Climate Action Accelerator

Health facility Climate Vulnerability and Capacity Assessment Manual

A method to identify and address climate and health vulnerabilities, risks, and solutions for health facilities in low- and middle-income settings.

Version 5, January 2026

LIST OF ACRONYMS

CAA:	Climate Action Accelerator
CSO:	Civil Society Organisation
CRESH:	Climate Resilient and Environmentally Sustainable Health Care Facility
DRR:	Disaster Risk Reduction
FGD:	Focus Group Discussion
HCW:	Health Care Worker
M&E:	Monitoring and Evaluation
MoH:	Ministry of Health
NAP:	National Adaptation Plan
PHC:	Primary Health Care
VCA:	Vulnerability and Capacity Assessment
WHO:	World Health Organisation

ACKNOWLEDGMENTS

The Climate Action Accelerator would like to thank colleagues at ALIMA, ALERT Santé and the University of Stellenbosch, whose input has been invaluable in developing and refining the Climate VCA approach; Health Care Without Harm for access to their climate impact tool and the Aga Khan Development Network for access to their carbon management tool; as well as all the staff of Ngouri District Hospital, Ngouri District Health Bureau and Western Cape Health Authority for their contributions.

INTRODUCTION | BACKGROUND

Health care facilities are the first and last line of defence against climate change because they provide care to people harmed by extreme weather and other long-term climate hazards. Health facilities are themselves at risk from climate hazards, so whilst managing the health needs of people due to climate events, they must also take measures to protect their infrastructure. Health care facilities can also produce large amounts of environmental waste and GHGs and are thus an important contributor to the climate crisis.

The term "Climate Resilient and Environmentally Sustainable Healthcare" (CRESH) is used by World Health Organisation (WHO) to describe health care facilities and health systems that are implementing measures to protect and improve the health of their target communities in an environmentally sustainable manner, by optimizing the use of resources and minimising the release of waste into the environment. The WHO CRESH guidance documents define 10 system-level domains and 4 facility-level domains that need to be strengthened to achieve this (Figure 1).

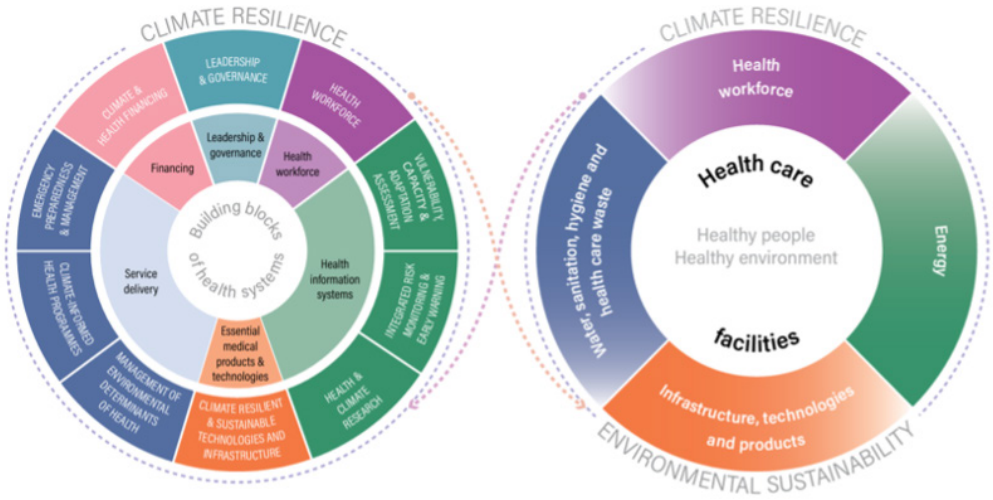


Figure 1: CRESH at the level of health systems (left) and health facilities (right) – from WHO CRES health care facility guidance

WHO proposes a 'healthcare improvement' approach to CRESH implementation (Figure 2). This approach is underpinned by a Climate Vulnerability and Capacity Assessment (Climate VCA), which correspondsto steps 2 and 3 in the diagram below, and is the subject of the current document.

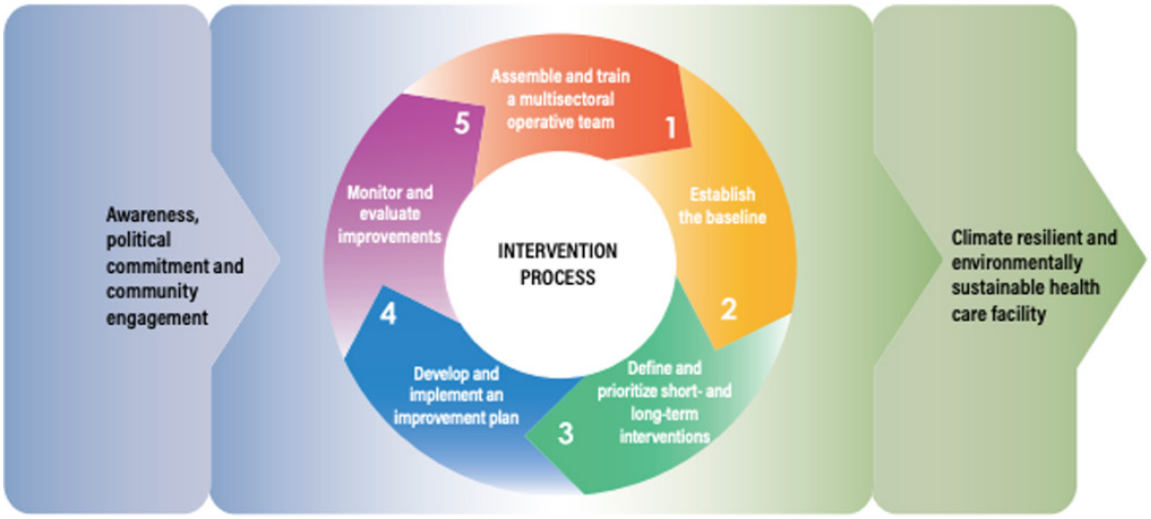


Figure 2: Process for CRESH implementation (from WHO Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities)

Until now, there have been very few documented examples of health facilities that have implemented such measures, which is likely to be due to a lack of financing and a lack of implementation guidance and support. This is particularly marked in low-income contexts, where health facilities must integrate some of the health systems domains (e.g. leadership, financing and service delivery) to compensate for weak health systems. Indeed, the few documented examples of CRESH implementation come from middle-income settings in the Americas, where the PAHO SMART hospitals initiative and toolkit have filled the implementation gap.

Climate Action Accelerator's CRESH initiative supports health facilities in low- and middle-income countries to strengthen their climate resilience and environmental sustainability.

Climate Action Accelerator has defined a six-module concept for health facility resilience and sustainability that includes the four WHO health facility domains and incorporates those additional WHO health system domains that facilities can be meaningfully reinforced at the health facility level (e.g. in the case of underfunded central health systems). This approach is similar to other facility models in the literature[1] (Figure 3).

[1] Health Care Without Harm and Life Resystal, "Practical Guide for Building Climate-Resilient Health Systems". Available here: https://life-resystal.eu/wp-content/uploads/2024/11/Practical-Guide-for-Building-Climate-Resilient-Health-Systems-2024-HCWH-Europe.pdf

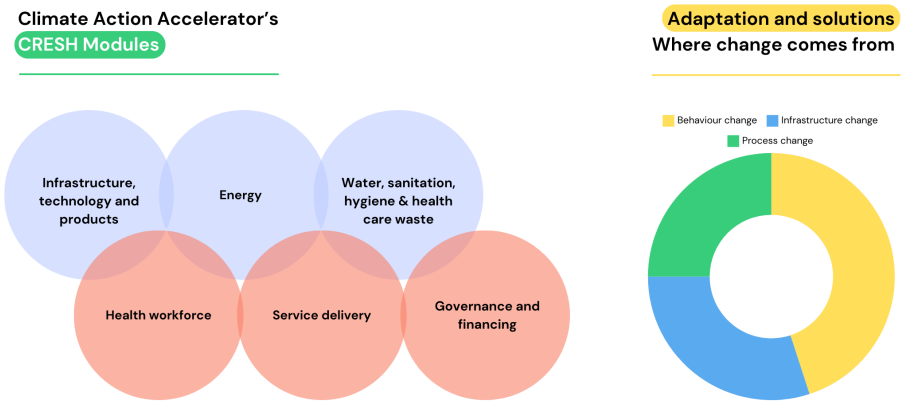


Figure 3: Climate Action Accelerator's 6-module concept for health facility resilience and sustainability.

WHAT IS A HEALTH FACILITY CLIMATE VULNERABILITY AND CAPACITY ASSESSMENT (CLIMATE VCA)?

The enormous global variation in health facilities, geographical contexts and climate hazards requires a highly contextualised assessment approach. WHO has described an approach to Climate Vulnerability and Capacity Assessment (Climate VCA) at health systems level, which can be used by countries to develop National Adaptation Plans for the health sector. At the level of health facilities, WHO has produced a climate risk checklist for health facilities[2], but does not define an assessment approach, nor how to integrate the outputs into the CRESH implementation process. Several organisations have defined Climate VCA approaches for facility level, but these tend to be resource-intensive and more suited to the needs of higher-income settings[3] [4].

The current document describes a methodological approach developed by the Climate Action Accelerator (CAA) to deliver a Climate VCA at the level of a single hospital or primary care facility in low/medium resource and fragile settings. The CAA Climate VCA is a rapid, mixed-methods, multi-stakeholder assessment process consisting of six stages, designed to be used by health managers and senior health facility staff to generate an 'adaptation plan' to enable that facility to become a Climate Resilient and Environmentally Sustainable Health Care (CRESH) Facility. In contrast to existing facility-level vulnerability assessments:

- It enables the leadership and staff to identify the most relevant climate risks (and hence the intervention priorities) for that facility in relation to climate change and health.
- It considers sustainability to be an intrinsic part of health facility resilience (e.g. reducing dependence on grid electricity in unstable settings) and hence incorporates carbon footprint measurement and carbon weighting of solutions.
- It provides a health service assessment that not only focuses on infrastructure, but also on how care is delivered and received, and systems issues (e.g. service delivery and governance) at the level of the facility.

[2] 'Checklists to assess vulnerabilities in health care facilities in the context of climate change' WHO 2021

[3] Climate change resilience framework for health systems and hospitals. Life Resystal 2022. https://life-resystal.eu/wp-content/uploads/2024/05/DA1.2-LIFE_RESYSTAL_CapacityAssessmentMatrixMethodo_VF.pdf.

