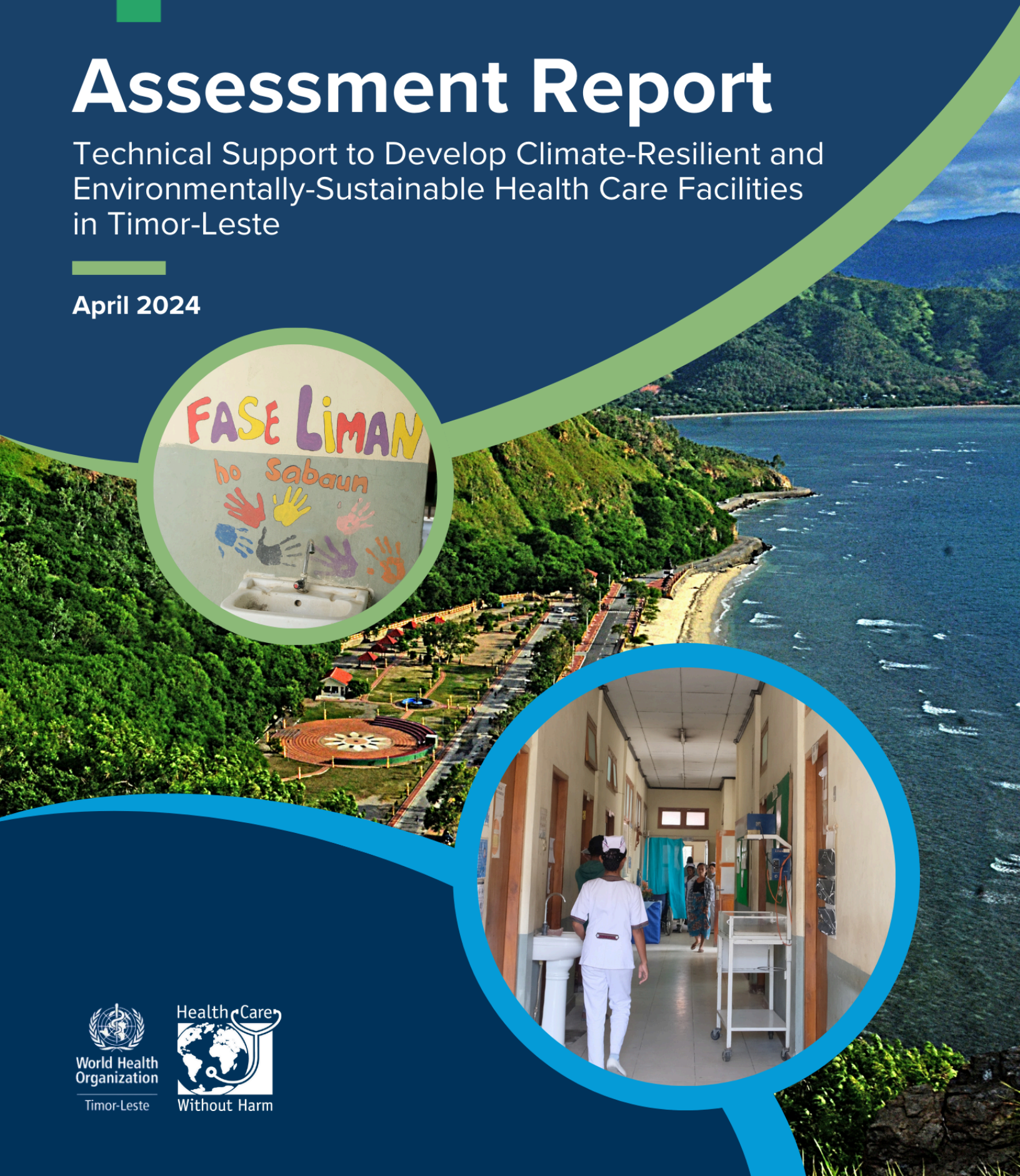
Ministério da Saúde

Assessment Report

Technical Support to Develop Climate-Resilient and Environmentally-Sustainable Health Care Facilities in Timor-Leste

April 2024



World Health Organization
Timor-Leste

Health Care Without Harm

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Section 1 | Introduction and Approach to Building Climate-Resilient and Environmentally-Sustainable Health Care

1.1 Introduction

Climate change is the greatest health threat that humanity is facing today. The recently published Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) Working Group II and the Lancet Countdown on health and climate change have strongly reiterated that adaptation actions are urgently needed to mitigate the vulnerabilities we are facing because of human-induced climate change.

Frequent extreme weather events driven by climate change have resulted in millions of preventable mortality and morbidity. Between 2000 and 2019, about 475,000 people died worldwide as a direct result of more than 11,000 extreme weather events.[1] Incidences of zoonotic, food-, water-, and vector-borne diseases have been more prevalent. Droughts, floods, heatwaves, and sea-level rise have adversely affected food security and nutrition. Mental health, migration, and other factors affecting well-being are being impacted by the changing climate.[2]

Climate change also threatens and undermines the existing vulnerability of the poor, minorities, and those who do not have access to health care and social support structures, among others. (WHO, 2021) We have seen in the past how extreme weather events have revealed the vulnerability of health care systems and the extent of devastation to communities when they fail. Climate change has the potential to disrupt health services, as road blocks may limit the accessibility of supplies; essential services needed for running health facilities, such as energy and water supply, may be interrupted; and patients' accessibility to health facilities may be obstructed.[3]

The impacts of climate change are more detrimental and disproportionately felt by vulnerable low- and middle-income countries that are least responsible for it and least able to respond. IPCC's Working Group 2 report assessed that in 8 out of the 12 climate-sensitive health risks, countries in Asia - including those who are from the Southeast Asia region - are the most affected and where the majority of global deaths in 2019 come from.

With climate change increasing the risk of severe impacts on our health and placing complex, multifaceted, and unpredictable demands on health systems, countries need to systematically assess and monitor their health vulnerabilities in order to inform appropriate adaptation plans and actions.

1.2 Objectives of the Study

This project is a collaboration between the World Health Organization (WHO) in Timor-Leste and Health Care Without Harm Southeast Asia (HCWH-SEA) to support the Ministry of Health (MOH) to develop a climate-resilient and environmentally-sustainable health care facilities policy and strategy for the country. Specifically, the project aims to understand the *climate vulnerability of select health facilities* in the country and propose strategic policy recommendations for the implementation of climate-resilient and environmentally-sustainable healthcare in Timor-Leste.

This report contains the results of the assessment conducted by the team at Health Care Without Harm Southeast Asia (HCWH-SEA) and will feed into a policy and strategy report which is the second deliverable under this project.

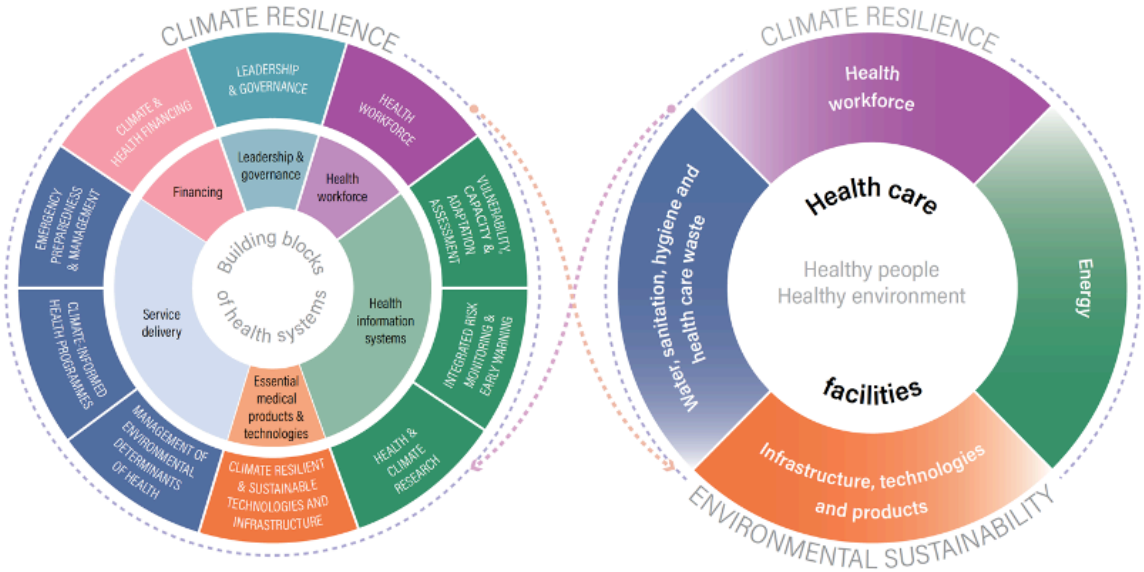
1.2 Approach to Climate-Resilient and Environmentally-Sustainable Health Care

The WHO has developed a comprehensive approach which aims to strengthen countries' capacities and improve the resilience and adaptive capacity of health systems and facilities to deal with the adverse health effects of climate change. Under WHO's *Operational Framework for Building Climate-Resilient Health Systems*, ten components have been identified to provide a comprehensive approach to integrating climate resilience into existing health systems.

For health facilities, WHO developed a guidance document which builds upon the operational framework (see Figure 1). The *Guidance Document for Climate-Resilient and Environmentally Sustainable Health Care Facilities* looks specifically at how the initial 10 components of the broader framework can be adapted to healthcare facilities and highlights 4 fundamental requirements of for providing safe and quality care

1. **Health workforce**: adequate numbers of skilled human resources, with decent working conditions, empowered and informed to respond to these environmental challenges.
2. **Water, sanitation, hygiene (WASH) and health care waste management**: sustainable and safe management of water, sanitation and health care waste services.
3. **Energy**: sustainable energy services.
4. **Infrastructure, technologies and products**: appropriate infrastructure, technologies, products and processes, including all the operations that allow for the efficient functioning of a healthcare facility.

Figure 1. Climate-resilient and environmentally sustainable health care



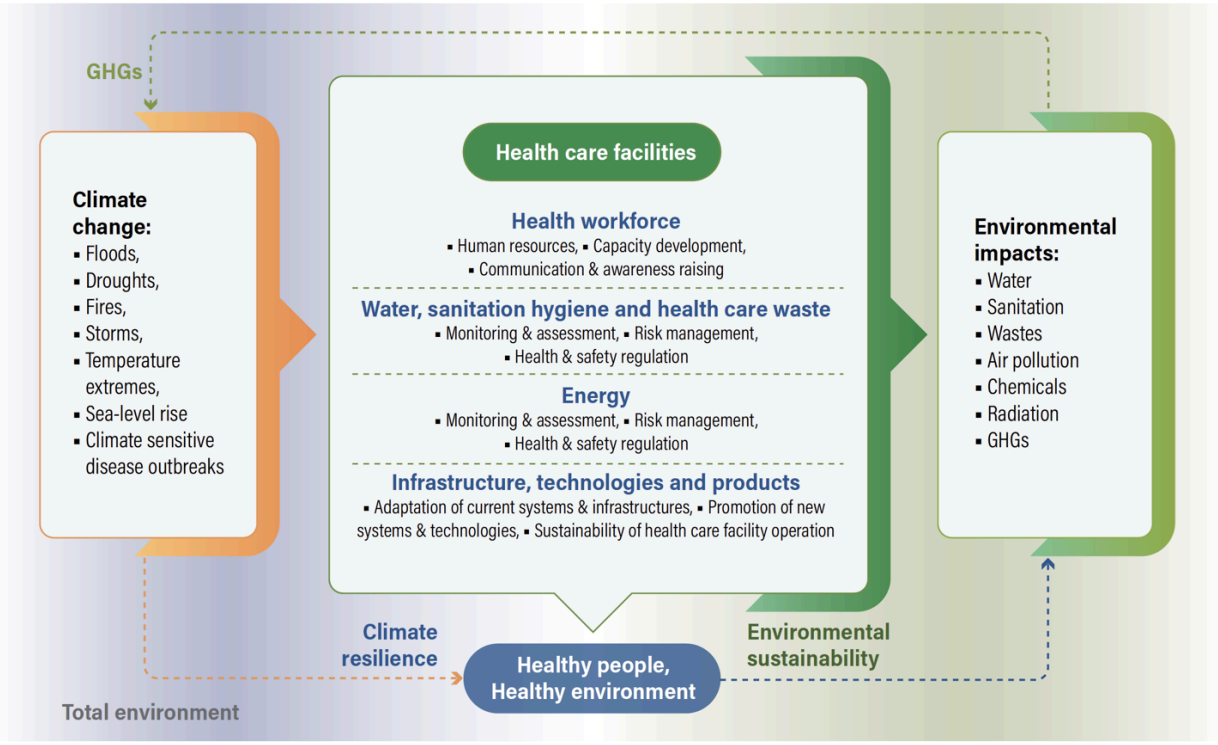
Source: WHO, 2020

WHO defines **climate-resilient healthcare facilities** as those that are "*able to anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stress, so as to bring ongoing and sustained health care to their target populations, despite an unstable climate*".[4] When health facilities are impacted by climate-related events such as typhoons, flooding, or drought, their level of performance and capacity to continue to provide quality healthcare services are also impacted due to potential impacts on their

key elements. This determines whether they are able to recover worse than before, to their pre-event state, or better than before.

