Climate Action Accelerator

Health facility Climate Vulnerability and Capacity Assessment

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

Version 3, March 2025

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 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 own 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 minimizing the release of waste into the environment. The WHO CRESH guidance documents define 10 system-level domains, and four facility-level domains, that need to be strengthened to achieve this (Figure 1).

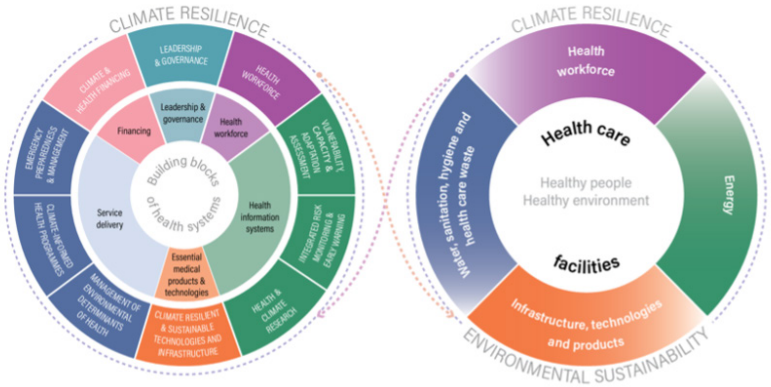


Figure 1: CRESH at the level of health systems (left) and health facilities (right) – from WHO CRES health care facility guidance

Until now, there are 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 has 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 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 2).

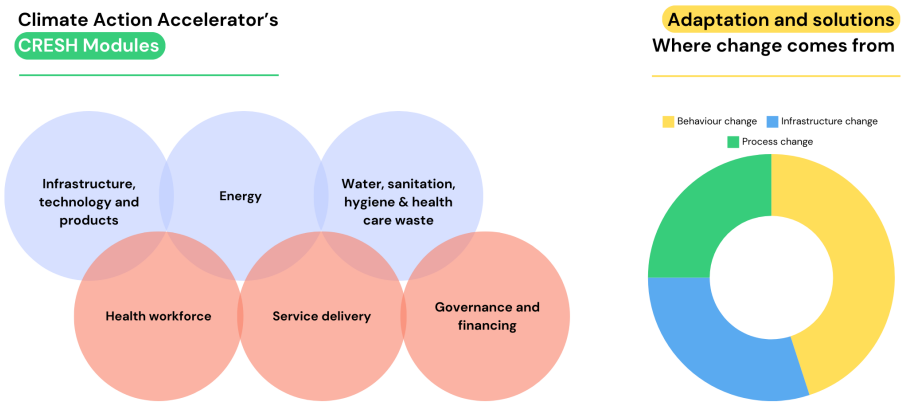
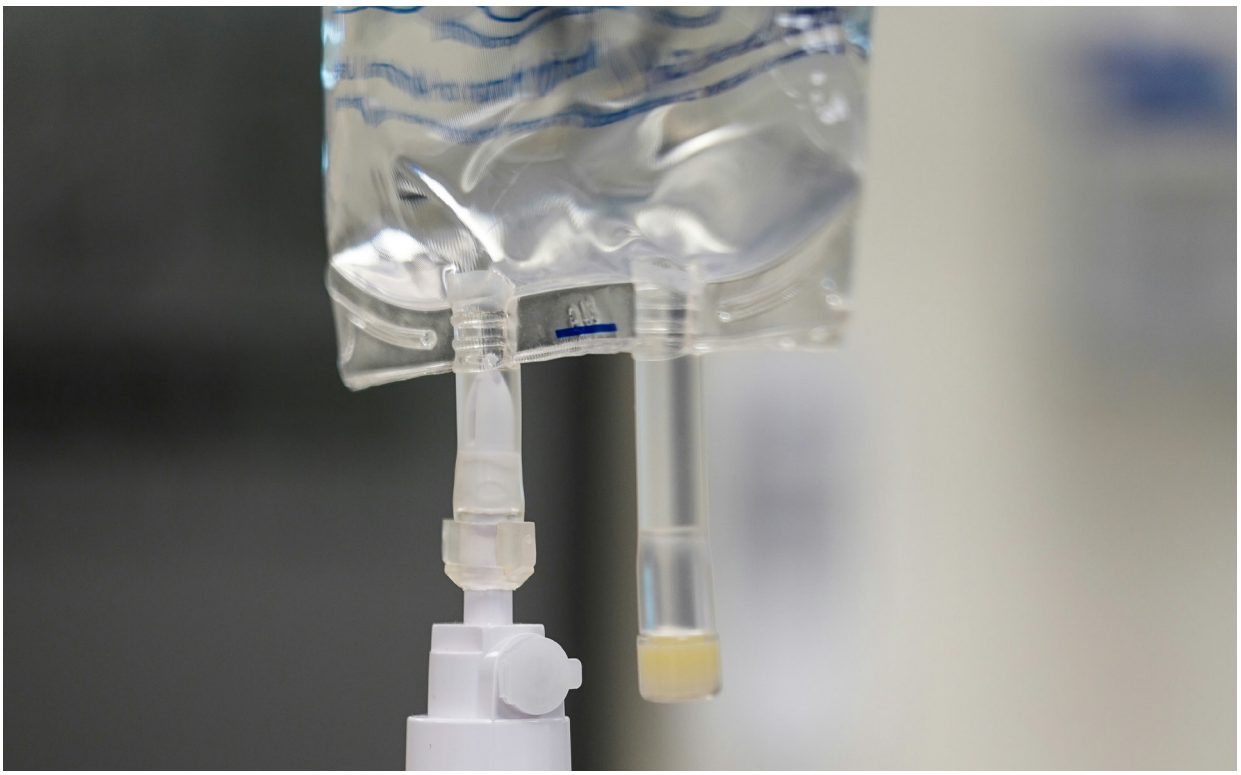