[4] Pan American Health Organization. Smart Hospitals Toolkit. Washington, D.C. : PAHO; 2017. https://iris.paho.org/bitstream/handle/10665.2/34977/9789275119396_eng.pdf?sequence=1&isAllowed=y.

The VCA methodology is highly contextualizable and can be aligned with National Adaptation Plans (NAPs), and Disaster Risk Reduction (DRR) plans at the national level, as well as existing community resilience structures and initiatives. Knowing that healthcare managers have heavy workloads and competing priorities, the approach delivers a prioritised list of Climate RISKS to the facility and population and a corresponding list of **solutions** to mitigate those risks (outlined in sections 1-6 of this document). Once costed and mapped over time, this output can be used to develop a comprehensive health facility climate action plan, discussed in the 'next steps' section at the end of this document.

TERMS & DEFINITIONS (adapted from IPCC 2008)[5]

Concepts of 'climate resilience' and 'environmental sustainability' within healthcare settings can sometimes lead to misunderstandings and a feeling of intimidation amongst health staff. Yet once discussed, the concepts quickly become familiar, and health staff who have undergone training on this topic report regularly witnessing the impacts that climate has on health. Framing climate and health as something 'new' can lead to hesitancy to engage, or fear of additional workload. On the contrary, a Climate VCA aims to identify areas of inefficiency and improve the quality of existing patient care and staff satisfaction at work. Furthermore, users of the Climate VCA manual should feel free to adapt the terminology to their organisational culture.

Climate hazard

Climate hazard refers to a natural or human-induced environmental change (fast or slow onset) that has the potential to cause damage. How individuals and populations are exposed to the hazard can be direct or indirect.

Direct Exposures: Ways in which the hazard acts directly on exposed facilities and population. For example:

Population level: Hazards such as floods can directly impact individuals through injuries and exacerbation of existing medical conditions.

Facility level: Floods (and other hazards) can directly impact health facilities by causing electrical damage, with further consequences for patient care.

Indirect Exposures: Some hazards may have environmental consequences which can indirectly impact on the population and facility. For example:

Population level: extreme heat or reduced rainfall (hazard) can lead to crop failure and food insecurity, as well as changing vector-borne disease epidemiology. These factors indirectly increase morbidity and/or mortality (e.g. through malnutrition, malaria and dengue outbreaks).

Facility level: Heat and reduced rainfall (hazard) increase population morbidity, resulting in increased demand for hospital care (with the consequence of the hospital being overwhelmed, impacting the general functioning of the facility, staff wellbeing and quality of care).

Vulnerability

The tendency / likelihood for a specific population group, health facility, or area to be more negatively affected by a hazard than others in the local area.

Vulnerabilities that make a facility or population more likely to be affected by the hazard include:

- High levels of pre-existing (chronic) malnutrition
- Poor levels of vaccination, or lack of a malaria prevention programme
- Poor facility ventilation makes heat crises worse for patients
- No staff roster planning to manage during high demand
- No preventative staff health (vaccinations, etc.)
- Facility functions which harm the environment can also be considered a vulnerability (diesel fuel use)

[5] IPCC, 2018: Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Cambridge University Press,, pp. 541-562. https://doi.org/10.1017/9781009157940.008.

Adaptive capacity

(usually referred to just as 'Capacity')

The ability of individuals, populations and facilities/institutions to adjust to the hazard, taking advantage of opportunities, or adapting to be better prepared next time.

Adaptive **capacities that exist within a population or facility, which make them less likely to be negatively impacted by the hazard, include**:

- Living close to a health facility, and not relying on transport for access
- Strong social or community networks (including community committees for managing crises)
- High education levels (including knowledge of management of common childhood illnesses)
- Facility contingency plans for staff to travel to work during floods
- The involvement of other agencies who provide support

Risk

Risk is the probability that a specific hazard will cause a harmful consequence. To calculate this probability, the exposure, vulnerabilities and capacities are taken into account. If the exposed populations or faculties do not have specific vulnerabilities, or have strong adaptive capacities, the hazard is unlikely to represent a risk to that population / facility. However, if the hazard is likely to cause harmful consequences (e.g. because that population / facility has specific vulnerabilities or a lack of adaptive capacities), it is classified as a risk. All the risks are listed and prioritised according to how important the harm caused is to the community and health facility.

In the case of a heat crisis, for example, if a facility already has good ventilation and shade, and the population has measures to manage during heat, this hazard may not cause much harm and thus does not constitute a significant **risk** to the population or facility. But if the same population has poor capacity to detect new vector-borne diseases, and the health facility lacks capacity to cope with fluctuating patient demand due to changing malaria epidemiology, this poses a significant **risk** to both the population and the health facility.

Climate risk = **Exposure to the hazard (direct + indirect)** x $\frac{\text{Vulnerabilities}}{\text{Adaptive capacities}}$

CONCEPTUAL MODEL OF THE CLIMATE VCA

This visual model explains how hazards can lead to risks for the exposed facilities and populations, and how these risks are modulated by vulnerabilities and capacities.

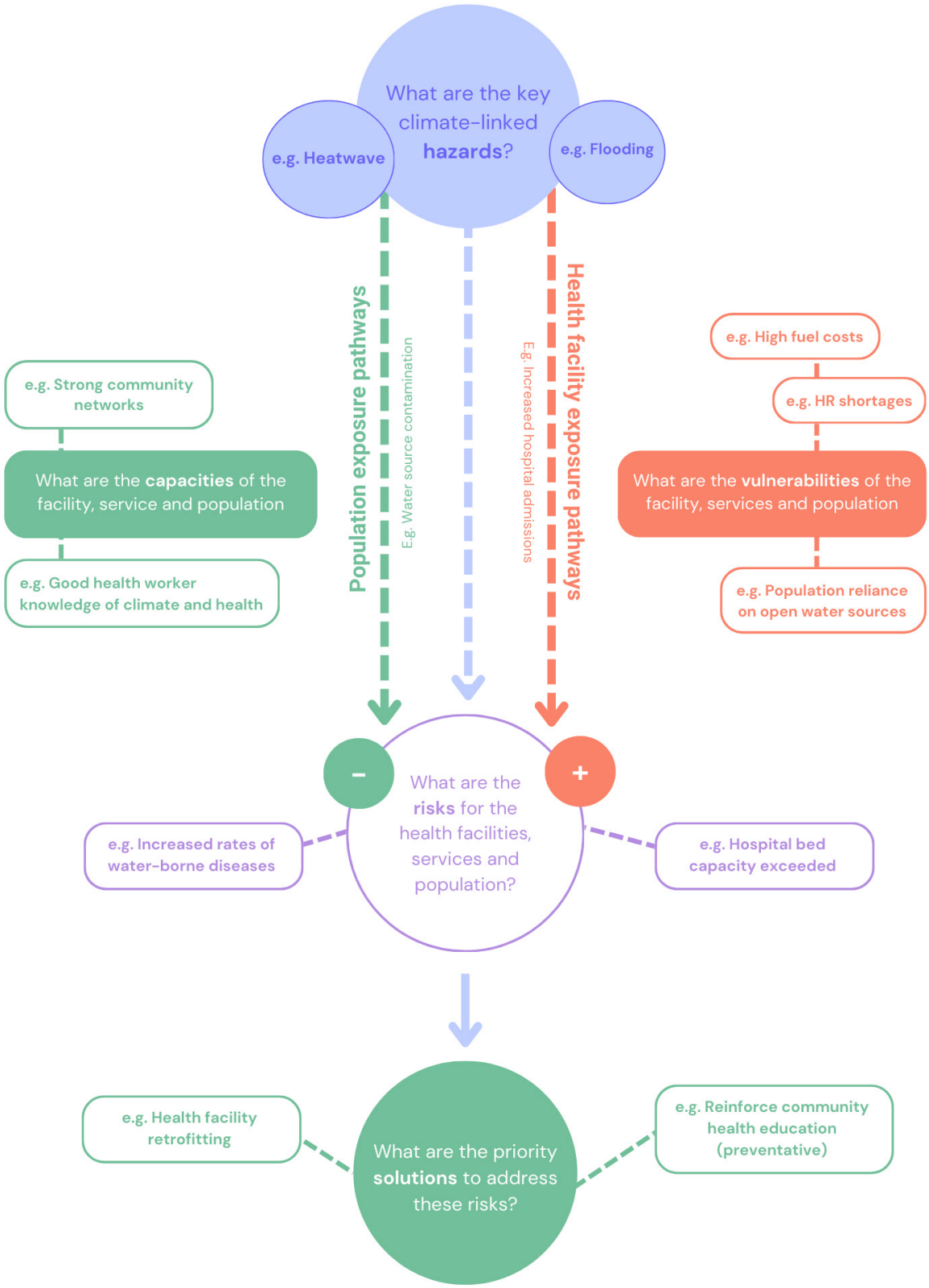


Figure 4 : The relationship between climate hazaards, vulnerabilities, capacities and risks.

OVERVIEW OF THE CLIMATE VCA METHODOLOGY

A detailed account of each stage is provided in the following pages.

STAGE 1: EXISTING DATA REVIEW: In most contexts substantial data on climate hazards already exists, and it may be possible to obtain data on facility and population vulnerabilities and capacities. Conduct a desk review and prepare a summary (max 6-8 pages) to highlight the most relevant points and identify gaps in existing data.

STAGE 2: CONTEXTUALISE THE TOOLS: Adapt the generic CAA tools to the context based on Stage 1 and local knowledge. Review and modify the quantitative and qualitative tools to address the relevant hazards, vulnerabilities and capacities of the facility and staff (facility and district level). At this stage, also provide any training required for staff who will conduct stages 3 and 4.

STAGE 3: QUANTITATIVE (AUDIT) DATA COLLECTION: Conduct an audit of the facility function (infrastructure, staff, medical activities and governance) to identify the existing vulnerabilities and capacities, and thus to understand the potential risks. This is often done via a facility walk-through and/or semi-structured interviews with staff.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION: Conduct focus group discussions (or equivalent) to gain additional insights on exposures, vulnerabilities and capacities from staff and other community members, to confirm the potential risks and to start to generate possible solutions. CAA proposes using a scenario-driven tabletop methodology based on real past events.

STAGE 5: FINALISE THE RISK & SOLUTIONS MATRIX: Compile a list of the climate health risks identified during stages 3 and 4, identify relevant solutions for each risk based on the CAA solution inventory, enriched by insights from stage 4.

STAGE 6: SOLUTION PRIORITISATION STAGE: Prioritise solutions through a series of workshops, ensuring all stakeholders are appropriately engaged in the process. The solutions are ranked from 1 to X.