Health care facilities can also have adverse environmental impacts if not well designed and managed, affecting both the health workforce and the community they serve. In a 2019 study conducted by HCWH, the sector was found to be contributing to the climate crisis, accounting for about 4.4% of net global emissions.[5] Facilities contribute to greenhouse gas (GHG) emissions and air pollution through energy consumption, product manufacture, procurement, use and disposal, with various sources of emissions throughout the supply chain. It is therefore imperative for the sector to not only build its resilience to impacts of climate change but also, at the same time, optimize the use of its resources and minimize the release of wastes and emissions by becoming environmentally-sustainable and low-carbon.

Figure 2. WHO's framework for building climate-resilient and environmentally-sustainable healthcare



Source: WHO, 2020

WHO defines **environmentally-sustainable healthcare facilities** as those that "*improve, maintain or restore health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, for the benefit of the health and well-being of current and future generations*".[4] This means that initiatives on environmental sustainability in a health facility should be reducing the hazards that come from its operations (ie. use of chemicals that can lead to food and water contamination) while at the same time decreasing its exposures and vulnerabilities (ie. on patients, health workforce, and the community).

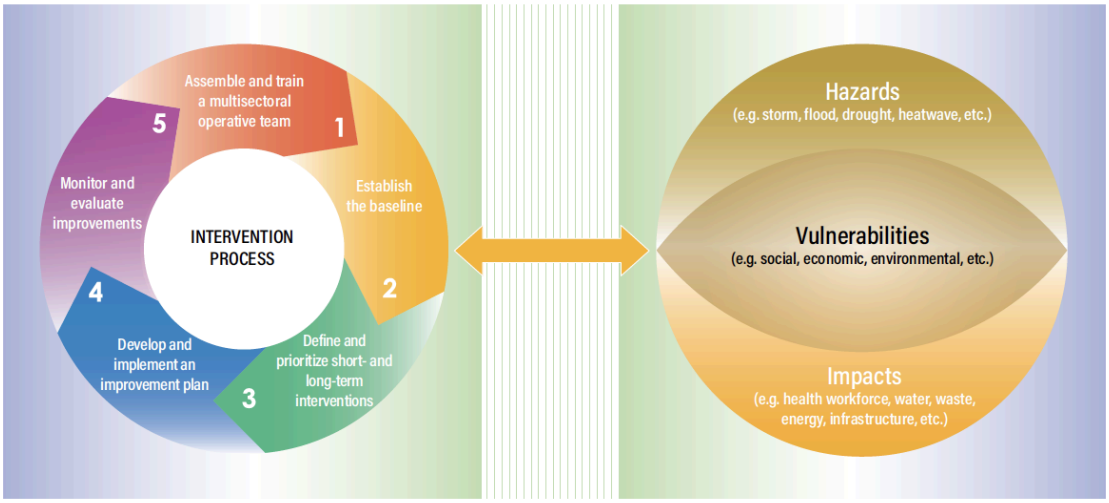
Following this approach, a **climate-resilient and environmentally-sustainable healthcare** is therefore defined as an institution that is able to "*anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stresses, while minimizing negative impacts on the environment and*

leveraging opportunities to restore and improve it, so as to bring ongoing and sustained health care to their target population and protect the health and well-being of future generations".[4]

When combined, these strategies can aid in identifying a health facility's greatest climate vulnerabilities and sources of environmental impacts and emissions, facilitate the prioritization of policies, programs and investment areas aimed at addressing all three elements, and encourage innovation and ingenuity that will enable the transformation of their facility into a sustainable and climate-resilient health care.

WHO proposed a process to implement interventions contained in the guidelines for health facilities and that includes **establishing the baseline by conducting vulnerability assessments**. A vulnerability and adaptation (V&A) assessment is a crucial step before implementing any adaptation plans. It is a participatory process that will guide healthcare facilities to find the relevant information needed to identify current and future climate hazards that affect health care facilities; understand the health impacts from these hazards; understand the current capacity of the health care facility to manage these health impacts; and identify and prioritize effective adaptation interventions to respond.

Figure 3. Process for implementing climate-resilient and environmentally-sustainable interventions



Source: WHO, 2021

V&A assessments are useful to provide insight into the linkages between climate and health within the assessment area (e.g. health system, health care facility, community, region) and serve as a baseline assessment against which changes in risk and the effectiveness of protective measures can be monitored. They provide an opportunity to build capacity and to strengthen the case for investments in health protection.

Complementary to the guidance document, a tool called *Checklists to Assess Vulnerabilities in Health Care Facilities in the Context of Climate Change* was developed by WHO to "*help health care facility managers and other health workers understand the climate risks that health care facilities may face, specifically in terms of existing vulnerabilities and possible impacts, and support them in taking appropriate action*".[8] This tool provides support in establishing a baseline with regards to climate vulnerability in facilities, and the results of the assessment using the checklists will inform the design of improvements to strengthen their resilience and environmental sustainability. It is important to note that the proposed checklists of WHO may not be relevant to every health care facility in every location; and therefore may need to be selected, modified or supplemented with additional tools and guidance.

In accordance with this guidance, there are three main steps to assessing the vulnerability of a targeted healthcare facility. First, identify a climate hazard of concern in each area. In order to do this, the next section will look at each area in accordance with the hazard template provided in the guide. This initial assessment will help determine which tools to use when carrying the next step. Second, each healthcare facility will use a checklist tool that has been adapted to the climate hazards present in each district in order to calculate their level of vulnerability towards these climate hazards. Each checklist will identify and assess climate-related vulnerabilities and impacts based on four main categories: 1) capacity health workforce; 2) management of water, sanitation, and hygiene (WASH), and healthcare waste; 3) energy source and utility; and 4) appropriate infrastructure, technologies, products and processes. Finally, utilize these findings to understand potential impacts posed by climate variability and change in each of the key components of health care facilities and produce relevant recommendations and strategies to increase healthcare facility resilience in the face of a changing climate.

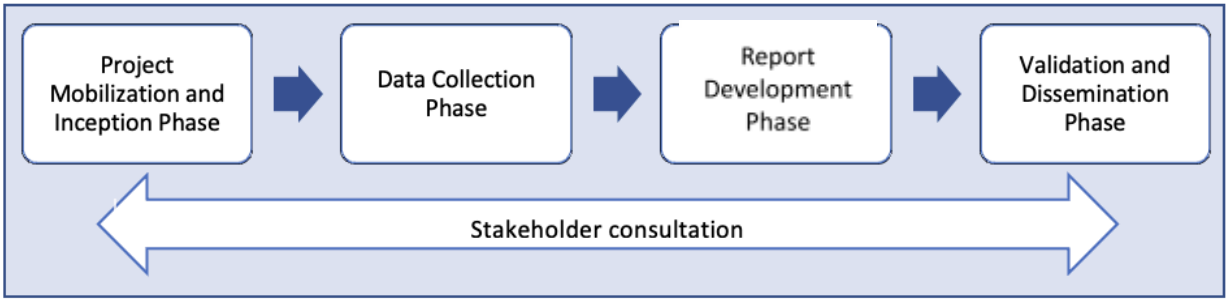
Building on the WHO frameworks and tools, the team co-developed the data collection instruments and contextualized them to ensure they are fit for purpose and are relevant to the realities of the target facilities in Timor-Leste. An explanation of this process is outlined in the next section.

1.3 Project execution process

The project team adopted a consultative and collaborative approach to executing this engagement as a way to ensure buy-in and ownership, optimize the guidance and inputs of the WHO and MOH. We employed a simple and systematic process that organizes and coordinates project activities to ensure the production and delivery of project outputs within the defined project schedule. Our project execution process is organized into the following four stages:

PHASE 1: Project Mobilization and Inception Phase
PHASE 2: Data Collection Phase
PHASE 3: Report Development Phase
PHASE 4: Validation and Closing Phase

Figure 4. Project Execution Process



1.3.1 Phase 1: Project Mobilization and Inception

At the start of the project, the team conducted internal meetings to discuss and finalize the project management organization and process. The team had a virtual kick-off meeting with WHO and MOH on April 3, 2023 to clarify and level expectations, to present the project team's initial approach and methodology, project management structure and execution process, timeline, and to discuss major

concerns in the execution of the project, if any. At this stage, the team also consulted with the WHO and MOH in finalizing the target health facilities for the study.

With assistance from WHO and MOH, the team proceeded to gather and review available documents on the current situation of climate and health in the country, national and provincial V&A assessments, health/national adaptation plans, relevant policies at the national level, briefing documents on the target facilities, among others. The team also gathered and reviewed relevant guidance documents and tools of WHO as well as reference materials such as the *Global Road Map for Health Care Decarbonization* and *Climate-Smart Healthcare: Low-Carbon and Resilience Strategies for the Health Sector* of HCWH, among others. The team also reviewed a similar set of reports on green, climate-smart assessment and policies in Maldives co-developed by WHO and HCWH in 2018.

From this initial literature review and the kick-off meeting with WHO and MOH, the approach and methodology was reviewed and improved upon. This Inception Report was prepared which spells out improvements in the approach, methodology, and work plan. It also includes the draft instruments, draft field visit plan, and the initial scoping review. The report was submitted to WHO and MOH for review. Revisions based on such review were made, and the report was finalized for approval before proceeding to the next phase.

1.3.2 Phase 2: Data Collection and Analysis

A. TARGET FACILITIES AND AREAS

The target health facilities, located in three different districts, are shown in Table 1. The target facilities represent the three-tiered health system of Timor-Leste composed of a national hospital, referral hospitals, and community health centers (CHC) and health posts (HP) as well as the different geographical and environmental challenges that Timor-Leste faces. Notably, these facilities are situated in areas characterized by a rich tapestry of geographical and environmental challenges, including mountainous, coastal, and mixed terrains, echoing the wide spectrum of conditions faced by Timor-Leste.

Table 1. Target Areas and Facilities

Level	Location and Facility		
	Dili	**Ainaro**	**Covalima**
Tertiary	Hospital Nacional Guido Valadares (HNGV)	-	-
Secondary	Maternidade-Escola de Nossa Senhora de Fatima	Maubisse Referral Hospital	Suai Referral Hospital
Primary	Comoro (CHC) Tasitolu (HP)	Santo Joaquim (CHC) Canomera* (HP)	Covalima (CHC) Salele* (HP)

The team categorized these facilities into three levels of tertiary, secondary, and primary. This categorization is necessary as it ensures that the instruments for data collection are fit for purpose and relevant to the facility we are targeting.

Figure 5. Location of Target Facilities

Source: Google Maps

B. DATA COLLECTION METHODS

The team used a mixed method approach (qualitative and quantitative) to gather data as shown below.

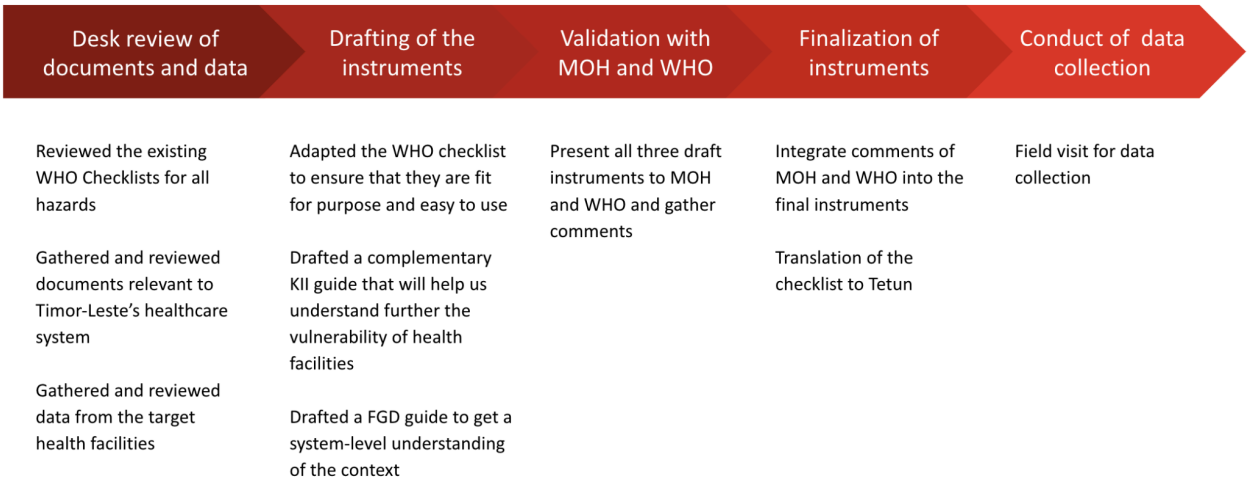
Table 2. Data Collection Methods

Method	Description	Respondents/Source
Document Review	In addition to the initial review of literature during Phase 1, a set of documents were collated and reviewed by the team.	WHO, MOH, HCWH, Online sources
Focus Group Discussion (FGD)	A free-flowing discussion with the WHO and MOH who are involved in climate and health, V&A assessments, adaptation planning, resilience and sustainability at the national level to understand the system context	WHO and MOH representatives
Key Informant Interviews (KIIs)	An in-depth, one-on-one interview with guide questions to help us gather first-hand knowledge and experience as well as suggestions and recommendations	Representatives from target hospitals and health facilities
Checklist	A series of questions patterned to the Checklists developed by the WHO and considering the specific context of the healthcare facilities to be surveyed	Representatives from target hospitals and health facilities

Method	Description	Respondents/Source
Site visits	In-person site assessment of target health facilities. The team will take notes of all of the physical components of the hospital that are covered by the 4 components of the WHO guidance.	4 hospitals, 3 community health centers, and 3 health posts

The team co-developed the data collection instruments with WHO and MOH. The summarized process of developing and finalizing the instruments are shown below:

Figure 6. Process of developing and finalizing the data collection instruments



As agreed with the WHO and MOH, each level of healthcare facility had its own version of the vulnerability checklist considering their different levels of operation and context. The specific process of adapting and tailoring the WHO checklists to Timor-Leste context involved the team reviewing the original checklist, and identifying the key components, categories, and questions included in the checklist. We considered the language, format, and structure of the original checklist.