Figure 2: Climate Action Accelerator's 6 module concept for health facility resilience and sustainability.



[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

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

WHO proposes a 'healthcare improvement' approach to CRESH implementation (Figure 3). The Climate VCA corresponds to steps 2 and 3 in this figure (after establishing the team), and is thus the key to setting the CRESH implementation process in motion.

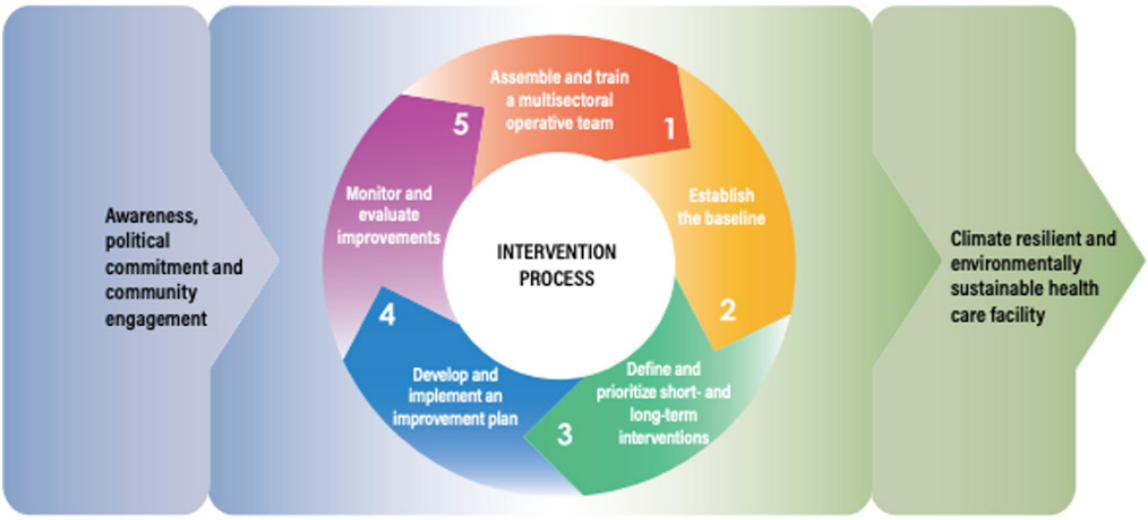


Figure 3: Process for CRESH implementation (from WHO Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities)

The enormous global variation in health facilities, geographical contexts and climate hazards requires a highly contextualised assessment approach. WHO has produced a checklist for health facilities that focuses on climate risks[2] but does not provide guidance for adapting this to context and integrating it into the process of CRESH implementation. Several 'Climate Vulnerability and Adaptive Capacity Assessment (VCA)' approaches have been defined that convert the WHO checklists into a robust assessment approach, but these tend to be resource intensive and can result in an analytic output that may not serve the needs of implementation planning.