The stages broadly follow a stepwise sequence, but there is some back and forth to allow for flexibility and iteration as new information comes to light. This way, data is analysed and verified as it emerges, making the matrix increasingly reliable and robust. This approach also prevents an overwhelming amount of information needing to be analysed in stage 5.

OVERVIEW OF THE CLIMATE VCA METHODOLOGY

The VCA Output

The output of the Climate VCA extends beyond a simple assessment. A completed Climate VCA (stages 1-6) provides a **prioritised risk matrix** with corresponding solutions. Many partners find this information on key risks and solutions valuable, as it can be integrated into an organisational strategic plan, and/or used to seek additional funding or implementation support.

Whilst an essential output, a matrix summarises what needs to change, but not how this change will occur. **A health facility Climate Action Plan** may be an **additional output** for some partners to outline the individual actions to be implemented, ensuring each solution is timed and funded. If a CRESH seems desirable but initially out of scope, the implementation plan can be progressive and phased over time to match implementation feasibility.

Case studies – Introduction

To illustrate the Climate VCA process, two case studies are presented stage by stage based on conducting a Climate VCA in two different contexts.

Pilot 1: Ngouri hospital, in the Lake Region of Chad

The Ngouri District General Hospital is run by the Ministry of Health of Chad and provides secondary-level care to the predominantly rural population of 220,000 inhabitants in the department of Wayi. The hospital receives support from Alerte Santé (National NGO) and ALIMA[6] (International NGO) for nutrition and paediatric services.

The initiative to perform a Climate VCA came from ALIMA and Alerte Santé, as part of a larger organisational environmental footprint roadmap and an effort to provide more environmentally sustainable health care. The primary focus of the VCA was on nutrition and paediatrics, although it was conducted in partnership across the entire hospital. The aim of the Climate VCA for Ngouri hospital was to produce a multi-year CRESH improvement plan to enable the hospital to respond to current and future climate-related health needs using climate-smart, low-carbon technologies. CAA was commissioned to develop the process, which was planned for a six-month timeline.

[6] ALIMA (The Alliance for International Medical Action) is an international medical humanitarian NGO based in Dakar, Senegal, that has been saving lives for over 12 years in emergency situations and health crises in Africa.

OVERVIEW OF THE CLIMATE VCA METHODOLOGY

Pilot 2: Western Cape, South Africa

Cederberg sub-district, located in the West Coast District, encompasses a primary health care network of seven towns with an estimated population of 64,850 semi-rural inhabitants. Each town has a primary health clinic (PHC) led by nurse managers with visiting physicians. The two larger towns (Clanwilliam and Citrusdal) also have small district hospitals. The top five contributors to the burden of disease are tuberculosis, interpersonal violence, HIV/AIDS, road traffic accidents and chronic obstructive pulmonary disease. Compared to the national average, the district is in the lowest quartile for hospital beds per 10,000 population and number of professional nurses per 100,000 population.

The initiative to perform a Climate VCA started as a research study proposed by the Chief Director for Infrastructure, who also led the Department's Climate Change Forum. The University of Stellenbosch received a grant to perform a sub-district Climate VCA across the PHC network, with a vision to develop and implement a sub-district improvement plan, and to scale up this approach across Western Cape Province if feasible. The university reached out to CAA to propose a collaboration to adapt CAA's Climate VCA approach to the setting of PHC in Cederberg.

PREPARING FOR THE CLIMATE VCA

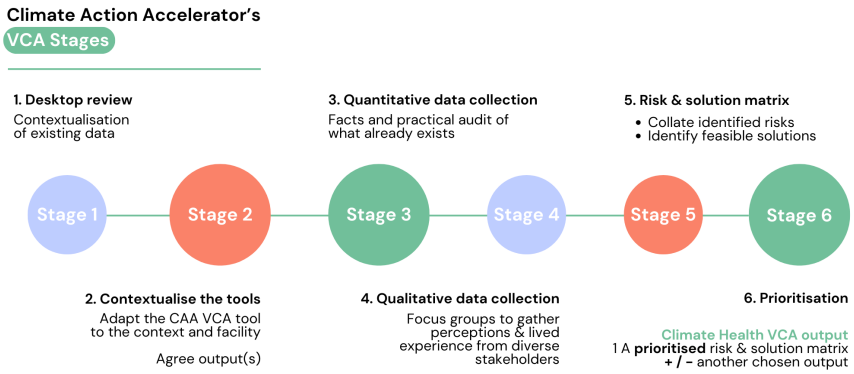


Figure 5: Stages of the Climate VCA process

Establishing the CRESH team

Before starting, it is crucial to clarify who is commissioning and overseeing the process, and who will be carrying out the work. The commissioning body (e.g. Provincial MoH / NGO / other) should help define (1) the CRESH team members and 2) Governance. The setup will vary by context, but some general principles apply:

- The CRESH team is multiagency and multidisciplinary, as different skills and partners are required to deliver the Climate VCA. The team set up will be different for different partners.
    - Multi-disciplinary: Hospital director or clinical lead; polyvalent logistician (architecture, energy, WASH); social scientist (e.g. anthropologist); and at least one person with experience in conducting a climate VCA or who has received training on this methodology.
    - Multi -agency: health facility leadership (medical and logistic) and representatives of partner health organisations; district health administration; involved civil society organisations (CSOs); community leaders/representatives; religious leaders where relevant.
- The roles of each member will need to be established in advance. Normally, a core group (e.g. 4-5 people) will implement the main activities of the VCA, with regular check-ins with the broader CRESH team. It is essential to clarify who will participate in each stage of the VCA to ensure the availability of each person on the days of data collection. The team member with climate VCA experience ensures that the rest of the team understands the objectives, roles, process and outputs.
- The timeline and deliverable format should be agreed on between the commissioner and the CRESH team, as should the level of incentive payments for CRESH team members (where relevant).
- The commissioner will normally appoint a separate group responsible for oversight (governance). This group will normally include senior representatives of the organisations involved, as well as community leaders and key health system decision makers, and will likely review and validate the final outputs of the VCA process. Identification of members of this governance committee may require a detailed stakeholder mapping.

PREPARING FOR THE CLIMATE VCA

Baseline tools

There are two additional tools to be considered during the preparation phase that can complement the VCA process:

I. A health facility baseline assessment provides essential information on each service within the facility (number of beds, toilets, types of energy, etc).

a. If this data is already known and available, there is no need to conduct a baseline assessment.

b. If this data is not already available, the 'CAA Health facility standard baseline data tool' can be adapted to the context and used to collect this critical information that will be necessary for steps 5 / 6 (see figure 4).

II. A carbon impact assessment tool

a. This may not always be included in low-income settings or may already have been completed for the organisation.

b. Available tools include:

i. **The Aga Khan Health Carbon Management Tool** was launched by Aga Khan University and Aga Khan Health Services. For access email: healthcarbonfootprint@akdn.org

ii. **Healthcare without Harm** Climate Impact Checkup Tool V3.3, Carbon audit tool.

Ngouri case study – preparatory phase

CAA and ALIMA appointed co-facilitators to coordinate the Climate VCA. The facilitators made a preliminary visit to Ngouri hospital to establish the disciplinary CRESH team consisting of the hospital director, head of logistics, district medical director (MCD), a senior clinician, and a representative of the other supporting NGO (Alerte Santé). During the preliminary visit, the CAA facilitator provided brief training to the rest of the team on CAA's Climate VCA approach; a fuller training programme for the CRESH team (and others who would be involved in the VCA) was planned and developed. During the preparatory visit, meetings were carried out with key stakeholders where collaboration and buy-in were required (MoH, WHO, etc.).

PREPARING FOR THE CLIMATE VCA

Western Cape case study – preparatory phase

The Stellenbosch research team initially met with CAA to understand the VCA process. It was decided to apply the climate VCA to the whole subdistrict and six primary care facilities, in a 'primary care network' approach. The Stellenbosch research team consisted of a family physician, a researcher in planetary health and primary health care, an emergency medicine specialist, a public health specialist and a psychologist with a special interest in public health. The CAA team consisted of a nurse-researcher and two public health/health operations specialists who had developed the VCA process and piloted it in Chad. The team was completed by a representative of the Department of Health and Wellness, as well as a public health specialist for the rural health services and the provincial head of disaster management. A preparatory workshop was held with the whole multi-disciplinary team, at which the Climate VCA process was outlined and contextualised within the wider research study. The purpose of this workshop was to ensure the full team understood the CRESH approach and that the health services were willing to adopt and engage with the Climate VCA process.

STAGE 1: DESK REVIEW

AIM : Make best use of existing information to 1) provide an initial overview of local **hazards, vulnerabilities and capacities**, and 2) identify the information gaps that need to be addressed in subsequent stages.

TEAM:

I. This stage is typically completed by someone with a healthcare background and skills in conducting literature reviews.

II. The resulting desk review is used to initiate the 'Risk Solution Matrix', which is a key tool for subsequent stages. This tool is managed by someone with a health operations background, normally the CRESH team lead.

TOOLS:

- *Climate Information Sources* (Annexe 1)
- *Risk solution matrix* (Annexe 2)

ACTIONS

1. Review and analyse available and relevant data into a 6-10-page summary document:
    a. Context overview (including humanitarian context if relevant)
    b. Population demographic and health profile data: To identify local existing population health vulnerabilities. This includes demographic and disease burden data, as well as facility-level data (if available) on patient morbidities and mortality.
    c. Health system overview: basic structure of the health system, including reporting lines/governance of health facilities and the role of district health administration. Outline how health is funded, including patient contributions, national insurance and any protection mechanisms for poor/vulnerable patients.
    d. Potential climate hazards for population health and to health care facilities: location-specific or regional information on recent and anticipated climate hazards from secondary data.
    e. Climate-informed adaptations to protect from these hazards: at national/regional / district level, and (if available) at facility level. It is important to include relevant initiatives by other agencies (e.g. Green Climate Fund-supported initiatives).
    f. Vulnerabilities of the local health system or facilities (if available): e.g. waste management issues, processes that are highly energy dependent / energy intensive.

2. Initiate the 'Risk Solution Matrix', using the information on hazards from the desk review, and, where sufficiently robust, desk review data on vulnerabilities and adaptive capacities. Data from the 'Health Facility Baseline Assessment' (See 'Preparing for the Climate VCA') may enrich the matrix. In red or italics, identify potential vulnerabilities and capabilities that require verification through subsequent steps in the process.