The team then identified climate hazards in each district (drought, flood, heatwaves, sea-level rise and storm) and integrated the essential elements of the individual climate hazard checklists into one to make the process simpler, less time-consuming but still capable of assessing the vulnerability level of the relevant climate hazards. The integration is done through coding similar questions found across the documents, whilst still retaining the overarching structure and sub-divisions of the checklists.

The team identified the key areas of concern for Timor-Leste's healthcare system, taking into consideration the country's geographical location, climate, health status, infrastructure, and socio-economic conditions. This was done through the initial scoping and review of literature. The initial areas of concern included access to clean and safe WASH, sustainable healthcare waste management, resilient and sustainable energy supply, access to healthcare services, availability of medical staff, medical supplies, communication and coordination among healthcare providers, and infrastructure resilience.

Starting with the tertiary hospital, the team prioritized the questions in the original checklist based on their relevance and importance to Timor-Leste's healthcare system and the tertiary hospital. The team integrated similar questions, removed questions that are not applicable or are redundant, and simplified the language and format of the checklist, making it easier to understand and complete. The team validated the checklist for tertiary hospitals with WHO and MOH. Based on the tertiary facility checklist, the team developed the versions relevant for secondary and primary facilities and translated all the checklists to Tetum.

Because of time constraints, the team was unable to send the checklists to the facilities in advance which was the initial recommendation.

C. FIELD DATA COLLECTION

The team from HCWH conducted the field visit between June 20-28, 2023 (see Annex 1) together with WHO and MOH representatives. The team were able to visit all 10 facilities. However, in CHC Covalima the team was not able to speak with a representative and we were only able to observe the surroundings of the facility. Two target health posts were also replaced:

- HP Salele in Covalima was replaced with HP Lakonak due to its location
- HP Canomera in Ainaro was replaced with HP Horaikiik as the previous facility did not have available representatives during the arrival

The FGD was conducted on the first day of the field visit as a foundational dialogue to understand the key challenges and opportunities for building climate-resilient healthcare facilities in Timor-Leste. The FGD is designed to seek a systems-level perspective to the topic, with questions directed towards the WHO and MOH of Timor-Leste.

The checklists were completed to understand the vulnerabilities of the facilities to climate change. The team explained the tool to the respondents then proceeded to ask each question in the checklist and fill up the checklist with the answer given by the respondent.

The KIIs were conducted to understand the facility-specific challenges and opportunities for improving their climate resilience and sustainability. The checklists and KIIs were conducted simultaneously to save time. The team spoke with a representative at each facility and asked a set of questions based on their initial response in the checklists.

The duration of the facility visits depended on the size and type of facility. To maximize time, the team split to cover two facilities in Maubisse and Dili.

- Introduction and overview of the project and purpose of the visit by WHO/MOH representative
- Checklist completion and and key informant interview by HCWH Team
- Site assessment, walk through in the facility by HCWH, WHO and MOH Team
- Wrap up and closing

Aside from the notes and data collected throughout the visit, photos and videos were also taken by the team. All raw data collected can be found in Annex 2.

There were some challenges faced by the team during data collection. The language barrier was particularly challenging but with the support of the representatives from WHO and MOH, we were able to overcome communication difficulties and successfully gather the necessary data.

D. DATA PROCESSING AND ANALYSIS

The data processing methodology for the FGD and KIIs involved a thematic analysis approach. While not extensively systematic, a brief coding process was conducted to identify the main points emerging from the FGDs and KIIs. These main points were then organized into themes, allowing for a deeper analysis and understanding of the data. The thematic analysis was then synchronized with the results obtained from the initial scoping review, findings from the checklist assessments as well as data collecting during the site visits. This comprehensive approach enabled the identification of key patterns, trends, and insights, contributing to a more holistic understanding of the vulnerabilities and challenges faced within the healthcare system.

The checklist processing involved several steps to analyze and evaluate the vulnerabilities within the healthcare facilities. Firstly, we categorized the checklists into three levels based on facility types: primary, secondary, and tertiary. Each facility level checklist was adapted from the original WHO checklist tool to better align with the specific context, conditions, and requirements of the facilities in Timor-Leste.

During the processing stage, we encountered a gap in guidance or instructions for interpreting the checklist responses. To address this, a methodology was developed, guided by the suggestions provided. Numerical values were assigned to each answer option, corresponding to the level of vulnerability it conveyed. Specifically, 'Yes' responses were assigned the value '1', as they indicate low vulnerability, signifying that the facility has taken appropriate measures to address the specific aspect. 'Partially' was assigned the value '2', as it reflects a medium level of vulnerability, suggesting that some measures have been implemented but improvements are needed. 'No' responses were assigned the value '3', as they indicate high vulnerability, revealing the absence of adequate measures to address the specific aspect. This allowed us to quantify the vulnerability levels for each component, including health workforce, energy, WASH and waste, and infrastructure.

Through these calculations, two main processing outputs were generated. The first is the component vulnerability, which provides the percentage vulnerability for each component based on the assigned numerical values. This enables us to identify the component with the highest vulnerability for each facility. The second output is the overall vulnerability, which is the average percentage vulnerability across all four components. This measure allows us to compare and assess the levels of vulnerability across different facilities within the same facility level category.

Figure 7. Formula of component vulnerability scores

$$Component\ vulnerability\ scores = \frac{(Sum\ of\ comopnent\ scores)}{(Total\ number\ of\ questions\ x\ 3)} \times 100\%$$

Figure 8. Formula of component vulnerability scores

$$Overall\ vulnerability\ scores = \frac{(Sum\ of\ comopnent\ vulnerability\ scores)}{4} \times 100\%$$

After calculating the vulnerability scores for each component and the overall vulnerability, the results were categorized into three distinct levels: 'low,' 'medium,' and 'high' vulnerability. Facilities with vulnerability scores falling within the range of 0-33% were classified as having 'low' vulnerability. This indicates that the facility has relatively robust measures in place to address climate-related challenges and is better equipped to withstand potential impacts. Facilities with vulnerability scores ranging from 34% to 66% were considered to have 'medium' vulnerability. Such facilities have implemented some measures but may require additional improvements to enhance their resilience to climate-related risks. Finally, facilities with vulnerability scores ranging from 67% to 100% were designated as having 'high' vulnerability. This indicates that these facilities have significant gaps in their climate resilience measures and are more susceptible to adverse impacts of climate change.

By employing this data processing approach, we gain valuable insights into the specific vulnerabilities of each component and the overall vulnerability profile of the healthcare facilities. This information assists in prioritizing interventions, allocating resources, and implementing targeted measures to address the identified vulnerabilities effectively. The processed checklist answers are found in Annex 2.

The results of the assessment can be found in Section 3 of this document.

Section 2 | Overview of Timor-Leste's Healthcare System and Vulnerability to Climate Change

2.1 General Information

Timor-Leste is a small island developing state (SIDS) in Southeast Asia with a land size of about 15,000km^2 and a population of over 1.3 million people. Emerging from decades of conflict, Timor-Leste became the first new sovereign state of the 21st century in May 2002 and has since developed social and economic policies that focused on alleviating poverty to address the immediate needs of our people, consolidating security and stability, and providing a foundation for nationhood through building institutions of State[7].

Figure 9. Map and country profile of Timor-Leste

Source: Adapted from OCHA Asia Pacific[8]

2.1.1 Population

Timor-Leste is divided into 14 municipalities/districts, which in turn are subdivided into 67 administrative posts, 442 *sucos* (villages), and 2,225 *aldeias* (hamlets). The 2022 Population and Housing Census[9] reported the following key findings:

- The census recorded a **resident population** of 1,340,434 persons which were enumerated in 250,034 **households**.
- Of this population, 678,087 were males, and 662,347 were females. This sex distribution implies a **sex ratio** of 102.4 males per 100 females. The following are key findings from the report:
- Among all the countries in Southeast Asia, Timor-Leste has the highest annual population growth, with the **average annual growth rate** of 1.8%. However, this is a decline from the 2.1% growth rate in the 2015 census and is a continuation of the downward trend since 2004

- The municipality of Dili has the highest population density of 1,425 persons per square kilometer. Lautem (39) and Manatuto (29) are at the low end of population density.
- The **urban population** constitutes 36.8% of the total population of Timor-Leste, with a majority living in Dili. Whereas the remaining 63.2% live in **rural areas**.

The World Bank[10] also records population ages 15-64 as the largest age group, comprising 59% of total population.

2.1.2 Socio-Economic Context

The global economy continues to face steep challenges, but Timor-Leste's economy is slowly recovering. In light of the sharp rise of inflation due to the war in Ukraine as well as the recent economic slump caused by COVID-19 and Cyclone Seroja, **the economy is on track to further grow by 3.0% in 2022**. Based on the 2022 Timor-Leste Economic Report[11] produced by the World Bank, the recent developments are as follows:

- **Oil and gas** account for more than 90% of GDP and 70% of government revenue. The technology-intensive oil industry has done little to create jobs and the non-oil economy remains under-developed[12].
- However, Timor-Leste is still a predominantly **agrarian society** and an estimated 45% of the population work in agriculture[13].
- GDP per capita has not returned to pre-pandemic levels due to factors such as political uncertainty, a global health emergency and natural disasters.
- While **poverty levels remain high**, the proportion of Timorese living in poverty has declined from 50% in 2007 to an estimated 42% in 2014, as measured by the national poverty line.
- **Price pressures remain high**, with increase in consumer price inflation and food inflation, which disproportionately affects vulnerable populations.

Several ongoing projects to help improve Timor-Leste's economy include:

- The $25 million Timor-Leste Water Supply and Sanitation Project will benefit up to 25,000 people in Timor-Leste's second largest city, Baucau. The $125 million Dili Water Supply Project was signed in August 2022 and will serve up to 90,000 persons in the eastern part of Dili.
- The five-year, $23.55 million Basic Education Strengthening and Transformation (BEST) project aims to deliver new and upgraded classrooms, school facilities and higher teaching quality.
- The Timor-Leste Branch Roads Project will finance critical new roadworks to link Gleno and Letefoho to Hatubuilico, supporting tourism, coffee producers, and farming communities.
- The International Finance Corporation (IFC), is supporting Timor-Leste's largest microfinance institution, Kaebauk Investment and Finance (KIF), to provide access to finance to over 10,000 people, with a focus on assisting women and farmers. Advisory work and the Public Private Partnership (PPP) mandate for Tibar Port has resulted in the successful opening of the new port in October 2022. The IFC now has the PPP mandate for the rehabilitation and operation of the Dili International Airport.
- Timor-Leste Petroleum Fund, created by the government that aims to contribute to the wise management of Timor-Leste's petroleum resources for the benefit of both current and future generations.

Source: World Bank[14]

2.1.3 National Strategic Development Plan Priorities

The Timor-Leste Strategic Development Plan (2011-2030)[15] is a twenty year vision that reflects the aspiration of the Timorese people to create a prosperous and strong nation. The main priorities of the plan are:

Social Capital	Infrastructure Development	Economic Development
• Education and Training • Health • Social Inclusion • Environment • Culture and Heritage	• Roads and Bridges • Water and Sanitation • Electricity • Seaports • Airports • Telecommunications	• Rural Development • Agriculture • Petroleum • Tourism • Private Sector Investment

2.2 Climate Risk Profile of Timor-Leste

Timor-Leste is highly vulnerable to natural hazards which are associated with droughts, floods, landslides and soil erosion. Increasing temperatures, changing precipitation patterns and increased heavy rainfall events increase impacts of climate change for the country. Timor-Leste submitted its Nationally Determined Contributions (NDC) in 2016. In the country's Second National Communication to the UNFCCC in 2020, Timor-Leste identified agriculture, water resources, forestry and public health to be the most vulnerable sectors to climate change[17].

While Timor-Leste has made considerable progress in development, it still suffers from high levels of poverty. Climate change threatens to exacerbate vulnerability and inequality, particularly in food security. The rural poor and other marginalized groups are most vulnerable. Without systemic action climate change threatens to increase inequality and drive significant damage and loss.

The following table summarizes selected Indicators from the INFORM 2019 Index for Risk Management for Timor-Leste for the subcategories of Risk (e g "Flood"), where higher scores represent greater risks.