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:

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

- It enables the leadership and staff to identify of 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 how care is delivered and received and systems issues as (e.g. service delivery and governance) at the level of the facility.

The VCA methodology is highly contextualizable, and can be aligned with National Adaptation Plans (NAPs), and Disaster Risk Reduction (DRR) plans at 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 service adaptation plan, discussed in the 'next steps' section at the end of this document.

TERMS & DEFINITIONS

The relatively recent introduction of 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 report regularly witnessing the impacts 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 toolkit should feel free to adapt the terminology to their organisational culturel; indeed, this is part of the Climate VCA contextualisation process. The figure below provides an example.

Climate hazard

Climate hazard refers to a natural or human-induced environmental change (fast or slow onset) that has the potential to cause damage. The way in which 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.

Population level: Hazards such as floods have the potential to directly impact individuals (e.g. injuries, exacerbation of existing medical conditions).

Facility level: Floods and other hazards have potential to directly impact health facilities (e.g. electrical damage), with further consequences for patient care.

Indirect Exposures: The hazard is associated with environmental consequences which have the potential for indirect impact on the population and facility.

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

Facility level: Heat and reduced rainfall (hazard), by potentially increasing morbidity and mortality, could result in greatly increased demand for hospital care (with the consequence of the hospital being overwhelmed, impacting on the general functioning of the facility and staff wellbeing)

Vulnerability

The risk of harm that a hazard causes depends on the existing vulnerabilities and capacities of the individuals within that population or the health facilities.

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)

TERMS & DEFINITIONS

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, that make them less likely to be affected 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
- Reflective roof paint to reduce temperature

Risk

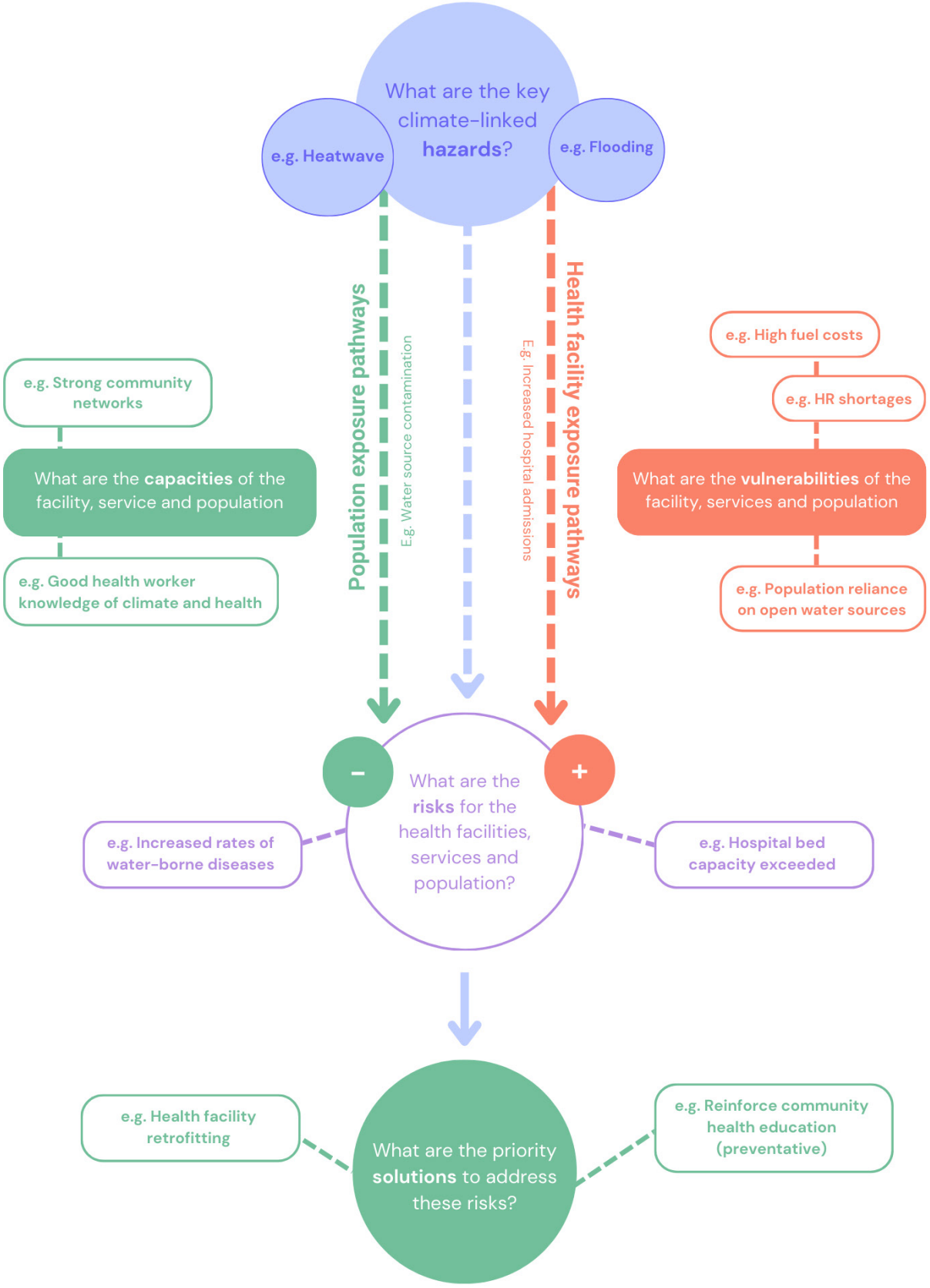
Risk is the probability that a specific hazard will cause a harmful consequence. To calculate this probability, the exposure, vulnerabilities and capacities are taken into account. If the outcome is not harmful (i.e. due to strong capacity), it is not classified as a risk. When harmful, it is classified as a risk. All the risks are listed and prioritised according to how important the harm caused is to the staff, patients and community.

