectives set in the plan, identifying areas of success and opportunities for improvement.
	4.3.2	Water, sanitation, healthcare waste interventions	Evaluate the need for UV filter replacement: Investigate whether replacing the UV filter in the water quality treatment system is necessary.
			Consult with Dr. Nico to assess if a water distiller could enhance water quality for operations and services.
			Assess water pipe infrastructure: Determine if the water supply pipes entering the facility are equipped with non-return valves to prevent contamination.
			Invest in a water quality testing kit: Acquire a testing kit to monitor the performance of the filtration system, ensuring its effectiveness, especially during hazardous events or emergencies. This is particularly crucial if non-return valves are not in place.
			Collaborate with VCH for wastewater management: Work with the VCH to establish a proactive approach to managing and disposing of wastewater and sewage, shifting from the current reactive response when the system reaches capacity.
	4.3.3	Energy	Expand staff training on energy system management: Provide additional training for staff on the management, monitoring, and maintenance of the energy system to ensure contingency plans are in

			place in the event of staff unavailability. This will ensure continued system reliability even during staffing gaps.
			Consult with Henry Cassin for advanced training opportunities: Explore the possibility of offering high-level training for the health workforce to enhance their understanding of the energy supply system. Historic issues have arisen from a lack of in-depth knowledge of how the system functions, and addressing this gap will improve system management.
			Assess provincial energy systems and their limitations: Investigate the energy systems at the provincial level to understand their capacity to withstand chronic and acute climate hazards. This assessment will provide insights into how energy system limitations could impact operations during outreach clinics and inform potential improvements.
	4.3.4	Infrastructure, technology and products interventions	Regularly inspect the alleyway at the rear of the facility (Appendix C - Figure 5): Conduct routine inspections of the alleyway along the east boundary to identify and address any instances of ponding water. Ensure that standing water is promptly removed or treated to prevent the spread of water-borne diseases.
			Ensure key personnel have a comprehensive understanding of resource provision: Make sure that key team members (Dr. Nico, Danstan and Monique) understand how critical resources, including backup power, are provided to the Centre. This knowledge is essential for effective response and continuity during emergencies.
			Evaluate infrastructure at the provincial level: Investigate the infrastructure at the provincial level to understand its limitations when facing chronic and acute climate hazards. Assess how these limitations might impact the operational capacity during outreach clinics and plan accordingly.
			Maintain accurate maintenance records: Ensure the accurate and consistent upkeep of maintenance records for key infrastructure elements to support long-term reliability and readiness.
			Assess need for greater access to operational infrastructure for contingency planning: Investigate whether increased access to, and understanding of, infrastructure and key operational elements is necessary to enhance contingency planning. This will strengthen the Centre's preparedness for emergencies.
			Invest in staff training to reduce reliance on external contractors: Provide training to NEC staff to build internal capacity for equipment assessment and upkeep. This will reduce the dependency on external contractors and ensure more efficient, timely maintenance.
			Utilise available space for improved storage: Explore the possibility of acquiring part of the physiotherapy clinic to use as a dedicated storage compound for equipment and materials. This would improve organisation and security of essential supplies (e.g. Appendix C - Figure 8, Figure 9 & Figure 10).

Earthquake insights – recommendations	4.3.5	Insights from the Port Vila Earthquake	Minor procedural changes have been implemented to reduce patient exposure to potential aftershocks. • Due to ongoing aftershocks and the potential risks associated with the internal waiting room, the team at the NEC has decided that patients are to remain outside rather than inside the NEC when waiting for an appointment. • Opportunities to actively engage patients in "what to do" if an aftershock occurs during their appointment.
			Conduct a structural assessment of the two water tanks supplying the NEC.
			Investigate integration of Starlink into the broader communication network at both the NEC and the VCH • Discussion should be held with the Ministry of Health's (MoH) IT department for feasibility.
			The air conditioning unit in the server room was damaged and requires replacement (estimated cost: 9,200 Vanuatu Vatu).
Modelling Recommendations	4.4	Modelling of Climate Change Impacts on MPH Eye Clinic and Outreach Clinics	Raise critical infrastructure to mitigate flooding risks and ensure continuity of operations.
			Plan outreach activities to avoid peak cyclone periods and extreme weather conditions.
			Enhance staff knowledge and preparedness for climate-related disruptions to minimise operational impacts.
			Improve ventilation and cooling for projected increases in average temperatures.
Overall Recommendations / Key Findings	5.3	Key insights and broader community implications	Advocate for improved waste management practices across the broader VCH site.
			Advocacy for climate-resilient curriculum in nursing education.
			Addressing water supply challenges for outreach planning.
			Mitigating weather-related impacts and optimising outreach operations. • Implement a flexible schedule that can be adjusted based on short-term weather forecasts and early warning systems. • Collaborate with local communities and stakeholders to align outreach schedules with local seasonal and climate knowledge.

			• Integrate climate forecasting tools into planning to avoid periods of anticipated severe weather, such as tropical cyclones or heatwaves. • Utilise data insights, including weather patterns and historical attendance records, to optimise outreach timing and resource allocation.
			Enhance community impact through collaboration for outreach clinics.
			Establishing regular maintenance schedules and integrating climate resilience protocols.
			Repurpose older infrastructure for secure storage facility • To address this, collaborate with the VCH and MoH to assess the feasibility of repurposing the older infrastructure for secure, weatherproof storage. Prioritising the creation of a dedicated storage facility will reduce the risk of damage to supplies and improve workplace safety.
			Address smoke infiltration from VCH incinerator.
			Employ an additional nurse to enhance workforce resilience.
			Strengthen health workforce capacity through advocacy for WASH and infection control practices.
			Conduct a Water Consumption Assessment (WCA) at the NEC.
			Develop comprehensive procedures for emergency response and disaster management.
			Conduct review of emergency response and disaster management plans and execution.