Table 3. Risk Indicators for Timor-Leste

Flood (0–10)	Tropical Cyclone (0–10)	Drought (0–10)	Vulnerability (0–10)	Lack of Coping Capacity (0–10)	Overall Inform Risk Level (0–10)	Rank (1–191)
1.7 [4.5]	3.6 [1.7]	1.5 [3.2]	4.2 [3.6]	6.2 [4.5]	4.5 [3.8]	66

Source: World Bank

According to the ThinkHazard 2020 report on Timor-Leste[18], below are the calculated hazard levels of the climate-related trends in the three target areas of this project.

Table 4. Risk Level by Natural Hazard of the Target Areas

District	Risk Level by Natural Hazard					
	Urban Flood	Coastal Flood	Earthquake	Landslide	Drought	Wildfire
Ainaro	High	High	Medium	High	Medium	High
Covalima	Medium	High	Medium	Medium	Medium	High
Dili	High	Medium	High	High	High	High

2.2.1 Climate Change Trends

Timor-Leste faces high disaster risk levels, ranked 66 out of 191 countries by the 2019 Inform Risk Index. Tropical cyclones represent the climate-related natural hazard risk Timor-Leste is most exposed to, while for flooding and droughts Timor-Leste is ranked at a relatively low risk. However, it is worth noting that the country currently finds itself grappling with the challenges of an ongoing El Niño-induced drought period.

Timor-Leste's ranking in the top-third of at-risk countries is largely down to its lack of coping capacity and the levels of social vulnerability in its population, both of which are scored lower than most countries in the region[15]. The *2021 Climate Change Impacts on Health and Livelihoods: Timor-Leste Assessment*[13] reports on the following climate change trends:

- **Temperature** has increased by 0.5-0.8°C over the past century, and average air temperatures will continue to increase
- Annual **rainfall** has decreased at the rate of 40mm per decade but the long-term projections suggest annual rainfall by 2050-2080 may increase in wet season rainfall and decrease in dry season rainfall.
- Since 1993, the mean **sea level** in Timor-Leste has been rising at the rate of 9mm per year, which is above global average. Sea level is expected to continue to rise to 18-34 cm by 2050, 30-58cm by 2070 and 43-88cm by 2090.
- **Extreme weather events** have become more frequent and intense, especially heavy rainfall. This increases the risk of flash floods and landslides.
- There has been a decrease in the number of **tropical cyclones** in the region, but an increase in intensity. This is projected to continue in the long-term.
- Historically, **drought** conditions occur frequently, often during El Niño events. Long-term trends indicate a drying climate with a higher likelihood of drought.
- **Extreme temperatures** predominantly affect low-lying coastal areas, and both hot days and extremely hot days will largely increase in the long-term.

The most climate-vulnerable populations are: poor and low-income households; women and children; persons with disabilities and the elderly.

2.2.2 Climate Change and Health[13]

Timor-Leste has seen significant improvements in healthcare over the past decade. Life expectancy has risen, and the country has achieved several Millennium Development Goals (ie. reducing infant and child mortality, improving maternal and child health, and increasing immunization coverage). Additionally, they've successfully eliminated polio, measles, and maternal/neonatal tetanus. Looking forward, the government is committed to significantly reducing tuberculosis cases and deaths by 2030. The country also demonstrated its strength during the COVID-19 pandemic by setting up quarantine and isolation facilities, training healthcare workers, and improving medical supply chains. However, despite this progress, new challenges are emerging. The health of the Timor-Leste population is already being impacted by climate change and will further be vulnerable to its impacts. Following are some documented information on health outcomes associated with this growing threat.

Floods are the most frequently occuring and deadly natural hazard in the country, followed by landslides and strong winds. These natural hazards cause death and injuries from drowning, falling trees and structures, as well as fast-flowing mud or water. The increasing number of 'hot' days and nights will also produce extremely uncomfortable conditions, resulting in increasing heat-related deaths. Mortality from non-communicable diseases may also increase due to outdoor and indoor air pollution caused by greenhouse gas emissions.

Dengue fever is a major public health concern in Timor-Leste, exhibiting a highly seasonal increase in cases. Most cases occur across the wettest and hottest months of the year (December-February, peaking in January), with hotspots in Dili. Additionally, rising temperatures and water shortages will likely result in the increased storage of water in containers, which provide ideal breeding places for mosquitoes.

The projected changing rainfall patterns, the heightened risk of drought and more extreme rainfall events will affect water supplies in Timor-Leste, with some districts already being impacted by water scarcity. In addition, only 57% of the overall population have access to basic sanitation[22] which poses a heightened risk of the transmission of waterborne diseases. Waterborne diseases already represent a high burden of mortality, especially amongst children. In the latest WHO Health and Environment Scorecard for Timor-Leste, 45% of deaths from diarrhoea are known to be caused by unsafe drinking water, sanitation and inadequate personal hygiene[23]. Changing conditions favoring parasitic and pathogenic growth may increase the already huge burden of diarrhoeal diseases, typhoid fever, and soil-transmitted helminths.

Climate change will likely exacerbate the serious public health problems of food and nutritional insecurity facing Timor-Leste. Malnutrition is already the "single greatest contributor to premature death and disability in the country" and the observed climate change trends will worsen this due to its disrupting impacts to the country's food systems.

There is a high proportion of internal migration (17.7%) as people settle in other districts, often towards Dili. There is limited evidence on environmental migration as a result of climate change, however there is already an observed yearly displacement due to floods and landslides – likely to rise with increased rainfall intensity.

Mental health issues (ie. anxiety, stress, depression, post-traumatic stress syndrome) as a result of climate change and extreme weather events around the world have been identified in numerous studies. However, there is limited evidence linking mental health issues to climate change in Timor-Leste.

Nevertheless, there is reason to believe that those already suffering from mental illnesses are likely to face multifaceted challenges as a result of direct and indirect climatic stressors on livelihoods, people and services.

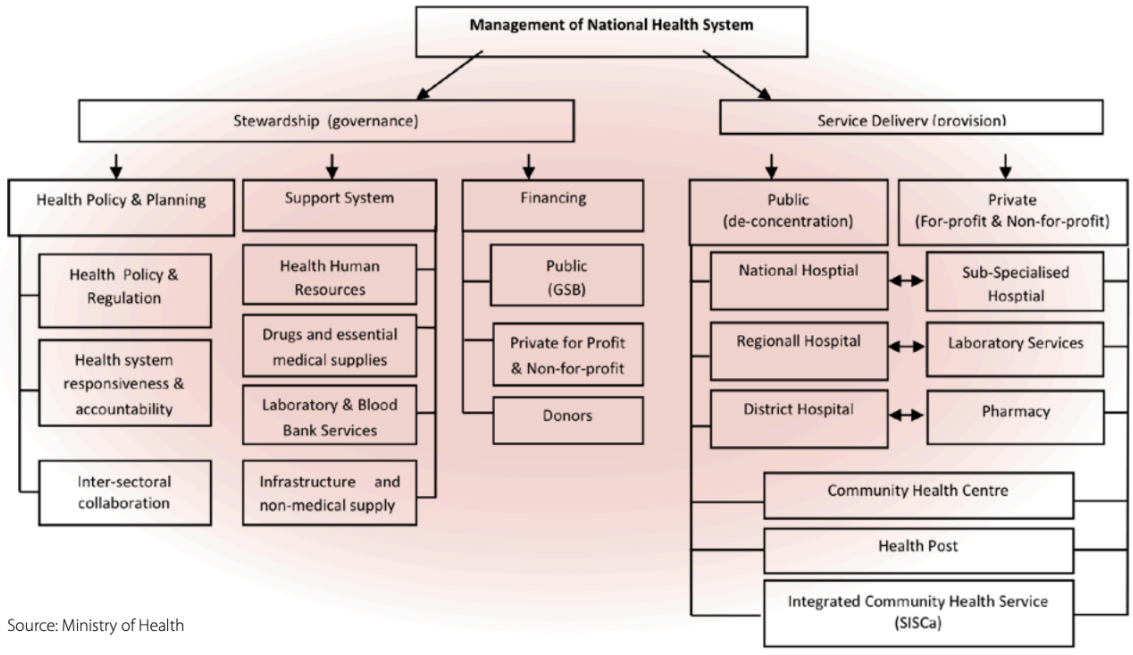
Key areas of concern from global studies have shown how a changing climate is altering the dynamics and risk of negative maternal health outcomes, forced child marriages, human trafficking, sexual exploitation and gender-based violence. While there are considerable gaps in research and evidence that link climate change and sexual and reproductive health rights both globally and in Timor-Leste, some key trends to consider include: poorer access to and delivery quality of sexual and reproductive healthcare services; increasing intimate partner violence that is already notably high in Timor-Leste; poorer reproductive, maternal, newborn and child health due to climate change impacts toward nutrition.

2.3 Timor-Leste's Healthcare System

Health care service is a fundamental right of all Timorese, guaranteed by the constitution. The Government of Timor-Leste remains committed to achieving Universal Health Coverage (UHC) as outlined in its National Health Sector Strategic Plan (NHSSP) 2011-2030.

The MOH designs, directs, manages and coordinates all government health care and pharmaceutical policy and activities throughout the country. However, access to health services is a significant concern in Timor-Leste, given that 70% of the population resides in rural areas, scattered across small villages isolated by mountainous terrain and inadequate road conditions. Additionally, the country faces alarming malnutrition rates, with Timorese children experiencing the highest levels of stunting and wasting in the WHO SEARO region. Malnutrition among women is also a critical issue, with micronutrient deficiencies, including iron, vitamin A, and iodine, posing substantial challenges to public health.

Figure 10. National health system model (as of 2023)



Source: Ministry of Health, cited from the Strategic Development Plan document[15].

2.3.1 Timor-Leste's Healthcare System

Timor-Leste has a three-tiered referral system. The three tiers include one national tertiary hospital, five district referral hospitals and numerous community health centers and health posts. At the district/municipality level, primary health care is provided through a network of: 66 Community Health Centres (CHCs) and 205 Health Posts (HPs). In addition, the CHCs undertake special monthly outreach programmes known locally as SISCa (Servisu Integrado Saude Comunitaria) or 'Integrated Community Health Service', which provides access to health services for the people living in villages and sucos within a 1 hour walk[16]. The private health system remains relatively underdeveloped, although the MoH estimates that about 25% of basic health services are delivered by private providers (both for profit and not for profit).

Timor-Leste also implements a tax-based health system, which is predominantly publicly financed and provided. Health services are provided free at the point of use, as a result, proportionate government contributions to health care spending are large (90% of total health care expenditures). However, the absolute amount of government spending on health care is low, at US$101 per capita[17]. This low level out-of-pocket payments is an indication of limited infrastructure and availability of health services rather than low-cost access to a full range of health care services. Timor-Leste's health sector is heavily dependent on external funding, and World Bank data show that the share of government funding for health care has been falling since 2011[18]. This is concerning in a country still considered to be in a post-conflict period, where health status indicators are persistently lower than in other countries in the region.

2.3.2 Determinants of Health Care Utilisation

Guinness et al (2018)[17] conducted a national cross-sectional survey of health care utilization in 1,712 households in Timor-Leste to explore the need, predisposing and enabling factors affecting health care utilization at both primary and secondary care facilities. The findings are as follows:

- Despite the availability of services that are free at the point of use, the distribution of health care service utilization in Timor-Leste is not equitable. According to the Andersen behavioral model, this means that 'predisposing factors' and 'enabling factors have a stronger influence on the decision to use health services.
    - Predisposing factors include age and sex.
    - Enabling factors include the ability to pay, distance to health services, education level as well as income.
- Gender is an important predisposing factor, with women being the most likely to use primary care or hospital services. This is most likely driven by the need for maternal and child health services.
- Chronic disease was found to have a large and significant impact on whether to seek health care services and is a major predictor of health care utilization.
- Rural respondents are 1.3 times more likely to seek health care in a primary care facility than urban residents and less likely to seek health care in a hospital than urban residents.
- Government health care expenditures are weighted in favor of the hospital level. Findings suggest a higher level of subsidy to urban residents and those in the richest quintile.

The study recommends health care reforms in Timor-Leste needing to focus on maximizing the enabling factors associated with improved health care utilization by improving access to secondary care to reduce these inequalities. The study confirms that provision of free health services at the point of use is not always sufficient to ensure a more equitable distribution of health care service utilization.

2.3.3 Access to Medical Supplies

A 2015 article from the World Bank[20] reports access to medication in the country was a significant issue, particularly in remote areas of Timor-Leste without hospitals and where medications and supplies are only available at HPs or CHCs. Responsibility for the distribution of drugs and medical supplies in the country falls under the MoH. This was done through an autonomous medical store called Serviço Autónomo de Medicamentos e Equipamentos de Saúde (SAMES) with the MoH responsible for managing the procurement and distribution of supplies.