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 community 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 population and the health facility.

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

CONCEPTUAL MODEL OF THE CLIMATE VCA

A visual way of linking climate health for the example of floods.



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: 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: PRIORITISATION: Establish a prioritization approach (who is involved and in what way), ensuring all necessary stakeholders are appropriately engaged in the process. The risks and solutions are ranked from 1 to X (# of solutions).

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. For example, creating the matrix (stage 5) can begin during stages 1-4 by inputting information as it becomes available. 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 collated 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 **prioritized risk matrix** with corresponding solutions. Many partners find this information on key risks and solutions valuable, as it can be integrated into an organizational 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 CRESH improvement plan (micro-level)** 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[3] (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 organizational 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.

[3] 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 habitants. 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

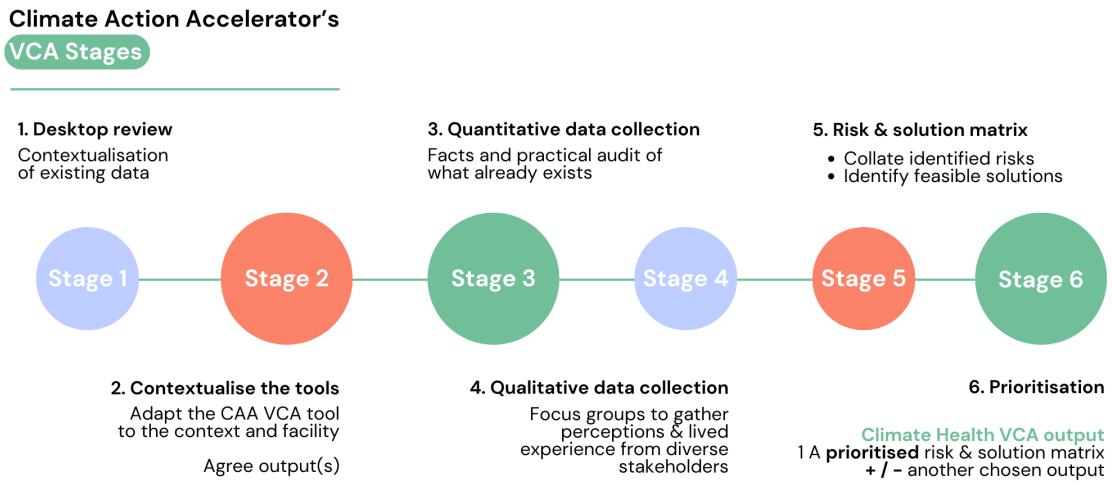


Figure 4: Stages of the VCA

Before starting, it is crucial to clarify who is commissioning and overseeing the process, and who will be carrying out the work. The setup will vary by context, but some general principles apply:

- Governance: The commissioning body (e.g. Provincial MoH / NGO / other) should help define 1) the CRESH team members and 2) the VCA output.
- The CRESH team is a multidisciplinary team as different skills are required to deliver the Climate VCA. The team set up will be different for different partners.
    - It typically includes the health facility director, clinical lead and logistics lead, representatives of partner health organisations and involved civil society organisations (CSOs), community representatives, and at least one person with experience in conducting a climate VCA or who has received an induction on this methodology.
    - The team member with climate VCA experience ensures that the rest of the team understands the objectives, output, and process.
- The timeline and deliverable format should be agreed on between the commissioner and the CRESH team.
- The commissioner may choose to appoint a separate person or group responsible for oversight (governance).
- Access to the facility patient and service databases early on is very helpful to contextualise the VCA tools in later stages.

PREPARING FOR THE CLIMATE VCA

COMPLEMENTARY TOOLS

There are two additional tools to be considered during the preparation phase that are not formally part of the Climate VCA but can complement the VCA process.

I. 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. **Aga Khan Health Carbon Management Tool** 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.

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

a. If such an assessment has been conducted it helps reduce the number of questions asked during the quantitative audit (stage 3)

b. A basic example is available here for reference but more comprehensive assessments also exist.

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 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) to identify the information gaps that need to be addressed in Stage 2.

TEAM:

I. This stage is typically completed by someone with a health care background and skills in conducting literature views.

II. Depending on their experience, they may need support to be concise and to select the most relevant information for the Climate VCA. CAA can provide this support if needed.

TOOLS: *Climate Information Sources* (Annex 1)

ACTIONS

a. Context overview (including humanitarian context if relevant)

b. Population demographic and health profile data: To identify local existing population health vulnerabilities. Facility level data on patient morbidities and mortality; Population level health data: local disease burden. The scope of the data used (regional, national, district, local facility) is decided by the CRESH team depending on the local health system set up. This data may be copious, be selective what is included in the summary based on what health data is most relevant to the likely climate hazards.

c. 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 (as well as tested mitigation / adaptation initiatives in the region).

d. Climate-informed adaptations in response to these risks: at facility level (hospital and PHC logistical data) and if available district and national. Regarding facility level vulnerabilities, e.g. identifying waste processes, processes that are highly energy dependent / energy intensive, or processes for which there is limited backup in case of shortages of energy or infrastructure failures (e.g. Oxygen concentrators dependent on diesel generators). If available this information can help reduce the number of questions asked in Stage 3.

OUTPUTS

- A summary of existing known relevant climate hazards, as well as population and facility vulnerabilities (and possibly capacities), and identified gaps in information.
- A maximum of 6-8 pages is recommended.
- The information is used in Stage 2 to review and simplify and tailor the tools for Stage 3 and 4 to the needs of the facility.

STAGE 1: DESK REVIEW

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 summarized climate hazards in the Sahel region and provided 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 was 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, and 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 Stage 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. There is a tendency to keep adding questions to collect more data, which can ultimately lengthen the audit and making it less focused, this can demoralise staff and reduce the quality of their inputs.

III. The CAA facilitator can support template revision and training needs.

TOOLS:

1. Quantitative Audit (Stage 3): Health facility audit (covering the 6 CAA modules within a facility)
2. Qualitative Assessment (Stage 4): Tabletop Scenario and focus group discussion (FGD) preparation

ACTIONS

1. Review the tool templates for the facility quantitative audit (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 it from 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 a baseline facility assessment of some type already exists as this will provide substantial information.