STAGE 1: DESK REVIEW

OUTPUTS

- A summary of existing known relevant climate hazards, as well as population and facility vulnerabilities (and possibly capacities), and identified information gaps. A maximum of 6-8 pages is recommended.
- A first draft of the Risk Solution matrix, with (as a minimum) the main climate hazards outlined.

Ngouri case study – Stage 1 (desk review)

A literature review was conducted using an internet search of public domain documents, as well as unpublished reports and data from Ngouri Hospital. Although local meteorological data was sought, none was found that helped further elaborate the hazards and exposures. This review summarises climate hazards in the Sahel region and provides basic information on population vulnerabilities. It also included logistics information on the hospital facilities, which helped narrow down the audit to address existing information gaps only. The review took five days to complete

Western Cape case study – Stage 1 (desk review)

The research team gathered published and available information on the local climate hazards, population, burden of disease and facilities. Being an upper-middle-income country, comprehensive health data were readily available for the region, and previous climate health assessments provided useful information to streamline Stages 3 and 4. Therefore, only the most recent health data and the most significant climate hazards from recent years were included. The desk review took four weeks to complete. Sources of information were the Department of Environmental Affairs and Development, the District Health Barometer (district health information system indicators), and internal reports from the subdistrict on infection prevention and control. The subdistrict manager also prepared a useful presentation on the subdistrict as part of the preparation step. A 10-page report was produced, including numerous graphs and visuals to easily convey the information.

STAGE 2: CONTEXTUALISE THE TOOLS

AIM : Use the Stage 1 summary to review and adapt the data templates (that will be used for Stages 3 and 4) to the local context. Additionally, provide any necessary training and support for staff who will be conducting these stages.

TEAM:

I. Select several CRESH team members (3-4) who know the facility well and have experience in doing similar assessments.

II. Identify the final decision maker for the questions to be included (normally the CRESH team lead). There is a tendency to keep adding questions to collect more data, which can ultimately lengthen the audit and make it less focused. This can demoralise staff and reduce the quality of their inputs.

TOOLS:

1. Quantitative Audit (Annexe 3): Health facility audit tool (covering the 6 CAA modules within a facility).
2. Qualitative Assessment (Annexe 4): Focus group discussion (FGD) preparation, including data collection tool.

ACTIONS

1. Review the tool template for the facility quantitative audit (Annexe 3) that will be used for Stage 3.

    a. Decide the methodology to obtain data (interview Vs walk-through Vs another format) and the data collection format (paper, electronic, etc.)

    b. Remove any questions already answered in Stage 1

        i. Balance where information needs to be verified to be trusted or completed, from where questions are repetitive, creating unnecessary work.

    c. Review if known data gaps will be included in the questions.

        i. Ensure each question is appropriate to be asked at the facility level so staff will likely know the answer (e.g. facility staff are unlikely to know the cost of electricity).

        ii. Identify any questions where the information is easier to obtain from district-level staff (or higher) and remove them from the facility audit. If needed, create a list of questions for the district health office (or higher), and include this activity in subsequent stages.

    d. Check if the answers to some questions have already been addressed through the baseline facility assessment or equivalent data collection.

    e. Review the language used in the tools and adapt the terminology to their understanding (i.e. renaming anything not understood locally).

STAGE 2: CONTEXTUALISE THE TOOLS

2. Prepare the focus group discussions and data collection tool for the 'scenario-based tabletop methodology' (Annexe 4) to be used for Stage 4.

    a. Based on Stage 1 (and/ or lived experience), identify recent climate hazards that will generate a lively focus group discussion (FGD). Choose hazards that participants are likely to have experienced if they live locally. The group may choose facilitation tools at this stage (e.g. flipcharts), but this is normally done in the process of the training workshop at Stage 4.

    b. Appoint the FDG facilitators and note-takers in advance, who speak the languages of the anticipated participants. This requires facilitators with strong interpersonal skills and the ability to think, adapt and redirect participants during the discussion.

    c. Agree on a data collection and analysis methodology that is aligned with the profile and skills of the note-takers and is contextually appropriate. Example methodologies include:

        i. Audio-recording and transcription of the discussion, followed by thematic analysis: although transcription can be done manually, digital recording with automatic transcription can be very reliable and has the advantage of automatic translation from most languages (although this will need to be checked in each context). This approach minimises the risk of information loss, but requires a team member to have experience of thematic analysis of transcripts (e.g. using the simple thematic template in Annexe 4)

        ii. Real-time note taking: if the notetaker is confident about distinguishing exposures, risks and vulnerabilities, they can take notes directly into a simple thematic template (See Annexe 4). If in doubt, it is safer for the note-taker to take exhaustive notes, and for a team member who is familiar with the terminology to then extract the information into the template. This approach tends to result in more information loss than the previous method, but it is quicker and does not require specialised skills.

        iii. Participatory note-taking (see Figure 5 for an example), with subsequent data extraction into a thematic template (e.g. Annexe 4) by a team member familiar with climate terminology. This is a powerful method for building consensus about priorities for subsequent action, but it can result in substantial information loss.

    d. Identify the training needs of the CRESH team, that will be addressed in the FGD training workshop that is conducted at Stage 4.

OUTPUTS

- Tailored, contextualised data collection tools for Stages 3 and 4, ready to use.
- The contextualisation process may yield additional information to add to the Risk and Solution Matrix (Annexe 2).

STAGE 2: CONTEXTUALISE THE TOOLS

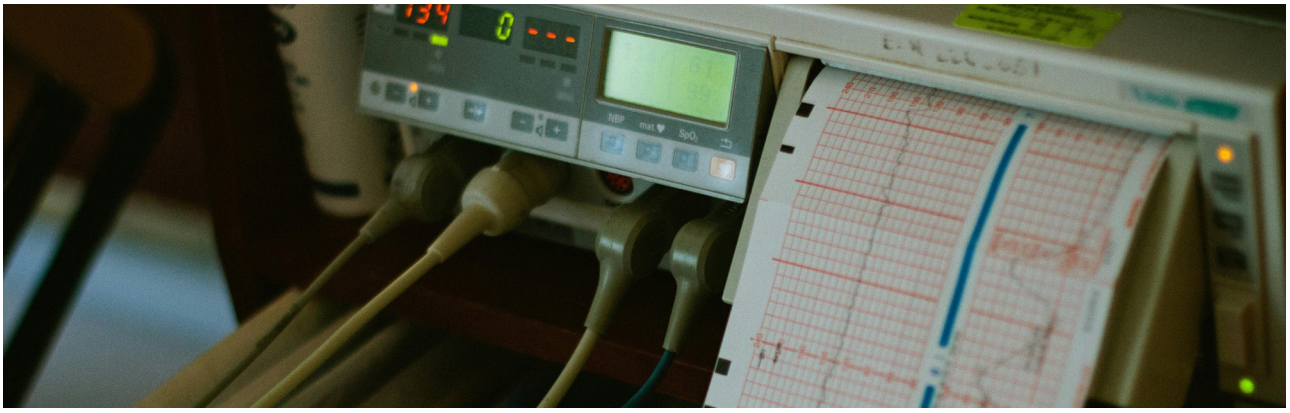
Ngouri case study – Stage 2

After the initial visit, ALIMA and CAA facilitators drafted a Stage 3 audit tool, which was then shared with the hospital staff for input and finalisation. For Stage 4, training needs were identified, leading to a 2-day workshop that covered Stage 4 FGD training. This workshop also provided initial training on climate and health links, contextualised to the local area, and then covered co-design of the Stage 4 methodology with inputs from a local anthropologist and staff. The staff completed two practice FGDs as training, and decided to use the tree diagram methodology for note taking (Figure 5), drawing their map of the hospital and the surrounding community. At the end of training, they felt confident to deliver the FGD independently in the local language and reported a very positive experience.

Western Cape case study – Stage 2

While reviewing the audit template, the research team referred to the WHO facility-level resilience guidance and checklist to validate the content of the tool for the Cederberg context. The draft audit tool underwent content validation by all members of the research team. During input, many questions were initially added and in the final cut, deleted as the audit became too long. Although 'Likert scales' were considered, for simplicity, many questions were simplified to closed questions (Yes/No/NA) or space for comments was added. The subdistrict manager reviewed the tool to check it and included the appropriate items and response options. Some items were based on environmental sustainability initiatives taken by the Department of Health and Wellness elsewhere in the province. Space was also given for explanatory field notes to elaborate on the responses. The final tool combined the service delivery and governance modules into a single section, with the final sections being: workforce; service delivery and emergency preparedness; water, waste and sanitation; energy; and infrastructure.

A 4-hour workshop was conducted by CAA on Stage 4 methodology for Stellenbosch team members who would lead this stage. From the inputs of Stage 1, confirmed by local knowledge, the scenario of flooding and heat was agreed upon, and the FGD plan was co-designed during the training to prepare the team.



STAGE 3: QUANTITATIVE (AUDIT) DATA COLLECTION

AIM : Conduct the facility audit to collect data on climate vulnerability and capacities, and any information gaps identified in Stage 1. By the end of this stage, an initial list of climate risks will be formed.

TEAM:

I. A small team of 2 or 3 people is ideal, especially if visiting small PHC facilities, not to disrupt health service delivery.

II. Appoint a lead person for questioning at each facility.

TOOLS:

1. The tailored version of the Health Facility Audit tool (Annexe 3) produced in Stage 2.

ACTIONS

1. Agree on the audit approach with health facility staff, according to their ways of working and availability of key staff. For example:

    a. A walk-through of the health facility with a staff member, observing infrastructure, work processes and reviewing existing policies and procedure documentation. Asking questions along the way.

    b. A semi-structured interview and then a brief tour of the facility.

    c. Another methodology, if more suitable for the context. For example, some questions relating to governance and financing may require a separate discussion with sub-district or district level health administrators.

2. Confirm a convenient time with the health facility staff for the audits to be carried out.
3. Conduct the audit, aiming for a maximum of 1 hour for a primary care facility and 1-2 hours at a hospital. Remain cognisant that health staff are often busy and are giving time to patient care or other duties.
4. Once the audit is complete, integrate any new details on hazards, vulnerabilities, and capacities into the Risk Solution Matrix. Previously identified vulnerabilities and capacities might become more specific from Stage 3 onwards, and some may be confirmed or rejected. Note that 'capacities' include capacities in the whole system, including initiatives from MoH or other partners that contribute to health facility resilience. It may be possible now to identify some risks and solutions; put these in red or italics if they require confirmation, which can be obtained at Stage 4.