Under this system, the availability of drug stocks and quality management of health facilities in Timor-Leste faced challenges including the distribution system that CHCs rely on to maintain adequate drug stocks. This is also affected by increasing numbers of patients and items not being able to reach the health centers due to bad roads and lack of transportation. To try to solve this issue, the World Bank worked with the Timor-Leste Government to support community outreach services, including improvements to SAMES as follows:

- Recruitment of a financial management and long-term supply chain management consultant to implement a new pharmaceutical management system at SAMES called mSupply
- mSupply aims to provide essential information on drug stock at SAMES, including distribution facts, details on the international market price of drugs imported, and drug expiration dates
- It should also be capable of generating reports, which will ultimately improve supply chain management and procurement

In 2023, the National Institute of Pharmacy and Medical Products (FPM is its acronym in Portuguese) was established in Timor-Leste by a decree-law, replacing SAMES.[21] FPM is now designated as the public institute responsible for supplying pharmaceutical products and medical equipment to the National Health Service. Aside from importing and producing pharmaceutical products and medical equipment, FPM is also tasked to ensure quality control of the goods as well as ensure best practices in storage and distribution to the National Health Service, and their resale to pharmacies and private national health units, when necessary.

2.3.4 Climate Change Impacts on Timor-Leste's Health System and Facilities

The IFRC Country Assessment Report[13] identified decades of conflict having significantly impacted critical infrastructure, including the health, water and sanitation systems in Timor-Leste. Furthermore, access to health care facilities may be impacted by the climate crisis. For example, roads in high elevation areas are routinely washed away by landslides, and those in low elevations are routinely blocked by floods and the debris of landslides. Increased extreme rainfall is projected to further hamper access to the health care services that communities require.

To address issues on climate resilience in the health sector, the Timor-Leste government identified the following heath sector adaptation priorities in their 2020 National Adaptation Plan[19]:

- Integrated disease surveillance and early warning systems
- Mainstreaming and implementation of climate change into the Comprehensive Primary Health Care System
- Enhance the capacity of the health sector and communities to anticipate and respond to changes in distribution of endemic and epidemic climate-sensitive diseases, and reduce the vulnerability to infection of population in areas at risk from expansion of climate-related diseases
- Create awareness among the health service providers at all levels on the different types of health risks associated with different types of climate risks and the different coping and adaptation measures so that these coping strategies could be communicated to the vulnerable populations
- Prepare the health workers, institutions, and communities on the prevention and response mechanisms to be adopted related to different diseases and health challenges exacerbated by climate change
- Support the development of health database and data management systems which includes climate sensitive health risk and vulnerability information to facilitate effective, targeted and efficient delivery of health services
- Advocate establishing specialized public health service unites well equipped and well trained to respond to health issues during climate induced disasters

2.3.5 WHO Timor-Leste Country Cooperation Strategy 2021-2025

Since 1999, WHO has been a key partner for Timor-Leste, providing technical assistance to strengthen the country's public health system. Timor-Leste officially joined WHO in 2003 and became a member of the South-East Asia Region. The most recent Country Cooperation Strategy 2021-2025 (CCS) outlines a five-year plan for WHO's collaboration with the government and other partners, focusing on providing targeted technical support aligned with Timor-Leste's needs to achieve the Sustainable Development Goals (SDGs) and further strengthen their healthcare system.

The CCS has four strategic priorities as outlined below. This specific initiative of strengthening health facilities to become climate-resilient and environmentally sustainable falls under the commitment of WHO under Strategic Priority 2.

Box 1. Strategic Priorities under the WHO Timor-Leste Country Cooperation Strategy 2021-2025

Strategic Priority 1: By 2025 people of Timor-Leste have access to equitable, high-quality, resilient, inclusive, and people centered UHC • Strengthen the health system through improved workforce, improved access to medicines, health information, sustainable finance and implemented service packages • Improved care through the life course and for communicable and noncommunicable diseases	**Strategic Priority 2:** By 2025 people of Timor-Leste are better protected from health emergencies including disease outbreaks and disasters, through strengthened national prevention, preparedness, and response capabilities • Strengthen national capacity in emergency health preparedness • Strengthen prevention of emerging high-threat infectious hazards • Strengthen national capacity to build climate-resilient health system

Strategic Priority 3: By 2025 people of Timor-Leste enjoy better health and well-being by addressing determinants of health through strong multisectoral action • Strengthen legal and regulatory mechanisms for health protection and promotion • Facilitate environmental health and improve access to clean air, water, and sanitation • Strengthen health promotion interventions for improved health behaviours	**Strategic Priority 4:** By 2025, health systems are supported by strong and sustainable leadership and governance at every level towards the vision of "Healthy East Timorese in a healthy East Timor" • Effective governance structures and mechanisms strengthened to improve functionality and regulation of health systems • Community engagement and empowerment for the realization to the right to health • Monitoring and addressing equity to ensure that no one is left behind WHO acts as an effective leader, convener and advocate for health through partnership and collaboration with all sectors of government, United Nations Country Team and development partners

Section 3 | Climate Vulnerability and Environmental Sustainability Assessment of Target Health Care Facilities

3.1 Fundamental components of climate-resilient and environmentally-sustainable health care facilities

Based on the data gathered through the KIIs and checklists, the team analyzed the climate resilience and environmental sustainability of facilities based on the 4 fundamental requirements of WHO.

Box 2. Four components of climate-resilient and environmentally-sustainable healthcare facilities[4]

Health Workforce Recognizing the pivotal role of health workers in building climate resilience and environmental sustainability in health care facilities, it is essential to prioritize their awareness, training, and empowerment. Raising awareness and building their capacity are key requirements for the successful implementation of interventions. Adequate staffing with healthy and safe working conditions is crucial to effectively address health risks resulting from climate change. Capacity development through targeted training and knowledge management equips health care workers to respond to climate risks and minimize environmental threats arising from the operation of facilities. Effective communication efforts also promote a culture of climate resilience and environmental sustainability among health workers, patients, visitors, target communities, and other sectors.	**Water, Sanitation, Hygiene, and Healthcare Waste Management** Access to safe and sustainable water, sanitation, and healthcare waste management services is vital for ensuring the quality of care and effective infection prevention and control in health care facilities. Monitoring and assessment of water, sanitation, chemical use, and healthcare waste management should consider the potential impacts of climate change. By promoting proactive action, healthcare facilities can address existing vulnerabilities and improve their capacity to manage water, sanitation, chemical, and healthcare waste risks. This involves conducting comprehensive assessments and implementation of health and safety regulations with a focus on climate resilience environmental sustainability to safeguard water, sanitation, chemical safety, and healthcare waste management practices.
Energy Access to reliable and affordable electricity is indispensable for achieving UHC and meeting multiple SDGs in health care facilities. However, many health care facilities struggle with unreliable and costly electricity supply, hindering essential services. To enhance climate resilience and environmental sustainability, monitoring and assessing energy services must consider the impacts of climate change. Proactive risk management involves building the capacity of health care facilities to respond to energy-related risks. Emphasizing health and safety regulations on energy use and access is essential in aligning energy practices with climate change adaptation and mitigation efforts. Transitioning to renewable energy sources can further enhance climate resilience and reduce the environmental impact of health care facilities.	**Infrastructure, Technologies, and Products** The structural and non-structural elements of health care facilities significantly influence their climate resilience and environmental sustainability. Integrating climate-resilient architectural aspects, emergency access routes, critical systems, and medical equipment ensures healthcare facilities can effectively respond to climate-related challenges. Additionally, the adoption of emerging technologies like digital health can contribute to efficient and sustainable health service delivery. Furthermore, the promotion of new systems and technologies should focus on those that integrate climate resilience, environmental sustainability, and enhanced health service delivery. Sustainable health care facility operations involve adopting and procuring low environmental impact technologies, processes, and products that not only improve climate resilience but also contribute to environmental sustainability.

3.2 Dili District

3.2.1 Climate and health vulnerability

Dili is the national capital of Timor-Leste. Although it is the most populous district, with approximately 324,000 residents, it is also the smallest in terms of land area, covering only 227.6km². Located on the north coast of the island, it consists of the National capital Dili and 6 sub districts of Nain Feto, Vera Cruz, Dom Aleixo, Cristo Rei, Metinaro (all coastal) and Atauro Island.

Table 5. Impacts on the 4 Components per Hazard Type in Dili District

ARE THESE AREAS IMPACTED? X Current observed impacts O Possible impacts with changed conditions					
CLIMATE HAZARD TYPE	**IS HAZARD OR EXPOSURE PRESENT? Yes/No**	**Health workforce**	**WASH and health care waste**	**Energy services**	**Infrastructure, technologies, products, processes**
Flood	Yes	x	x	x	x
Storm	Yes	x	x	x	x
Sea-level rise	Yes	o	o	o	x
Drought	Yes	o	o	o	o
Heatwave	Yes	o	o	o	o
Wildfire	Yes	o	o	o	o

Dili is one of the most vulnerable districts to flooding. Situated only a few meters above sea level, Dili is also particularly vulnerable to sea level rise and coastal flooding[23]. As the national capital and the most developed district in the country, Dili typically has higher access to improved sanitation systems. However, the National Strategic Development Plan[15] also reports on poor drainage infrastructure and stormwater pollution resulting in the frequency and significance of flooding in Dili during rainfall events.

During the wettest and hottest months of the year (December - February, peaking in January), Dili is a hotspot for vector-borne diseases, particularly dengue fever, notably experiencing an extreme outbreak of dengue fever in January 2014[13]. In Dili, the peak fire season typically begins in early September and lasts around 12 weeks[27].

3.2.2 Hospital Nacional Guido Valadares

Hospital Nacional Guido Valadares (HNGV) is the national referral hospital in Dili, Timor-Leste, providing a range of medical services to patients from all over the country. Despite being a critical healthcare institution, HNGV faces challenges due to resource constraints, limited infrastructure maintenance, and potential vulnerabilities during natural disasters. The hospital's services are essential in addressing infectious diseases, malnutrition, maternal and child health issues, as well as the growing burden of non-communicable diseases and mental health concerns in Dili.

Table 6. Vulnerability Checklist Results of HNGV

COMPONENT	VULNERABILITY SCORE	
Health Workforce	60.00%	Medium
WASH and Waste	47.22%	Medium
Energy	47.37%	Medium
Infrastructure	54.39%	Medium
OVERALL SCORE	**52.24%**	**Medium**

Based on the checklist completed by the HNGV representatives, their overall level of vulnerability is *medium (facility with basic preparation and medium-level of response)* and their biggest challenges and weak points are the health workforce.

Figure 11. Water supply system in HNGV

Figure 12. Medical Incinerator in HNGV

The hospital staff at HNGV have received training on managing and treating diseases related to climate change, which is crucial given the vulnerability of Dili to vector-borne diseases during the wettest and hottest months. However, there seems to be a lack of awareness among the staff regarding the direct connection between climate and health. This gap in knowledge should be addressed through targeted

awareness campaigns and training to ensure that the healthcare workforce understands the implications of climate change on public health.

The regular monitoring of WASH and healthcare waste management facilities is commendable, as it helps identify potential issues and ensure proper functioning. However, the lack of a backup water supply system is a concern, especially given Dili's vulnerability to flooding. The hospital should consider installing a backup water storage system to ensure a continuous water supply during emergencies.

Segregation of waste at source is a positive step, but the improper implementation calls for improvement. WHO's involvement in implementing color coding of waste is a good initiative that can enhance waste segregation practices.

Medical waste is incinerated on site. While it addresses infection control, it is essential to acknowledge that incineration is not environmentally sustainable and has negative health impacts due to the release of pollutants. The staff that was interviewed by the team is aware of the air pollution caused by incineration, but the fact that the nearby community has raised concerns indicates that further action might be needed to mitigate the impact. As the country is still developing and transitioning to more sustainable initiatives, it may take time to explore and implement alternative waste management methods. During this period, it is recommended that the hospital engages in dialogue with the community to address their concerns and ensure that incineration is conducted in a controlled and environmentally responsible manner.

Having backup generators to cope with power outages is essential for a hospital, especially during peak fire seasons and extreme weather events that may disrupt the power supply. However, the cost of maintaining generators and fuel expenses should be carefully managed to avoid financial strain on the facility. Exploring renewable energy sources like solar panels can be beneficial for reducing reliance on fossil fuels and cutting operational costs.

Figure 13. Backup generators in HNGV

The use of fluorescent lighting with mercury content is concerning due to its environmental impact. The hospital should prioritize a gradual transition to energy-efficient LED lighting, which is not only eco-friendly but also cost-effective in the long run.

Having green spaces within the hospital premises is advantageous as they contribute to cooling the facility naturally, especially during hot weather. Hospital authorities should continue maintaining and expanding these green spaces to optimize their cooling effects.

Regular assessment and monitoring of the entire facility are crucial for identifying weaknesses and improving climate resilience. However, the absence of written plans on emergency preparedness and contingency is a potential area of improvement. The hospital should develop comprehensive plans to address climate-related emergencies and ensure all staff members are familiar with them through regular drills and training.

The availability of backup/alternative sources for laundry, food, etc., is beneficial, as it reduces dependence on external resources during emergencies. This practice should be continued and expanded to cover other critical aspects of hospital operations.

Given Dili's vulnerability to sea-level rise and coastal flooding, the hospital should take proactive measures to assess and address potential risks. This may involve elevating critical infrastructure, developing evacuation plans, and collaborating with relevant authorities to stay informed about climate change projections.

Overall, HNGV has made commendable efforts to address climate vulnerabilities in certain areas. However, there is room for improvement, particularly in enhancing staff awareness, waste management practices, energy efficiency, and emergency preparedness. Implementing these improvements will strengthen the hospital's resilience to climate-related challenges and ensure it continues to provide quality healthcare services in the face of a changing climate.

3.2.3 Maternidade-Escola de Nossa Senhora de Fatima

Maternidade-Escola de Nossa Senhora de Fatima, a private, semi-charity, secondary hospital focusing on obstetrics and pediatric care, plays a crucial role in providing essential healthcare services in Dili.

Table 7. Vulnerability Checklist Results of Maternidade-Escola de Nossa Senhora de Fatima

COMPONENT	VULNERABILITY SCORE	
Health Workforce	58.33%	Medium
WASH and Waste	58.33%	Medium
Energy	60.61%	Medium
Infrastructure	45.45%	Medium
OVERALL SCORE	**55.68%**	**Medium**

Based on the checklist completed by the representatives of Maternidade-Escola de Nossa Senhora de Fatima, their overall level of vulnerability is *medium (facility with basic preparation and medium-level of response)* and their biggest challenges and weak points are energy, WASH and waste, and health workforce.

Not all staff members are trained on what to do during emergencies, which is a concern given Dili's susceptibility to extreme weather events such as flooding. It is crucial for all staff members, including medical and non-medical personnel, to receive proper training to respond effectively during emergencies and ensure the safety of patients and themselves.

The limited budget affecting staffing levels may lead to increased workload for employees, which can impact their efficiency and potentially compromise patient care. The hospital should explore ways to optimize staffing and ensure that employees do not multitask excessively to avoid burnout and maintain service quality.

The establishment of a system to cover for absent staff during emergencies, such as the 2021 flooding, demonstrates proactive planning. This system should be well-documented and regularly reviewed to ensure its effectiveness.

Figure 14. Water filtration system in Maternidade-Escola de Nossa Senhora de Fatima

Using groundwater supply with a filtration system is a good approach to ensure a stable water source. Regular water quality testing is also commendable as it helps monitor the safety of the water supply. However, the drainage system discharging wastewater directly into the ground raises environmental and public health concerns. The hospital should consider implementing proper wastewater treatment and disposal systems to minimize environmental pollution.

Like most of the facilities in Timor-Leste, the hospital uses an incinerator for medical waste management. However, the hospital should explore more sustainable waste disposal methods, especially for general waste, to reduce environmental impacts. Collaborating with waste management authorities for proper waste disposal and recycling can be beneficial.

Figure 15. Waste incinerator in Maternidade-Escola de Nossa Senhora de Fatima

Experiencing power outages is a common challenge in Dili, and having a backup generator is essential for a hospital. However, the high fuel consumption for the generator can be expensive for a semi-private hospital with limited resources. The hospital should consider exploring renewable energy solutions, such as solar power, to reduce reliance on fossil fuels and mitigate operational costs.

The well-ventilated rooms and the use of LED lighting and energy efficiency measures are positive steps in reducing energy consumption. The hospital should continue to prioritize energy-efficient practices to minimize its carbon footprint.

The availability of green spaces is advantageous, as they contribute to cooling the hospital naturally. The hospital should maintain and expand these green spaces to optimize their cooling effects and create a more pleasant environment for patients and staff.

Figure 16. Backup generator in Maternidade-Escola de Nossa Senhora de Fatima

Having ample fire hoses available is essential for fire safety preparedness. The hospital should regularly inspect and maintain fire safety equipment to ensure its functionality during emergencies.

The ongoing renovation and maintenance of the hospital's infrastructure indicate a commitment to improving the facility. The hospital should consider incorporating climate-resilient features during renovations, such as flood-resistant construction and energy-efficient technologies.

Limited budget constraints may impact the development and implementation of disaster preparedness and resilience plans. However, the hospital should seek external support and collaborate with relevant stakeholders, such as government agencies and NGOs, to build resilience and preparedness for climate-related events.

In conclusion, Maternidade-Escola de Nossa Senhora de Fatima plays a critical role in providing healthcare services in Dili. To enhance its climate resilience and environmental sustainability, the hospital should prioritize staff training for emergencies, explore sustainable waste management solutions, seek energy-efficient alternatives, and incorporate climate-resilient features during renovations. Collaborating with external organizations and stakeholders can also help the hospital overcome budget constraints and build a more resilient healthcare facility for the community it serves.

3.2.4 CHC Comoro

The community health center in Comoro in Dili serves as a primary healthcare facility for a population of around 77,000 people. The health center's primary focus is to provide basic medical services and preventive care to the local community. The center has around 23 programs and services being implemented which includes maternal and child health, immunizations, newborn care, nutrition, reproductive health/family planning, outpatient/inpatient, laboratory services, mental health services, among others. The center manages 4 health posts and has 49 doctors, 27 nurses, 28 midwives, 24 other staff (pharmacist, lab technician), 1 security guard, 3 drivers, and 10 cleaning staff.

Table 8. Vulnerability Checklist Results of CHC Comoro

COMPONENT	VULNERABILITY SCORE	
Health Workforce	57.78%	Medium
WASH and Waste	93.94%	High
Energy	81.48%	High
Infrastructure	77.78%	High
OVERALL SCORE	**77.74%**	**High**

Based on the checklist completed by the representatives of CHC Comoro, their overall level of vulnerability is *high (facility that is unprepared and with low-level of response)* and their biggest challenges and weak points are WASH and waste.

The training of focal persons per health program is a positive step, as it helps build capacity and knowledge within the facility. However, the limited dissemination of learnings from these training sessions may hinder the facility's ability to fully implement best practices in various health programs. It is crucial to establish a system for knowledge sharing and continuous learning to maximize the benefits of these training sessions.

The provision of appropriate personal protective equipment (PPE) to the staff is essential, particularly during instances when staff attendance is most needed, such as during health emergencies or disease outbreaks. This practice helps protect the health and safety of healthcare workers, ensuring they can continue providing essential services.

There were a number of WASH-related information, education, and communication (IEC) campaign materials present in and around the facility which is a positive initiative. However, the lack of a direct water supply poses a challenge to the facility. Underground storage tanks are available but will not be sufficient for when a climate-related disaster happens. It is essential to address the issue of contamination in the underground storage tanks to maintain the quality and safety of the water supply. Regular water quality testing and periodic maintenance of the tanks can help address this concern.

Figure 17. An example of hygiene-related IEC material in CHC Comoro

Power outages are a common challenge faced by both national and local health facilities in Dili. The availability of a back-up generator at the community health center is critical to ensuring uninterrupted healthcare services during power outages. Prioritizing back-up power supply for essential units like the maternity and emergency units demonstrates a proactive approach to addressing energy-related challenges. However, the generator set is in an area that may be vulnerable to flooding. Ensuring that the backup power supply is in a safe area will be crucial for continued provision of care during and after climate disasters.

Figure 18. Backup generator set in CHC Comoro

Periodic evaluation of the facility's structure is essential for identifying vulnerabilities and addressing any issues promptly. However, the lack of action from local authorities to implement changes based on evaluation results is a concerning obstacle to enhancing climate resilience. The health center should engage in constructive dialogues with local authorities to advocate for necessary structural improvements and seek support for implementation.

The use of electronic records for storing patient profiles is a positive step towards improving data management and accessibility. Electronic records can streamline patient care processes and facilitate quicker access to medical information when needed.

Considering that the CHC operates with limited resources, it is understandable that implementing significant changes towards more sustainable practices may take time. In this context, the health center can prioritize interventions that will improve its resilience to impacts of climate change such as improving its water supply and waste management systems. Collaborating with relevant stakeholders, such as the MOH and local authorities, can help leverage support and resources for implementing such initiatives. As the facility operates with limited resources, gradual and pragmatic steps will be key to achieving positive changes over time.

3.2.5 HP Tasitolu

The health post in Tasitolu serves as the lowest level of health facility in Timor-Leste's healthcare system, operating under the management of the community health center in Comoro. Given its status and location, it faces unique challenges in addressing climate resilience and environmental sustainability.

Table 9. Vulnerability Checklist Results of HP Tasitolu

COMPONENT	VULNERABILITY SCORE	
Health Workforce	73.33%	High
WASH and Waste	75.76%	High
Energy	74.07%	High
Infrastructure	66.67%	High
OVERALL SCORE	**72.46%**	**High**

Based on the checklist completed by the representatives of HP Tasitolu, their overall level of vulnerability is *high (facility that is unprepared and with low-level of response)* and their biggest challenges and weak points are WASH and waste, energy, and health workforce.

The dedication of the staff to continue providing services during the 2021 flooding, even using boats to reach patients, is commendable. However, the lack of proper protective gear, with staff clearing the health post with only gloves and masks during flooding, raises concerns about their health and safety. The health post should prioritize providing necessary personal protective equipment (PPE) to ensure the well-being of its staff during emergencies.

The absence of training and knowledge on climate change and health, as well as emergency/disaster preparedness, is a significant gap. Training on these topics is crucial to help the health post staff understand and address the potential health risks associated with climate change and to effectively respond during emergencies and disasters.

Staff not being trained on how to treat water for safe drinking of patients is a concerning issue, especially considering the lack of access to potable water at the health post. Proper training on water treatment techniques can help ensure the safety of the water provided to patients and staff.

The health post's reliance on groundwater without filtration and treatment raises concerns about the safety of the water supply. Implementing basic water filtration and treatment measures can significantly improve water quality and reduce health risks for patients and staff.

The open burning of general waste outside the health post is not environmentally sustainable and can contribute to air pollution. The health post should explore safer waste disposal methods, such as collaborating with the community health center for proper waste management.

The lack of a safe area for chemical supplies and hazardous waste is a potential hazard to both staff and the environment. Proper storage and disposal of hazardous materials are critical to prevent accidents and minimize environmental impacts.

Figure 19. Hazardous waste are seen underneath and next to a table in HP Tasitolu

The absence of a generator leaves the health post vulnerable to power outages, which can disrupt critical services, particularly vaccine storage. The health post should explore opportunities for acquiring a generator or collaborate with the community health center to develop contingency plans for vaccine storage during power outages.

Improving ventilation in the facility and providing adequate lighting in all rooms are essential for the comfort and safety of patients and staff. The health post should prioritize these improvements to create a conducive and safe environment for healthcare services.

The health post's location in an old building and its previous experience with flooding highlight the vulnerability of its infrastructure to extreme weather events. Planning to raise the health post to a community health center level and constructing a new building that considers these issues is a positive step towards enhancing climate resilience.

Moving important equipment to safe places during the rainy season demonstrates proactive planning, but the health post should develop a formalized plan and ensure all staff members are aware of it to protect critical assets during weather-related events.

Regular monitoring of the health post by the community health center is essential for identifying weaknesses and addressing issues promptly. This collaborative approach between the health post and the community health center is beneficial for enhancing healthcare services.

Considering the challenges faced by the health post, it is important to recognize that transitioning to more sustainable practices may take time due to limited resources. The health post should prioritize pragmatic approaches, seek external support, and collaborate with relevant stakeholders to improve its climate resilience and environmental sustainability gradually.

In conclusion, to enhance its climate resilience and environmental sustainability, the health post in Tasitolu should prioritize staff safety with proper protective gear, invest in staff training on climate change, emergency preparedness, and water treatment, improve water quality, explore waste management alternatives, plan for backup power supply, enhance infrastructure, and collaborate with the community health center for support and monitoring. Gradual improvements, realistic planning, and external partnerships will aid the health post in its journey towards providing more resilient and sustainable healthcare services to the community.

3.3 Covalima District

3.3.1 Climate and health vulnerability

The Covalima district is located in the western part of the country and borders Indonesia to the west. It has a population of 73,909 and an area of 1,206.7km². The capital of Covalima is Suai and its district comprises 7 sub-districts. It is identified as a district with one of the largest areas of pastures.

Table 10. Impacts on the 4 Components per Hazard Type in Covalima District

ARE THESE AREAS IMPACTED? X Current observed impacts O Possible impacts with changed conditions					
CLIMATE HAZARD TYPE	**IS HAZARD OR EXPOSURE PRESENT? Yes/No**	**Health workforce**	**WASH and health care waste**	**Energy services**	**Infrastructure, technologies, products, processes**
Flood	Yes	x	x	x	x
Storm	Yes	x	x	x	x
Sea-level rise	Yes	o	o	o	o
Drought	Yes	x	x	o	o
Heatwave	No	o	o	o	o
Wildfire	Yes	o	o	o	o

Suai, the capital of Covalima, is identified as one of the areas with the least access to safe and clean water supply in Timor-Leste (strategic development plan). Components of the management of WASH will therefore be of emphasis in the vulnerability assessment. Along with Ainaro, Covalima also has one of the highest coastal instability in the country making it susceptible to hazards such as floods and vulnerable to sea level rise[26]. In terms of historical loss due to flood events in Timor Leste, Covalima has

suffered significantly from houses destroyed and damaged as well as number of people affected (final hazard assessment). Due to exposure to droughts and extreme rainfall, Covalima also identifies as one of the most vulnerable districts to chronic food insecurity. Compared to the other two target districts, Covalima holds the largest forest area (GFW). Wildfire hazard is present, with peak fire season typically beginning in early September and lasts until December[27].