OUTPUTS:

- Completed audit(s): safely store the completed audit(s) in case you need to verify details later, as not all information will be captured in the matrix.
- Updated Risk Solution Matrix.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

AIM : Collect valuable first-hand accounts of lived climate hazards (and exposures) and identify vulnerabilities and capacities from staff and community members. This qualitative data complements quantitative data (Stage 3), aids in further understanding the risks, and helps identify feasible solutions and/or existing coping strategies that may need reinforcement.

TEAM: A minimum of two people from the CRESH team (one facilitator, one note-taker) who speak the languages of the participants.

TOOLS:

- Data collection tools for the Focus Group Discussions (see Annexe 4), plus any device required for data collection (tape recorder, note taking, etc.)

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

AN INTRODUCTION TO FOCUS GROUP DISCUSSIONS USING A SCENARIO-BASED TABLETOP METHODOLOGY

Focus Group Discussions (FGDs) are a well-established approach to gathering first-hand (qualitative) information from multiple participants. For the Climate VCA process, we recommend using a scenario-based tabletop methodology, ideally using a scenario that relates to a hazard that previously occurred in that setting, and that the participants can recall:

1. Multiple FGDs are organised, according to the number of facilities and the stakeholder groups involved, and the extent to which it is feasible to mix groups (based on geographical proximity, gender, roles, hierarchy, etc). Keeping the group size small (6-8 participants) facilitates more effective and manageable discussions.
2. Each FGD talks through the pre-chosen scenario in real-time. It is led by the facilitator, who is assisted by a note-taker.
3. Visual prompts (e.g. flashcards, map-making) are very useful to orient the group and help identify who or what was exposed to the hazard. Map-making involves the group drawing a visual map together on the tabletop (or board) to represent the affected area. The map helps participants visualise the scenario and prompts a recall of the event. Importantly, creating the aid also serves as a warmup/ icebreaker for the group.
    a. Mark key local landmarks, each participant's home, the affected areas, etc.
4. The facilitator prompts participants to retell events as they recall them, using the map (or alternative visual prompts) to immerse them in the scenario.
    a. This methodology elicits the different perspectives of group members, sharing their reflections on how they experienced the hazard, who or what was exposed (e.g. crops exposed to drought, people exposed to earlier malarial season)
5. To elicit the collective intelligence of the group, a flipchart (or equivalent) can be used, divided into four sections: Risks / Impacts[7], Vulnerabilities, Capacities and Solutions (ideally expressed in terms that resonate with the group).
    a. Vulnerabilities include health structure vulnerabilities, as well as vulnerabilities of the population. Capacities include other actors who supported or could support response efforts.
    b. Normally, it will be important to revisit the list of 'Risks / Impacts' after discussing the vulnerabilities and capacities, to ensure that these risks are indeed significant, after taking into account the way that existing capacities might mitigate those risks.
    c. Solutions include those that participants (or other actors) put in place, as well as solutions that would have been helpful but were not implemented. As such, the FGD's perception of a best-case scenario response is explored in real-time.

[7] Risks refers to 'Risk of Impact', so is used if the event is has not yet happened. If the event already happened, the term 'Impact' may be used.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

ACTIONS

1. Organise training of facilitators, to include co-design and practice of the scenario-based tabletop methodology:
    - Select one or two local climate hazards identified in Stage 1 from the list of identified hazards locally experienced.
    - Focus on a single scenario per FGD to ensure a thorough, in-depth discussion within the allocated time. However, different FGDs can explore different scenarios if desired.
        - E.g. if flooding is chosen as the scenario, it is preferable if all participants have experienced the same flood event. This is not essential if participants can recall a recent instance of living through flooding.
    - Create a list of conversational prompts for the facilitator to use to elicit the information sought.
    - Encourage the facilitators to consider the following aspects to help create a more effective and respectful environment for gathering valuable insights.
        a. Cultural aspects of storytelling: Understand the local norms around sharing experiences and narratives.
        b. Common forms of communication: Be aware of the preferred communication methods within the community, including verbal, non-verbal, or a mix.
        c. Cultural hierarchies: Recognise the social structures and hierarchies that may influence who speaks and how freely they share.
        d. Familiarity among participants: Consider how well the participants know each other, as this can affect the openness and dynamics of the discussion.
    - Decide on the visual prompts and facilitation tools that will be used – e.g. flipcharts, maps, flashcards - these can be sourced externally or developed ad hoc if time permits.
    - Ensure the method of data collection (identified in Stage 2) is still felt to be appropriate by the facilitators, and adjust if necessary.
    - Ensure the note-taker is familiar with the use of any electronic tools (e.g. digital transcription applications) that will be used for the FGDs. When using applications with automatic translation capacity, ensure they are tested on the languages that will be used for the FGDs for translation. Work with facilitators to identify participants and allocate them into groups.
2. Pre-identify the FGD participants, allocate them into three or four groups (more may be necessary if health structures/localities are geographically dispersed). Group constitution will vary by context.
    - Participants will normally include hospital and community health care workers (HCWs), health administrators (e.g. hospital director and district health director), community leaders, CSOs and service users. Discuss with senior hospital staff and community members to identify locally relevant participants.
    - Consider if any persons are at risk of re-traumatisation from reliving such an experience. This risk can be raised at the beginning of the FDG, giving any participants the option to excuse themselves for any reason at any time.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

- Consider language, hierarchical relationships, diversity of age and experience to ensure the collected information is as representative as possible. For example, in some contexts, mixing categories of participants (e.g. health workers and community representatives) will enrich discussions; in others, community participants may feel inhibited in a group that includes doctors, and in this case, group constitution should be homogeneous.
- Communicate FGD dates to invited participants in advance. Decide what information the participant will require in advance to feel comfortable participating and what will be communicated as an introduction on the day.

3. Carry out the FGDs.
    - On the day, each group is briefed on the methodology and questions of clarification are answered. Ensure on the day to re-ask about trauma and allow any participants to excuse themselves from the exercise.
    - Carry out a debriefing and lessons learnt exercise with the facilitators after the FGDs have occurred.
4. Analysis of data collected: if data was collected directly into a thematic template (e.g. the example shown in Annexe 4), the outputs are ready to use to enrich the Risk Solution Matrix. Transcripts or real-time notes will require thematic analysis by a team member who has the experience required to do this. The example template in Annexe 4 can also be used for extracting themes from transcripts / real-time notes. Ultimately, the aim is not to exhaustively analyse the whole transcripts, but to extract just the information required to complete the risk solution matrix.
5. Update the risk solution matrix, completing the list of risks and solutions, verifying the assumptions made in earlier stages. Further interviews may be necessary if there are still some outstanding uncertainties at this stage.

OUTPUTS:

- An updated Risk Solution Matrix, with a fully elaborated list of risks, and an initial list of appropriate solutions.
- Collected FGD notes plus a 1-page summary of each FGD highlighting common themes to support subsequent prioritisation decisions.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

Ngouri case study – Stage 4 (Qualitative phase)

During the training workshop, the group decided on a recent malaria peak as the best scenario, and tabletop methodology was chosen as a culturally acceptable approach. Initially, four focus groups were planned: (1) health care workers, (2) health administrators, (3) community leaders and (4) patients and relatives. In the end, groups 3 and 4 were combined but then separated by gender, which was felt by the CRESH team to be the best way to elicit contributions from all participants. The participants began with a warmup exercise to draw the local facility and community places of interest. This prop helped guide the discussion as each participant retold their experience during the malaria peak, either as a patient or carer. They collectively identified challenges and solutions, which were mapped onto a problem-solution tree diagram (Figure 6), serving to depict a root cause analysis as FDG documentation.

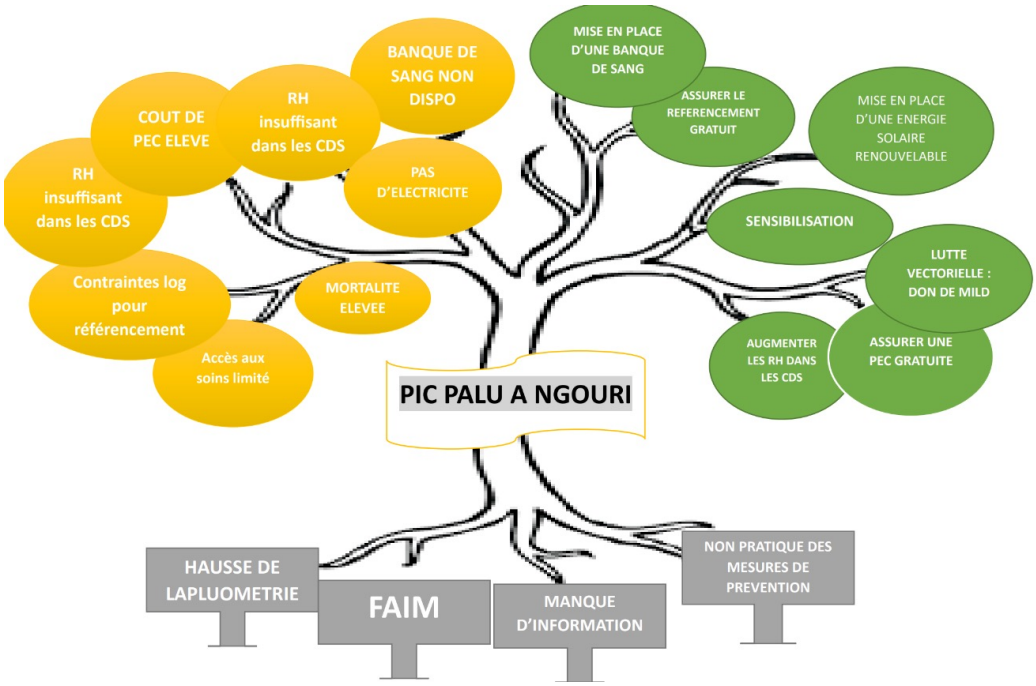


Figure 6: Solution tree diagram of the malaria peak in Ngouri

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

Western Cape case study – Stage 4 (Qualitative phase)

The methodology was co-designed and practised during a Stage 2 workshop. Extreme temperatures in the summer and flooding and high episodic rainfall in the winter were selected as the two most common climate hazard scenarios identified in Step 1. Based on their qualitative audit results and larger size, three of six facilities were selected to participate in the FGDs. The research team returned a week after the Stage 3 audit to conduct FGDs. All facilities wanted to speak about the high temperatures, even though we were visiting them in the winter season. The FGD participants included members of the facility PHC team (e.g. nurses, pharmacy assistant, receptionists) as well as community health workers and their nurse coordinators from the community-based services. Groups included 8-10 people in total. In one facility, the focus group included community health workers and the nurse coordinator.