3.3.2 Suai Referral Hospital

Established in 2009, Suai Referral Hospital accommodates patients for services such as outpatient, pediatric, maternity, adult, obstetrics-gynecology, and some major operations. It has 24 standard beds with additional 10 more beds should need arise. With a total of 114 staff including medical, allied medical, and administrative, the Suai Referral Hospital is able to serve an average of 46 patients per day in its outpatient department, which runs from Monday to Friday. Patients seek medical help mainly due to dermatitis, diarrhea, and asthma to name a few. Meanwhile, their Emergency Department is open 24 hours everyday to cater to the residents in the community.

Table 11. Vulnerability Checklist Results of Suai Referral Hospital

COMPONENT	VULNERABILITY SCORE	
Health Workforce	71.67%	High
WASH and Waste	65.00%	Medium
Energy	42.42%	Medium
Infrastructure	60.61%	Medium
OVERALL SCORE	**59.92%**	**Medium**

Based on the checklist completed by the representatives of HP Tasitolu, their overall level of vulnerability is *medium (facility with basic preparation and medium-level of response)* and their biggest challenges and weak points are health workforce, WASH and waste.

During the time of the interview and visit, the director of the hospital shared that the hospital itself has not experienced direct impacts from natural disasters. However, they have noticed that the changing climate has contributed to an increase in crocodile attacks in the area, making it more prevalent due to the presence of crocodiles. This poses a threat to the safety of patients and staff in the region.
The hospital grapples with a shortage of staff, which is partially offset by the recruitment of student interns annually. The hospital's limited capacity, with only two beds for their operating room, and the lack of public health staff present significant challenges in providing adequate healthcare services to the community. The prevalence of respiratory issues such as asthma and skin problems like dermatitis indicates the influence of the environment on public health. Changing climate conditions, unclean housing environments, and a lack of clean water contribute to the surge in asthma and dermatitis cases.

The lack of proper WASH facilities hinders its ability to maintain a healthy and hygienic environment especially with its water supply. Furthermore, the intermittent access to water (with two weeks without

water last May 2023) impacts the hospital as well as the community's well-being and makes water management a critical issue.

Figure 20. One of the few water storage facilities in Suai Referral Hospital

And the organization struggles with managing supplies and logistics, encompassing pharmaceutical supplies, medical equipment, and even air conditioners, affecting its overall operational efficiency and effectiveness. Addressing these issues will be crucial to lessen the hospital's vulnerability.

Among the four (4) components in the checklist, it shows that the Health Workforce appears to be the most vulnerable component with a score of 71.67%, indicating a higher level of vulnerability compared to the other components such as WASH and Waste (65%), Infrastructure (60.61%), and Energy (42.42%). The overall vulnerability score for all components combined is 59.92%. Therefore, efforts should be focused on strengthening the Health Workforce to address its higher vulnerability and ensure better overall resilience.

Based on the Health Workforce capacity, Suai Referral Hospital ranks second, which presents the second biggest vulnerability due to its lack of staff. Aside from this, its current staff lacks training about climate change and emergency preparedness, although they have not experienced any impact on disaster.

3.3.3 CHC Covalima

The CHC Covalima site visit revealed critical issues in waste management, energy, and infrastructure. When the team visited the center, there was no one available to be interviewed and the facility was closed. However, they were able to observe the facility's exterior and, with the assistance of a WHO staff member stationed in the district, later requested the completion of the checklist. It is important to take note of this as the checklist results have some inconsistencies and were not validated with a complete site assessment of the interior areas of the facility.

The overall vulnerability score of 90%, indicates that the Covalima CHC is highly vulnerable. Among the individual components contributing to this score, the Energy and the Infrastructure are the most vulnerable at 100%, while Health Workforce follows closely behind at 93.33%. WASH and waste have a relatively lower vulnerability at 66.67%.

Table 12. Vulnerability Checklist Results of CHC Covalima

COMPONENT	VULNERABILITY SCORE	
Health Workforce	93.33%	High
WASH and Waste	66.67%	High
Energy	100.00%	High
Infrastructure	100.00%	High
OVERALL SCORE	**90.00%**	**High**

However, these results contradict the exterior site assessment done at the said facility. The water storage tanks at the facility present potential risks to the availability of clean and safe water due to uncertainty about their functionality and water quality. Inadequate waste management practices, such as mixing general waste with biohazardous medical waste and improper waste bin labeling, further exacerbate environmental and health concerns. The presence of an open burning site for waste adds to these issues, necessitating urgent attention to ensure a safer and healthier environment for the facility's occupants.

While the facility provides air conditioning units, their functionality remains uncertain due to an absence of assessment with the person-in-charge during the visit. The CHC also contains a solar panel, but its operational status cannot be confirmed. Moreover, emergency power generators are not readily accessible, with one noticeable generator being in a state of disrepair and disuse.

The facility exhibits significant safety and maintenance deficiencies, including the absence of a fire suppression system and apparent structural dilapidation in walls, floors, windows, and roofing, posing risks in case of fire emergencies and compromising building stability. Damaged fences and inadequate inventory management for pharmaceutical and medical supplies raise concerns about security and health hazards. The haphazard storage of damaged medical equipment further highlights the facility's lack of organization and safety measures. Urgent attention is required to address these issues and ensure the well-being of the facility's staff and patients.

Figure 21. An unused generator at the Covalima Community Health Center

On a positive note, the facility seems to offer rooms with ample natural lighting and excellent ventilation, creating a comfortable and inviting atmosphere. Additionally, the substantial parking lot/garage enhances convenience and accessibility for visitors or patients. Despite these positives, immediate action is necessary to rectify the facility's safety, maintenance, and water quality issues to ensure a safe and pleasant environment for all those involved.

Figure 22. Medical wastes are mixed with general waste and are thrown in the vicinity of the facility

3.3.4 HP Lakonak

The Health Post in Lakonak is open from Monday to Friday from 8:30 in the morning to 5:30 in the afternoon. It employs one (1) doctor, two (2) nurses, two (2) midwives, one (1) public health officer, and one (1) volunteer. It serves an average of 60-75 patients every week, catering to services such as immunization, outpatient, family planning, and general antenatal care to a total of 189 families in the community.

Table 13. Vulnerability Checklist Results of HP Lakonak

COMPONENT	VULNERABILITY SCORE	
Health Workforce	75.56%	High
WASH and Waste	90.91%	High
Energy	85.19%	High
Infrastructure	88.89%	High
OVERALL SCORE	**85.13%**	**High**

Based on the vulnerability checklist, HP Lakonak's highest vulnerability score of 90.91% is attributed to the WASH and Waste category, indicating that issues related to water, sanitation, and waste management present the biggest vulnerability. Other critical vulnerabilities include Infrastructure with a score of 88.89% and Energy with a score of 85.19%. The Health Workforce category has a relatively lower vulnerability score of 75.56%. Overall, the vulnerabilities in WASH and Waste pose the most significant concern.

HP Lakonak faces critical water supply issues, lacking a consistent water source and sanitation for toilets, leading to inadequate water provision for patients and staff. Moreover, the community water supply used lacks proper contamination prevention measures due to the absence of valves and reliance on a small hose. Additionally, the leaking ceiling in the file storage room poses potential risks. The absence of proper waste segregation and safe waste storage, with sharps being the only waste segregated, further compounds the facility's safety concerns. Urgent action is needed to address these deficiencies and ensure a safer and more hygienic environment for patients and staff.

In this facility, some sockets lack bulbs and all installed bulbs are of the fluorescent/CFL type. The well-ventilated environment and ample natural indoor lighting suggest an energy-efficient approach to illumination. However, the presence of empty sockets indicates room for improvement in ensuring consistent illumination throughout the facility.

HP Lakonak has some basic preparedness measures with first aid kits available. However, its lack of an emergency triage area raises concerns about its ability to handle critical situations. The facility's access points being used for other purposes may hinder efficient patient flow and emergency response. The noticeable cracks on the walls and leaking ceiling indicate structural issues that require attention. Although the presence of fencing provides some security, improvements are needed to ensure the safety

and proper storage of pharmaceuticals by securely tucking away used bottles. Overall, HO Lakonak shows potential for improvement in its infrastructure, organization, and safety protocols to enhance its functionality and better serve its community.

Figure 23. Lakonak Health Post's open burning site of waste, including medical waste

The high vulnerability score of HP Lakonak on WASH and Waste indicates a lack of waste management training and assignment, leading to unaddressed waste disposal practices. The absence of proper infrastructure for water supply suggests the reliance on groundwater with no filtration, resorting to boiling for purification. Moreover, focusing its effort on WASH, especially on training within the facility, could potentially address the shortcomings in waste management and water treatment strategies.

3.4 Ainaro District

3.4.1 Climate and health vulnerability

The Ainaro district is located in the southwest part of the country and its capital is also called Ainaro. It has a population of 72,989 and an area of 869 km². It comprises 4 sub-districts. The Ainaro district has a coastal area on the south part of the island, but also mountain ranges, such as Mount Ramelau (2.960 m) which forms the highest peak in the country.

A 2015 Natural Hazard Risk Assessment[25] reports Ainaro as one of the most flood affected districts. A simulation result of strong wind hazards for a 100-year return period also identifies Ainaro as the most affected district. Ainaro also has historical landslide locations, with a few areas having very high landslide

susceptibility level. This will increase due to prolonged high rainfall. The coastline in Ainaro district is also projected to be vulnerable to increasing sea level rise, as it is one of three districts with the highest coastal instability in Timor-Leste[26]. However, the effects of this are not yet significant. Due to its mountainous area, strong wind and landslides are also identified as natural hazards. Currently, the extreme heat hazard is at a medium level[18], but future projections suggest potentially significant risks of prolonged exposure to extreme heat, resulting in heat stress. The peak fire season in Ainaro typically begins in late August and lasts around 12 weeks[27].

Table 14. Impacts on the 4 Components per Hazard Type in Ainaro District

ARE THESE AREAS IMPACTED? X Current observed impacts O Possible impacts with changed conditions					
CLIMATE HAZARD TYPE	**IS HAZARD OR EXPOSURE PRESENT? Yes/No**	**Health workforce**	**WASH and health care waste**	**Energy services**	**Infrastructure, technologies, products, processes**
Flood	Yes	x	x	x	x
Storm (tropical cyclone)	Yes	x	x	x	x
Sea-level rise	Yes	o	o	o	o
Drought	Yes	x	x	o	o
Heatwave	No	o	o	o	o
Wildfire	Yes	o	o	o	o

3.4.2 Maubisse Referral Hospital

Maubisse Referral Hospital caters to the citizens of the entire district, including complicated services that health posts and community centers could not accommodate. The main services of the facility include surgery, pediatrics, internal medicine, orthopedics, ob-gynecology. Patients are usually coming in due to common illnesses such as tuberculosis, asthma, diarrhea, and hypertension.

The hospital has demonstrated strength through its proactive and regular monitoring of the status of the facility's structures, health status, and well-being of patients and staff. In spite of that, the hospital's weakest point is the health workforce, with 80% vulnerability based on the checklist. Lack of education on preparedness measures and limited resources pose challenges in ensuring the safety and well- being of the staff during climate events. Based on these findings, it highlights the need for additional resource allocation and support, as well as, awareness raising and information dissemination among the staff regarding climate hazards, and how to respond effectively and safely during climate events.

Table 15. Vulnerability Checklist Results of Maubisse Referral Hospital

COMPONENT	VULNERABILITY SCORE	
Health Workforce	80.00%	High
WASH and Waste	68.42%	High
Energy	53.33%	Medium
Infrastructure	72.73%	High
OVERALL SCORE	**68.62%**	**High**

For context, the facility commonly experiences heavy rains and has experienced landslides before, but because of the absence of measures, processes, backup sources of supplies, and information for critical services, the facility becomes partially capable of continuing operations during and after climate events. Hence, it increases the facility's vulnerability in terms of infrastructure, technologies, products and processes.

On the other hand, the facility has an existing water waste management system, but establishing reliable and consistent access to clean water, such as by implementing filtration systems, is crucial. Healthcare waste management, including proper segregation, storage, treatment, and disposal, remains a challenge that requires improvement. The facility's regular monitoring of energy and backup generators for power supply during climate events demonstrate proactive measures. However, long-term solutions and resilience strategies are needed to address frequent power outages.

Figure 24. Maubisse Referral Hospital's waste storage for general waste

In summary, enhancing response capability and addressing identified needs, including staff training, consistent energy and water supply, resource allocation, and effective and sustainable healthcare waste waste management, will strengthen the resilience of the hospital and its capacity to continue providing services.

3.4.3 CHC Santo Joaquim

The CHC of Santo Joaquim was previously run by the church and has a contract and support from the government, which is going to end in 2024, posing a threat to the facility's sustainability and continued operation. It offers ambulatory, and outpatient departments, nutrition counseling, immunization, and TB programs. It is currently managed by the St. Carmelite Sisters, with 11 staff. The average number of patients at the facility ranges from 50-200 a day that are coming in for treatment of upper respiratory infections, diarrhea, and dermatitis, which are very common illnesses in the community all year round except for their epilepsy. Due to the fact that the facility's contract with the government will be ending soon, the subsidy to continuously run the health center is the primary concern at the moment.

Table 16. Vulnerability Checklist Results of CHC Santo Joaquim

COMPONENT	VULNERABILITY SCORE	
Health Workforce	66.67%	High
WASH and Waste	76.67%	High
Energy	100.00%	High
Infrastructure	66.67%	High
OVERALL SCORE	**77.50%**	**High**

Apart from the funding issue, based on the data gathered, reliable energy sources and WASH emerged as major challenges for the facility. Even on a normal day, the facility and the community experience energy outages, which makes it hard for the facility to continue some of its services. Additionally, there is also a need to strengthen the capacity of the facility in terms of monitoring, maintenance, and restoration during emergencies. The same goes for the water supply. Although the facility is equipped with a water supply system, safe water storage, and an alternative water source, there is still a need to enhance its capacity to monitor water supply systems and establish its own filtration and treatment system to have access to safe water for its patients and staff. In terms of waste management, it is notable that the facility practices efficient waste segregation and has safe waste storage, notwithstanding safe healthcare waste disposal and treatment.

There are a lot of positive aspects that can be drawn from the facility, such as the fact that they have an efficient information storage system, which aids in maintaining records and data, and good working relationships with various stakeholders within the community. As it will aid in maintaining records and data and foster collaboration and support during climate-related emergencies. The facility's support for the mental health of the people affected by climate events is also commendable, as it recognizes the psychological impact of such events.

However, ensuring backup sources of supplies and services during emergencies is necessary to maintain uninterrupted operations and adequate patient care. Additionally, there is also a need for its health workforce to be equipped with protective gear and establish a comprehensive disaster response plan, including monitoring systems to enhance their preparedness.

Figure 25. Santo Joaqium Community Health Center's consultation area during power outage

Figure 26. Santo Joaquim's file storage area

3.4.4 HP Horaikiik

Horaikiik Health Post was established in 1992 in Maubisse. It offers ob-gynecology, pediatrics, immunization, and adult services to its patients. The facility is located in the vicinity of the primary school in Horaikiik. The average number of patients treated daily is 20. Some of the common illnesses are acute respiratory infections and diarrhea, which is a usual sickness during the rainy season due to water contamination. In terms of climate hazards, the facility often experiences rain and strong winds, similar to other health posts in Maubisse.

Table 17. Vulnerability Checklist Results of HP Horaikiik

COMPONENT	VULNERABILITY SCORE	
Health Workforce	86.67%	High
WASH and Waste	78.79%	High
Energy	92.59%	High
Infrastructure	77.78%	High
OVERALL SCORE	**83.96%**	High

The facility's vulnerability checklist places energy first, contributing 92.59% of the total vulnerability, and health workforce second, contributing 86.67%. Similar to Santo Joaquim, the lack of a consistent energy source greatly affects the operation of the health facilities within the district. While the facility has access to solar panels to power minor equipment, the need to strengthen the capacity to monitor and restore the energy supply is also apparent at the Horaikiik Health Post.

After energy sources, the next crucial issue to address is water sanitation and healthcare waste management in the facility, particularly, the separation of the facility's general waste storage from community waste. Education on proper segregation and disposal is highly needed as well. In terms of water, the facility has water storage but without consistent and safe water supply. Ensuring access to safe drinking water for patients and staff is also an area that requires attention.

The facility has established procedures for procuring supplies during emergencies and has digital storage of patients' data. On the other hand, the facility's health workforce demonstrates some awareness and preparedness for climate-related hazards, but there is a need for further education and training. These underscore the need to develop a comprehensive disaster preparedness plan, a strategy to secure the facility's infrastructure, and enhance information dissemination.

Figure 27. Horaikiik Health Post's general waste storage is beside the elementary classroom

Figure 28. The facility's solar panels from UNDP

Section 4 | Summary of Results

Timor Leste, a young and developing country, is confronted with critical challenges in bolstering climate resilience and environmental sustainability within its healthcare facilities. The vulnerability of the healthcare sector to the impacts of climate change demands urgent attention and proactive measures to protect public health and well-being. An in-depth analysis of prominent findings from the study has identified key areas that require focused action and strategic planning to establish a resilient and environmentally conscious healthcare system.

Table 18. Summary of Vulnerability Checklist Results

Health Facility	Health Workforce	WASH and Waste	Energy	Infrastructure
Hospital Nacional Guido Valadares	Medium	Medium	Medium	Medium
Maternidade-Escola de Nossa Senhora de Fatima	Medium	Medium	Medium	Medium
Suai Referral Hospital	High	Medium	Medium	Medium
Maubisse Referral Hospital	High	High	Medium	High
CHC Comoro	Medium	High	High	High
CHC Covalima	High	High	High	High
CHC Santo Joaquim	High	High	High	High
HP Lakonak	High	High	High	High
HP Tasitolu	High	High	High	High
HP Horaikiik	High	High	High	High

Based on the vulnerability checklists accomplished by the health facilities, almost all of the primary healthcare facilities have high vulnerability, while the tertiary and secondary health facilities have medium vulnerability. None of the targeted health facilities received a low vulnerability score in any of the four components.

While immediate shifts to fully sustainable practices may not be feasible, it is essential to approach these changes with a realistic and gradual mindset. Healthcare facilities should strive to make incremental improvements and collaborate with relevant stakeholders, including government agencies and NGOs, to support their journey towards enhanced climate resilience and environmental sustainability.

One of the key findings highlights the pressing need for enhanced, equitable training programs on climate change and health, emergency preparedness, and climate-resilient health systems. Timely and comprehensive training of healthcare workers is essential to increase their awareness and understanding

of the linkages between climate change and health. By providing staff with the necessary knowledge and skills to respond effectively to climate-related health risks, the healthcare sector can better protect communities from the adverse impacts of extreme weather events, vector-borne diseases, and other climate-related health challenges.

However, limited resources, both in terms of budget and staff, hinder the capacity of the healthcare workforce to effectively address climate-related health risks. Insufficient funding and staffing constraints limit the healthcare facilities' ability to implement climate-resilient strategies and initiatives. Addressing this challenge requires targeted support and capacity building, including strengthening the health workforce and allocating sufficient resources to climate resilience initiatives. Collaborative efforts between government agencies, international organizations, and local stakeholders can facilitate resource mobilization to bolster the healthcare sector's resilience.

The availability of secure water and electricity supply emerges as a critical challenge in almost all healthcare facilities. Many facilities rely on groundwater sources without adequate filtration and treatment systems, particularly during emergencies. This raises concerns about water safety, as communities and healthcare workers may be exposed to waterborne diseases and contaminants. To address this pressing issue, investments in water infrastructure and emergency preparedness are essential to ensure a stable supply of safe drinking water. Collaborative efforts between the healthcare sector and water management authorities can facilitate the development of sustainable water supply solutions.

Another vital aspect that requires attention is healthcare waste management. Although systems are in place, they are not properly implemented at all levels and are not environmentally-sustainable. Proper waste management training is crucial to address challenges related to waste segregation, storage, treatment, and disposal. Inadequate waste management practices can have detrimental environmental and health impacts, posing risks to both healthcare workers and the surrounding communities. Collaborative efforts between healthcare facilities and waste management authorities are essential to develop and implement effective waste management strategies that prioritize environmental sustainability and public health.

Power outages happen frequently in Timor-Leste, affecting healthcare facilities across the country. Some hospitals have existing arrangements with the electricity provider to ensure that they are prioritized in terms of supply. Furthermore, most hospitals and community health centers have access to backup generators to cope with frequent power outages. However, the reliance on fossil fuels for these generators raises environmental and financial concerns. The emission of GHG from generators contributes to climate change, exacerbating existing challenges. Fuels for generators are also costly expenses which can be reallocated to other needs of the facilities. A transition to renewable energy alternatives, such as solar panels, has been identified as a feasible solution to reduce emissions and dependence on costly fuel. Integrating renewable energy sources into the healthcare sector can bolster climate resilience while reducing operational expenses and carbon footprints. It would also be vital for the MOH to engage with the Electricidade de Timor-Leste Empresa Pública (EDTL, E.P.), the electricity provider in the country, and find out ways to ensure continued access to electricity in all healthcare facilities to reduce their dependence on backup generators.

Addressing the challenges related to energy monitoring, maintenance, and restoration, as well as backup planning during emergencies, is paramount to ensure uninterrupted healthcare services. The healthcare sector should invest in comprehensive energy infrastructure plans, outlining measures to enhance

energy efficiency and reduce energy consumption. Exploring alternative energy sources, such as solar, wind, or hydropower, can be instrumental in reducing reliance on conventional fossil fuels. Developing contingency plans for energy supply during emergencies can ensure continuous operations and critical healthcare services, especially during climate-related events.

Written plans for emergency preparedness and contingency are lacking in several facilities, primarily due to limited budget constraints. Emergency preparedness is crucial to equip healthcare facilities with the necessary tools and strategies to respond effectively during disasters and climate events. Investing in these plans and dedicating resources to building resilience can better prepare healthcare facilities to handle emergencies, safeguarding both healthcare workers and patients during times of crisis.

Structural integrity and maintenance issues within healthcare facilities are also pertinent concerns. Some facilities have dilapidated areas and roof leaks that affect facility safety and functionality. Regular monitoring and evaluation are conducted to identify weaknesses and areas for improvement. However, action by local authorities to address identified issues is lacking. Collaborative efforts with stakeholders within the community, including local government bodies and development partners, can foster support during emergencies and encourage timely responses to address infrastructure challenges. Advocating for the implementation of recommended structural changes can enhance the resilience of healthcare facilities to withstand climate-related impacts.

Despite the challenges, the healthcare sector in Timor Leste has established working relations with different stakeholders within the community. This collaboration can contribute to effective coordination and support during emergencies or climate events. Building on these existing partnerships and expanding networks with national and international organizations can provide access to technical expertise, financial resources, and knowledge sharing, further strengthening the healthcare sector's climate resilience and environmental sustainability.

In conclusion, Timor Leste faces formidable challenges in enhancing climate resilience and environmental sustainability in its healthcare system. The interplay between limited resources, water and electricity supply, waste management, energy infrastructure, emergency preparedness, and infrastructure integrity necessitates a multifaceted and collaborative approach. Strategic planning, targeted investments, capacity building, and pragmatic initiatives can empower the healthcare sector to respond effectively to climate-related health risks and build a more resilient and sustainable healthcare system. By prioritizing climate resilience and environmental sustainability, Timor Leste can safeguard the health and well-being of its population, ensuring a prosperous and healthy future for all.

ANNEX 1: Field Visit Schedule

Date	Time	Activities
20 June, Tuesday	09:00-12:00	Consultation meeting with with WHO and MOH
	12:00-14:00	Lunch
	14:00-17:00	HCWH Team finalizes all documents, necessary and preparations for the field visit
21 June, Wednesday	08:30-09:00	Travel from hotel to Hospital
	09:00-14:00	Visit to Hospital Nacional Guido Valadares
	14:00-15:00	Travel from Hospital to WHO Office
	15:00-17:00	HCWH Team reviews documents gathered so far and adopt changes on data collection process
	17:00	Travel back to hotel
22 June, Thursday	08:00-09:00	Travel from hotel to Hospital
	09:00-12:00	Visit to Hospital Maternidade
	12:00-13:30	Lunch and travel to next facility
	13:30-17:00	Visit to CHC Comoro and HP Tasitolu
	17:00	Travel back to hotel
23 June, Friday	09:00-14:00	Land travel from Dili to Suai
	15:00-17:00	Visit to HP Lakonak
24 June, Saturday	08:30-09:00	Travel from hotel to Hospital
	09:00-09:15	Quick visit to CHC Covalima
	09:00-12:00	Visit to Hospital Referal Suai
	12:00-14:00	Lunch and break
25 June, Sunday	10:00-14:00	Travel from Suai to Maubisse
26 June, Monday	08:30-09:00	Travel from hotel to Hospital
	09:00-12:00	Visit to Hospital Referal Maubisse and HP Horaikiik

Date	Time	Activities
	12:00-13:30	Lunch and travel to next facility
	13:30-17:00	Visit to CHC Santo Joaquim
	17:00	Travel back to hotel
27 June, Tuesday	09:00-13:00	Travel from Maubisse to Dili
	14:00-17:00	HCWH Team prepares for debriefing meeting
28 June, Wednesday	09:30-10:30	Meeting with WHO Representative
	10:30-12:30	Debriefing meeting with WHO and MOH Timor-Leste
	12:30-14:00	Lunch and travel back to hotel

ANNEX 2: Raw and Processed Data Collected

Raw data collected as well as photos from the target health facilities in the three districts can be accessed here: Ainaro District, Covalima District, and Dili District.

Processed checklist results for all health facilities can be found here.

ANNEX 3: Data Collection Tools

Following are the copies of validated tools used by the team for the data collection.

- Vulnerability assessment checklist for tertiary, secondary, and primary healthcare facilities
- Site assessment checklist

REFERENCES

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