Each FGD was facilitated by two people using a tabletop exercise approach. The first person facilitated the group discussion in a stepwise approach, beginning by creating a visual prop, drawing a picture of the facility and surrounding community on the paper tabletop to help people recall their experience and engage them in the discussion. The facilitator then oriented the group to the climate scenario and encouraged them to elaborate on what happened, what the strengths (capacities) and vulnerabilities (weaknesses) of the facility and services were in this situation. Participants were encouraged to reflect on their experience and possible solutions to improve coping strategies. All members of the group were encouraged to participate.

The second facilitator observed and listened to the group, making immediate notes on a prepared template (Figure 6). The template helped them to document in a structured approach the key vulnerabilities, capacities and solutions mentioned by the group. In addition, they documented verbatim key quotes that illustrated these ideas. The discussions were also audio recorded for future reference.

Afterwards, the note taker wrote a 2–3-page summary of each focus group discussion, summarising the key themes, based on the template and supported by the audio recording.

STAGE 5: FINALISE THE RISK AND SOLUTIONS MATRIX

AIM : Revisit the information obtained in Stages 1, 3 and 4 and refine the Risk and Solution Matrix.

TOOLS :

- Risk and Solutions Matrix template (Annexe 2)
- CAA generic solution inventory (Annexe 5)

TEAM: Often compiled by one lead person and reviewed by others

ACTIONS

1. Review the outputs from Stages 1, 3 and 4, ensuring that all key information is now included in the risk solution matrix. Normally, there is overlapping information in each stage. Take note of this, as aspects repeatedly identified are likely to be prioritised in Stage 6.
2. Ensure the following information is now captured in full:
    a. Hazards: environmental changes (fast or slow onset) that have the potential to cause damage.
    b. Exposure pathways: the process by which health facilities and populations are exposed to the hazard
    c. Vulnerabilities: characteristics that make a facility or population more likely to be affected by the hazard
    d. Capacities: adaptive capacities that exist within a population or facility, that make them less likely to be affected by the hazard. This includes other agencies or actors that play a supporting role.
    e. Risks: The probability that a specific hazard will cause a harmful consequence, taking into account the exposure, vulnerabilities and capacities. If a potential consequence of a hazard is not likely to significantly harm people or facilities (i.e. due to strong capacity), it is not classified as a risk.
3. Further elaborate the list of potential solutions for each risk, referring to the CAA generic solution inventory for inspiration and the VCA outputs (Stages 3 and 4).
    a. Make each solution as SMART (Specific, Measurable, Achievable, Realistic, and Time-bound) as possible.
        i. i.e. not “improve the laboratory services”, but what must be specifically done to bring about a certain type of laboratory improvement within what timeframe and how this can be measured.
        ii. This may require follow-up conversations with the health facility or logistics staff to refine the description of the solutions.
    b. If possible, estimate the resources required per solution, as this helps prioritisation in Step 6. At this stage, this might be a guesstimate (cost, time investment, procurement options, human resources needed, etc.), only finalised if an improvement plan is agreed as next steps, as this takes considerable time to double-check with local suppliers.
    c. At this stage, more than one solution might be proposed per risk, and a final selection will only be made during Stage 6.

STAGE 5: FINALISE THE RISK AND SOLUTIONS MATRIX

4. Refine and finalise the list of climate risks and solutions based on review by logistics experts / polyvalent climate and health advisors (this may include specialists who are not part of the CRESH team).

OUTPUTS

- The completed Risk and Solution Matrix should now include an exhaustive list of identified climate risks with matched potential solutions, on a single spreadsheet.

Ngouri case study – Stage 5 (Risk and Solutions Matrix)

The Risk and Solution Matrix and list of interventions were completed by a CAA facilitator and discussed with the CRESH team. Subsequently, data was added on estimated costs, feasibility and estimates on other parameters relevant for decision making.

Western Cape case study – Stage 5 (Risk and Solutions Matrix)

The information from steps 3 and 4 was entered into a modified Risk Solution matrix (Excel spreadsheet, example Annexe 2) by one person under the following column headings: Climate hazards and sustainability challenges, Vulnerabilities, Capabilities, Risks and Potential interventions. The matrix had a horizontal logic. For example, in the broad climate hazard category of "extreme heat and drought", one of the vulnerabilities was "farm and manual labourers work in extreme heat", and the associated "capability" was "mobile clinics go to farms and CHW teams cover communities". The risk was "manual and farm labourers at risk of heat-related diseases, dehydration, heat exhaustion, stroke". The suggested intervention was "health promotion in farms and other workplaces on action to take and modification of work patterns during extreme heat". In some cases, an intervention could address multiple risks.

Once all the potential interventions were identified, they were categorised into five groups: infrastructure, technology and products; energy; water, sanitation, hygiene and health care waste; health workforce; service delivery and emergency preparedness.

STAGE 6: SOLUTION PRIORITISATION STAGE

AIM : To produce an agreed, finalised and prioritised Health Risk and Solutions Matrix. The prioritisation is a key step in making the outputs of the VCA concrete and actionable.

TOOLS : Risk and Solutions Matrix template (Annexe 2).

TEAM: A series of meetings or workshops can be the best way to finalise the matrix as it permits discussion, clarification of any information and a decision on prioritisation in real-time. The workshops are led by the person best placed to facilitate the conversation between different stakeholders.

ACTIONS:

1. Preparation of the weighted solution matrix[8]:
    a. A preparatory meeting of the CRESH team (or a core group of CRESH team members) is organised to establish a list of values (factors) to score the solutions, in order to support the prioritisation process. Examples include cost, potential impact on resilience and sustainability parameters, visibility, and HR demands. The team may choose to give certain values a higher weighting (e.g. x 2) than others.
    b. A second spreadsheet (tab) is created within the Risk and Solution Matrix template, focusing just on the solutions (not the risks – which were the focus of the first tab). Each of the identified solutions is listed in the first column, and then their 'score' is estimated for each of the identified values (factors) in the subsequent columns. Where a particular value was given a higher weighting, this weighting is directly applied to the scores for each solution. Ideally, this step should be completed by at least two CRESH team members (e.g. one member scoring, one validating).
    c. The completed solution matrix is shared with CRESH team members for review. Usually a specific meeting or small workshop is required to raise questions / concerns, validate and approve the scoring, and identify any existing parameters which will influence the prioritisation approach (e.g. there is a wish for a maximum of 20 solutions, or a need to distinguish short term from long term solutions).
2. Prioritisation workshop(s). Depending on the size and geographical distribution of the CRESH team, up to four workshops may be required, either virtually or in person.
    a. The typical methodology is to discuss each solution in turn, and decide by consensus which solutions should be retained.
    b. Each proposed solution is discussed to agree on the realistic impact and feasibility in terms of cost and other resource requirements, keeping in mind the pre-identified parameters identified in the preparatory phase.
    c. Solutions are progressively excluded through discussion until a final realistic number of solutions are retained. The scoring is designed to be a support for decision making, but should not (alone) be used as a means to exclude solutions.
    d. Ensure key decision makers are aligned on the final ranking, seeking additional specialist input on specific solutions if required.

[8] For small projects, or where the number of solutions is very limited, the 'scoring approach' may not be necessary. In this case, preparation for the prioritisation workshops just involves finalising the long list of solutions and providing basic explanatory information for each solution.

STAGE 6: SOLUTION PRIORITISATION STAGE

3. Validation and approval workshop: Key stakeholders beyond the CRESH team – including the commissioner and the governance committees – are usually engaged through a final workshop (according to expected practice in that setting/organisation) to validate the final prioritisation of solutions.

OUTPUTS AND NEXT STEPS

- A complete Risk and Solution Matrix containing a prioritised list of solutions with estimated resource requirements as well as estimated impact on resilience and environmental parameters.
- This matrix can be integrated into an annual plan, communications, or fundraising proposals. It can also form the basis of a facility 'Climate Adaptation Plan' (See 'Optional' Next Steps) if desirable.
- It is recommended to produce a synthetic summary (report) of the Climate VCA process as a reference document, unless a Climate Adaptation Plan is developed, which summarises the findings of the Climate VCA and can thus serve as reference document.

Ngouri case study – Stage 6 (Prioritisation)

The Risk and Solution Matrix was reviewed on a preliminary basis by the CRESH team, together with colleagues in the Ministry of Health, who excluded any solutions that were not feasible, already implemented, or inconsistent with the values of the hospital and supporting partner (ALIMA). Further information was added (on Security/ Access) to enable decision making. A formal prioritisation workshop was then held for the full CRESH team to review and prioritise the identified interventions, to produce a preliminary shortlist to propose to senior managers in ALIMA. A second workshop was organised involving both the CRESH team and the senior managers of ALIMA, at which the proposed shortlist was further examined, modified and finally approved. This finalised matrix was used to develop a multi-year facility improvement plan (see below), with detailed activities, indicators and an indicative budget, from which funding proposals for individual interventions were derived.

STAGE 6: SOLUTION PRIORITISATION STAGE

Western Cape case study – Stage 6 (Prioritisation)

Two members of the research team presented the potential interventions to the subdistrict management team – the subdistrict manager, primary health care manager and community-based services manager.

Each category of potential interventions was presented in turn and discussed with the management team. Several factors were also considered to help prioritise the interventions: The likely cost of the intervention, the expected impact on climate resilience, and the expected impact on the carbon footprint, the expected impact on other environmental parameters.

Some of the interventions were immediately discarded as they were not within the control of the Department of Health and Wellness but could be considered by local government or other sectors. Some of the proposed interventions were already being implemented, and some were modified considering feedback from the managers. For each of the remaining factors, the cost or impact was assessed as low, moderate, or high. A final list of feasible and prioritised interventions was made and divided into short-term and longer-term actions that the subdistrict could take forward.

(OPTIONAL) NEXT STEPS: A HEALTH FACILITY CLIMATE ADAPTATION PLAN

AIM : Create a phased, costed facility Climate Adaptation Plan to action the solutions prioritised in the matrix with matched M&E indicators.

TOOLS: Climate Adaptation Plan template (Annexe 6) and M&E toolkit (Annexe 7)

ACTIONS:

1. Ensure agreement on the purpose and content of the Climate Adaptation Plan. If the purpose is for internal implementation planning, the document should be concise, with most of the information on the Climate VCA process placed in Annexe. If the document is aimed at funders or other partners, it can be helpful to summarise the findings of the Climate VCA in the text of the document. If the template (Annexe 6) is used, it will need to be adapted to the defined purpose.
2. Determine whether the planned list of solutions can be implemented with existing resources, or whether mobilisation of new resources (HR, funds) is required. If funding is required, the Climate Adaptation Plan may be written in the form of a funding proposal, including a plan for the HR required.
3. Investigate in detail the implementation requirements (cost, time investment, procurement options, human resources needed, etc.) for each solution. Determine if each costed, timed, and implemented solution is feasible or not.
    a. If a solution is deemed not to be feasible (too costly, parts not available), then omit the solution or replace it with a feasible solution.
4. Review the chronology of synergistic interventions to make implementation most efficient (i.e. install roof ventilation before painting the roof).

(OPTIONAL) NEXT STEPS: A HEALTH FACILITY CLIMATE ADAPTATION PLAN

5. Use the M&E toolkit (Annexe 7) to identify the data and processes that will be required to monitor the progress of the adaptation plan on an ongoing basis.
    a. Routine (monthly) service indicators of process and outputs are selected from the CAA CRESH indicator dictionary. Note: new indicators may be needed for novel solutions, if not contained in the dictionary.
    b. Annual outcome indicators, normally collected by audit, are captured in the CAA resilience scorecard.
    c. Ensure that data collection processes are defined to enable the chosen indicators to be measured before finalising the indicator list.
6. Plan the interim and final evaluation approach:
    a. This should be primarily based on the defined M&E data.
    b. Depending on the objectives of the evaluation, qualitative data and carbon footprint data may be required at baseline and during / following implementation.
7. Elaborate the final climate adaptation plan. This could be a single district (or sub-district) level document covering all health structures involved, or a separate document for each health structure, according to the needs of the context.

OUTPUTS

- A multi-year facility Climate Adaptation Plan and M&E plan.

ANNEXE 1: CLIMATE INFORMATION SOURCES

Climate forecasts

Model	Source	Ensemble members	Products
North American Multi-Model Ensemble Project (NMME) -- multi-system ensemble	International Research Institute (IRI) for Climate and Society; Columbia Climate School	• NOAA NCEP CFSv1 (retired Oct 2012) • NOAA NCEP CFSv2 • IRI ECHAMA and ECHAMF (retired Aug 2012) • NASA Goddard Space Flight Center (GSFC) GEOS5 • NCAR/University of Miami CCSM3.0 • GFDL CM2.1 • GFDL CM2.5 [FLORa06;FLORb01] (joined Mar 2014) • Environment Canada CanCM3 and CanCM4 (joined Sep 2012)	Available maps include: • Tertile summary maps • Flexible seasonal maps • Verification plots Available here.
Copernicus Climate Change Service (C3S) – Multi-system ensemble	Copernicus	• European Centre Medium-Range Weather Forecasts (ECMWF) • The Met Office UK • Météo-France • German Weather Service (Deutscher Wetterdienst, DWD) • Euro-Mediterranean Center on Climate Change (Centro Euro-Mediterraneo sui Cambiamenti Climatici, CMCC) • US National Weather Service's, National Centers for Environmental Prediction (NCEP) • Japan Meteorological Agency (JMA) • Environment and Climate Change Canada (ECCC)	Available maps include: • Ensemble mean anomaly maps • Tertile summary maps • Extreme 20th percentile maps • Verification plots Maps available here. Individual systems raw data available here. Verification plots available from here.
Probabilistic Multi-Model Ensemble (MME) –Multi-system ensemble	World Meteorological Organization (WMO) Centre for Long-Range Forecast Multi-Model Ensemble	• Beijing • CMCC • CPTEC • ECMWF • Exeter • Melbourne • Montreal • Moscow • Offenbach • Pune • Seoul • Tokyo • Toulouse • Washington	Available maps include: • Tertile summary maps Available here.

ANNEXE 1: CLIMATE INFORMATION SOURCES

Weather forecasts

Global Ensemble Prediction System (GEPS)

- 2 to 4 week projections
- Open source (https://app.climateengine.org/climateEngine)
- Relatively low resolution (55km square grid)
- Variables: cumulative rainfall, average temperatures.
- Uses: modelling and analysis, mapping
- Modality: online visualising tool (using point data), or can be downloaded and mapped in GIS software.

European Centre for Medium-Range Weather Forecasts (ECMWF)

- Up to 6-week projections, and longer range over several months
- Open source (https://charts.ecmwf.int/)
- Variables: all rainfall, temperature, wind and pressure
- Uses: online only
- Modality: online visualising tool (using point data)

Other tools

- The Regional Climate Outlook Forums (RCOFs) convene key stakeholders, including National Meteorological Services and various sectors, to generate consensus seasonal forecasts for significant regional seasons worldwide. For Africa, the relevant regional forums are PRESASS and PRESAGG (West Africa), GHACOF (East Africa), PRESAC (Central Africa), among others. These generally convene a meeting before key seasonal timelines to release a consensus forecast product in anticipation of, for example, the onset of the main rainy season. These products are made available publicly and to stakeholders. More information on RCOFs here: https://library.wmo.int/viewer/53939/download?file=RCOF-Factsheets-consolidated.pdf&type=pdf&navigator=1
- EM-DAT (International Disaster Database from Centre for Research on the Epidemiology of Disasters) - https://public.emdat.be/ Open source historic records of disasters, including climate-related events, accessible through a database format
- Severe weather warnings – WMO (https://severeweather.wmo.int/v2/)
- Flood hazard risk – UNEP/GRID (https://wesr.unepgrid.ch/?project=MX-XVK-HPH-OGN-HVE-GGN&language=en&theme=color_light)
- Dust forecast – WMO (https://sds-was.aemet.es/)
- Various monitoring and prediction tools relevant for the Africa region – NOAA (these also inform FEWS) (https://www.cpc.ncep.noaa.gov/products/international/africa/africa.shtml)
- Food security bulletins and mapping – FEWSNET and AGRHYMET
- Open source climate data analysis using GIS (GeoCLIM)

ANNEXE 2: CLIMATE HEALTH RISK & SOLUTION MATRIX TEMPLATE

The CAA Risk and Solution Matrix. A CAA Excel-based template is available, or create a matrix on another chosen platform with the following headings.

A partial example from the Western Cape matrix to aid understanding, with only three of nine hazards displayed.

Hazards and exposure pathways	Vulnerabilities	Capabilities	Risks (Population / Facility)	Potential interventions	CAA Module Classification
	Roofs do not reflect heat	Several clinics have white tiles but not highly reflective	Increase in facility temp and increased use of energy to cool	Paint roofs with highly reflective white paint	Infrastructure, technology, products
	During loadshedding the alternate energy supply does not include air	All clinics have window based air conditioning units	Inability to cool clinic during loadshedding/power cuts	Install solar energy as an alternative power supply during daytime	Infrastructure, technology, products
	Open window policy reduces effectiveness of air conditioning		High temperatures in clinic vs reduced ventilation for TB risk	Review policy for high temps	Governance and financing
	Patients waiting outside in the heat may be vulnerable	Four clinics have sufficient shade areas for usual workload	Patients' condition may worsen when waiting outside in extreme heat	Ensure that every clinic has sufficient shade for waiting outside. Clanwilliam.	Infrastructure, technology, products
	Farm labourers working in extreme heat and vulnerable to dehydration, heat exhaustion, stroke	Mobile clinics go to farms and CHW teams cover communities	Manual/farm labourers at risk of heat related diseases	Health promotion in communities and farms on action to take and modification of work patterns during extreme heat	Service delivery
High temperatures during summer (>40) with drought and risk of veld fires	Community members at risk of high temperatures esp children, older adults, NCDs, pregant women, and particularly in informal settlements	Mobile clinics go to farms and CHW teams cover communities	Community members at risk of heat related diseases (dehydration, diarrhoea)	Health promotion in communities and farms on action to take and modification of work patterns during extreme heat. Schools close during very high temps.	Service delivery
	Informal settlements have higher tempertures inside shacks and lack of shade, shacks have no windows due to security		Community members come to the clinic to shelter from the heat with overcrowding	Providing a community hall to serve as a refuge during extreme weather, offering shelter and resources for vulnerable populations. Plant trees or	Infrastructure, technology, products
	Staff are not trained in recognition and management of heat related conditions		Poor management of heat related conditions	CPD to staff on recognition and management of heat-related conditions and other climate-sensitive diseases	Health workforce
	Snakes and scorpions more active and come inside homes and clinics	Municipality has trained snake capturers and use of snake repellent	Venomous bites and access to hospitals slow via ambulances	Ensure supply of anti-venom, adequate training of staff in first aid and treatment, provide snake repellent	Infrastructure, technology, products
	Increased risk of diarrhoea in high temperatures and reduced water quality/quantity	CHWs provide bottles and advice on ORT	Diarrhoeal disease with risks particularly for infants and small children	Health promotion on self-management of diarrhoea. Attention to "brown water".	Service delivery
	Sleep disturbance and insomnia due to high temp at night		Staff are sleep deprived and stressed during the day affecting performance and well-being		
Wildfires	Wildfires can threaten communities and facilities close to nature e.g. NPO in Graafwater and Wupperthal (village burnt in 2018)	There is an emergency plan for fire at Wupperthal	Risk of damage or loss of facilities from fire	Fire breaks and emergency response	Infrastructure, technology, products
	Informal settlements at risk of flooding, loss of shacks, displacement, unsafe water	No facilities have been flooded	Displaced families, water-borne diseases		
	CHW teams are not actively addressing environmental hazards in the community	x		Include a focus on environmental determinants of health in communities in the COPC	Service delivery
	Staff may need additional training in disaster management plan	Staff are trained in fire drills and evacuation		CPD on disaster management plan	Health workforce
High rainfall leading to floods. Roads washed away or nor passable.	Difficulty getting to work due to long commutes with bad road and weather conditions (rain, fog), esp Wupperthal and with loss of	Staff living close to where they work	Staff may not arrive, arrive late, anxious/stressed, and may be soaked through	Appoint staff from local communities/ HRH policy. Provide facilities for people to dry off or change at work	Governance and financing

ANNEXE 3: STAGE 3 HEALTH FACILITY AUDIT TOOL TEMPLATE

- Health facility audit tool

CAA Climate VCA STEP 3: CLIMATE RESILIENCE AND ENVIRONMENTAL SUSTAINABILITY FACILITY AUDIT

HEALTH STAFF / WORKFORCE

Area of work	Questions (responses are binary or Likert scale where appropriate)
Workforce	What is your monthly headcount on average?
	What is the clinical workforce? Roles and numbers of each) Community-based workforce? (Roles and numbers of each)
Climate smart work practices for staff, focused on extreme heat exposure	Is there a routine of scheduling more physical tasks for cooler parts of the day and reducing / avoiding physically demanding work during very hot days?
	Is there a cooler space outdoors for patients to rest during very hot days?
	Do staff assist patients to remain cool during very hot days as part of patient care?
Resilience of the health workforce to patient peaks during outbreaks, acute events, mass casualty etc.	Does a routine exist to plan for and adapt the HR requirements (rostering, positions / skills / ratios) when patient peaks occur?
	Is there planning to cope with the peaks in advance of the arrival?
	Is there sufficient staff to cover the higher workload during peaks?
	Do staff regularly work overtime during peaks?
	If yes, is the overtime usually unplanned (i.e. staff working a longer shift without being asked to)?
	Is there additional individual support for staff during peaks (psychological or as needed)?
	Is there additional individual support for staff after peaks (debriefs, psychological support or leave days)?
	Is there a dedicated staff space for staff during peaks to rest, to eat, to disconnect from work momentarily etc.?
	Can staff easily access food and drink (for themselves) during peaks?
	Is there a routine to optimize the health of staff before a peak? (i.e. medical checkup or other actions relevant to the peak).
Education for climate health	Have health staff received training for preparing, responding, and recovering from climate-health shocks in the past year?
	Have staff received any training on the health and social effects of climate change/ecological crisis? e.g. malnutrition, infectious diseases, non-communicable diseases and heat, mental health, displacement, migration, injuries
	Have staff received any training on improving the climate resilience of services and the facility infrastructure? e.g. workforce issues, water, waste, sanitation, energy, infrastructure
	Have staff attended any training on improving the environmental sustainability (reducing environmental footprint) of services and the facility? e.g. leadership, energy-water efficiency, waste, food, procurement, transport, buildings, chemicals, pharmaceuticals

ANNEXE 4: STAGE 4 FGD NOTE-TAKING TEMPLATE

This template is available as a basic model for real-time note-taking during the FDGs or for simple thematic analysis of transcripts or outputs of participative data gathering processes.

Climate VCA: scenario-based tabletop FGD data template
Type of hazard / scenario:
Name of health facility / health district / locality:
Name of FGD (and number of participants):
Facilitator name:
Notetaker name:

	Comments from participants
EXPOSURES Which localities / populations / health facilities were exposed to the hazard and how?	
RISKS OR IMPACTS[9] What were the negative consequences of the hazard on the exposed structures / population? (e.g. increased incidence severe malaria, overwhelmed heath facilities)	
VULNERABILITIES What were the vulnerabilities of those facilities / localities (e.g. poor flood-proofing, high proportion of children <5)?	
CAPACITIES Were there any measures or structures in place that reduced the impact of the hazard? (e.g. local associations, other agencies / partners who provided support)	
SOLUTIONS IMPLEMENTED Were any solutions implemented at the time as a result?	
POTENTIAL SOLUTIONS What could be done differently in the future?	
FACILITATOR'S OBSERVATIONS	

[9] The term 'Impact' is used when referring to a previous event. When referring to potential events, the term 'Risk' if preferred (implying 'Risk of future impact').

ANNEXE 5: LIST OF GENERIC SOLUTIONS

SOLUTION	DETAILS
Energy	
Increase proportion of renewable energy sources	Solar energy with adapted circuits and durable batteries with automated switch to backup energy source, based on assessment of energy needs
Improve lighting efficiency	LED lighting and movement detector
Implement energy management protocols	Develop and train staff on efficient energy management protocols
Health staff / Workforce	
Adaptive and resilient workforce management	Assess HR requirements (positions / skills / ratios) based on peak demands; recruit and train staff to meet these requirements Adapt shift planning and workflows to ensure staff wellbeing and adequate rest during periods of climate (and other) stress
Interventions to improve working conditions for staff	Rest areas with shade and water; temperature-controlled duty room
Education for sustainable healthcare	Integrate teaching on the relationship between climate on health, sustainable and efficient use of healthcare resources, and reducing environmental impact of healthcare
Infrastructure, technologies and products	
Resilient supply, procurement and storage	Review medication & product requirements to change from (1) single use → reusable products, (2) minimise packaging, (3) change to low GHG meds where possible Reliable supply chains (medical and non-medical) with focus on sustainable materials and sustainable supplier practices Good medical inventory management to minimise stock outs; protection of stock from floods and heat. Review existing food service to ensure efficient procurement and protection of food stocks (e.g. flooding, rodents)
Ensure structural integrity and efficiency of buildings (including temp management)	Renovation or retrofitting of structures to improve climate integrity, including flexible use structures to adapt to changing needs Energy efficient/resilient materials, sustainable and locally supplied Temperature efficient roof design / materials (tin) / reflective painting Flood barriers and rain shelters Natural ventilation using ventilation chimneys and modified windows
Resilient biomed and technologies	Oxygen needs assessment, with adaptation of Oxygen infrastructure (e.g. efficient O2 concentrators, reliable bridging) to meet range of needs, supported by Oxygen management protocols Change to non-toxic cleaning processes and materials to reduce indoor air pollution Protection of equipment / machines from flooding (e.g. elevation) and power surges (e.g. UPS)

ANNEXE 5: LIST OF GENERIC SOLUTIONS

SOLUTION	RATIONALE
Health Service Provision	
Health service provision oriented to current and evolving needs and epidemiology	Review and adapt facility services to local (evolving) needs - e.g. • Strengthen bloodbank in malarial zones • Ambulance service for obstetrics • Telemedicine and digital tools to ensure continuity of access
Sustainable healthcare practices	Implement evidence-based changes relevant to the context e.g. • reducing non-essential iv fluids and pressurized metered-dose inhalers; • switching from Deslfurane to Sevoflurane or total intra-venous anaesthesia; switching from general to loco-regional anaesthesia where feasible. • Environmentally sound innovations in vaccine practices (e.g. Micropatches)
Community sensitization on Climate and Health	Integration of climate and health in community education activities to promote population resilience and reduce demand for healthcare.
Community health services oriented to local epidemiology and needs	Review and adapt community health services to local needs - e.g. • Supplementary Feeding Programmes / Community management of malnutrition • Preventative interventions of Malaria (Bednets, IRS, SMC) • Reinforcement of EPI (campaigns or opportunistic)
Water, hygiene and medical waste	
Reinforce waste reduction and management	Water management protocols (segregation, etc.) Conservation of reusable products Recycling of non-incinerable items e.g. plastics Efficient waste zone and clean incinerators
Ensure water security	Ensure access to clean water (e.g. wells) Efficient water management including rainwater harvesting
Adequate sanitation	Flood resileint toilets (e.g. elevated toilets)

ANNEXE 5: LIST OF GENERIC SOLUTIONS

SOLUTION	RATIONALE
Governance, financing and health information	
Leadership, advocacy, & funding	Work with national government / WHO / implementing partners to identify long term financing solutions. Clinical leadership activities (e.g. quality improvement processes, IPC procedures or committees).
Service continuity planning	Development of contingency / business continuity plans for key services. Eprep plans and processes, including pre-positioned stocks Establish or reinforce existing disaster management committee Undertake annual current / future risk scenario planning (e.g. risk information analysis to plan drug orders / prevent stock-outs)
Monitoring and evaluation	Implement a monitoring frame (using sector-validated indicators) to enable learning and accountability, including sharing with health staff

ANNEXE 6: CLIMATE ADAPTATION PLAN TEMPLATE

The CAA Climate Adaptation Plan template is a tool that organizations can use if they require a stand-alone action plan, whether for external communications or for detailed implementation planning. Having a dedicated Climate Adaptation Plan is optional, as some organizations will choose to integrate the necessary actions into existing organizational annual plans or facility improvement plans.

ANNEXE 7: MONITORING AND EVALUATION TOOLKIT

CAA has developed the following resources to support organisations to monitor and evaluate their CRESH initiatives:

1. **CAA CRESH indicator dictionary**
    a. **Purpose**: process and output reporting to measure progress and reorient activities.
    b. **Method**: monthly facility-based data collection by facility-based staff.
    c. **Tool**: Excel data tool built from CAA CRESH indicator dictionary. This dictionary contains over 200 indicators that monitor process and outputs. They draw on validated indicator repositories (e.g. WHO health systems resilience indicators, WHO climate resilience indicators, Geneva Sustainability Centre health facility indicators), that are particularly relevant to health facilities in low- and middle-income settings. The indicators are aligned with CAA's generic solutions. Users can select indicators from this list according to their specific planned solutions; we recommend not to exceed (on average) one process indicator and one output indicator per solution. Choice of indicators will be determined by the feasibility of measurement in that context, as well as the means of measurement identified (e.g. data extraction from monthly routine reports).

2. **CAA Resilience scorecard**
    a. **Purpose**: annual outcome assessment to measure potential impact of intervention.
    b. **Method**: primarily based on rapid ad-hoc audit.
    c. **Tool**: Excel data tool based on CAA scorecard outcomes. The 26 generic outcomes in this tool map onto the 6 modules of the CAA CRESH approach. They reflect a working consensus from CAA network experts on the most relevant resilience and sustainability outcomes for health facilities in low- and middle-income settings. The tool is currently undergoing expert review, and will always require expert validation in each setting in which it is applied.

The process of establishing M&E for CRESH initiatives can be summarised as follows:

1. Define the overall M&E approach in alignment with the existing data collection processes and resourcing. The two CAA M&E tools are sufficient for most initiatives, but are not compulsory.
2. If using the CAA tools:
    - select the monthly indicators that will be used from the indicator dictionary, incorporating these into existing facility data collection tools (or creating a standalone data tool using Microsoft Excel or equivalent)
    - review the scorecard outcomes, excluding any outcomes that are not relevant in that setting, adjusting any outcomes that need to be adapted to context. Create a data entry tool (using Microsoft Excel or equivalent) unless an annual outcome monitoring tool already exists.
3. Decide which organisation / staff member is responsible for data collection for each tool.

ANNEXE 7: MONITORING AND EVALUATION TOOLKIT

4. Validate the M&E tools through piloting in one facility / review by national experts:
    - Identify expert reviewers at national or organisational level, and agree a pilot approach with them
    - This will normally involve populating the data tools with a minimum of one month's worth of data for monthly indicators, and point-in-time data for annual outcome indicators.
    - Adjust the data collection tool (and choice / wording of indicators) based on the experience of data collection and the feedback of reviewers.
5. (If required) develop SOPs for facility-based data collection and for annual audit.

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