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

STAGE 2: CONTEXTUALISE THE TOOLS

2. Prepare the focus group discussions (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.

    b. CAA recommends 'scenario tabletop methodology' which prompts participants to recall and retell their own experience of a recent climate hazard (a scenario).

    c. Appoint the FDG facilitator in advance. It requires a facilitator with strong interpersonal skills and the ability to think, adapt and redirect participants during the discussion.

    d. Co-design the FGD methodology to tailor to the context, see Stage 4 description for details.

    e. Identify training or practice needs: If unfamiliar with this methodology a CAA facilitator can provide a training workshop. Even if experienced, we recommend having at least one FGD practice session, using the CRESH team members as participants before conducting Stage 4.

OUTPUTS

- Tailored, contextualized data collection tools for Stages 3 and 4, ready to use.
- Optional: It is possible to start using the Risk and Solution Matrix at this stage, populating the template (Annex 2) with hazards, vulnerabilities and capacities with associated risks already identified in Stage 1. This is useful if:
    - Stage 1 yielded substantial information, enabling Stage 3 and 4 to be more focused on verifying information and priorities that discovering new information.
    - For questions answered in Stage 1 and subsequently removed from the Stage 3 tool, add the information directly into the matrix to prevent data being lost in the process.

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 finalization. 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, contextualized 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 own map of the hospital and 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.

STAGE 2: CONTEXTUALISE THE TOOLS

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 become too long. Although 'Likert scales' were considered, for simplicity many questions were simplified to closed question (Yes/No/NA) or space for comments 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 were 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 a robust 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 to not disrupt health service delivery.

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

TOOLS: The tailored version of the Stage 3 tools, produced in Stage 2

- VCA Health Facility Audit

ACTIONS

I. A live health facility audit is conducted to complete the Stage 3 tools:

   a. Infrastructure - focused on building and infrastructure, inc. waste and WASH components

   b. Health service delivery - focused on health staff and health care delivery

II. Confirm a convenient time for health staff to conduct the audits depending on the methodology chosen, e.g.

   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 most suitable for the context.

III. This audit should only take 1 hour at a PHC and 1-2 hours at a hospital. Remain cognisant that health staff are often busy and are giving time from patient care or other duties.

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.
- Optional: If updating the Risk and Solution Matrix per stage, you can now add any new details on hazards, vulnerabilities, and capacities to complement the information from Stage 1. Previously identified risks might become more specific from Stage 3 and new risks identified can be added.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

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

TEAM: Two people from the CRESH team; one to facilitate the conversation and another to document the information.

TOOLS:

- Scenario tabletop methodology, plus any device required for data collection (tape recorder, note taking (Annex 4), etc.).

WHAT IS THE TABLETOP METHODOLOGY?

Focus Group Discussions (FGDs) via Tabletop methodology:

a. There will be multiple FGDs run separately during Stage 4.
    i. This allows for the grouping of participants based on different criteria (gender, roles, hierarchy etc.).
    ii. Keeping the group size small (6-8 participants) facilitates more effective and manageable discussions.

b. Each FGD talks through a pre-chosen scenario (Stage 2) in real-time. It is facilitated by a chosen team member who is assisted by a scribe for note taking (data collection).

c. The FGD begins by the group drawing a visual map together on the tabletop (or board) to represent the affected area. The map helps participants visualize the scenario and prompts a recall of the event. Importantly, creating the aid also serves as a warmup/ icebreaker for the group.
    i. Mark key local landmarks, each participant's home, the affected area etc.

d. The facilitator prompts participants to retell events as they recall them, using the map to immerse them in the scenario.
    i. This methodology elicits the different perspectives or group members, sharing their reflections on how they personally experienced the hazard (e.g. crops exposed to drought), they are prompted in 'lay term' to speak to exposures, vulnerabilities and capacities.

e. Finally, solutions that participants put in place, or that would have been helpful are discussed. The FGD's perception of a best-case scenario response is explored in real-time.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

ACTIONS

I. Organize training of facilitators, to include co-design and practice of the methodology (ideally facilitator training should be done in advance (Stage 2)).

  a. Hold a training workshop on the Scenario Tabletop Tools. Co-design the scenarios and approach and conduct a FGD 'practice run' in a learning environment.

    - Select one or two local climate hazards identified in Stage 1 from the list of identified hazards locally experienced.
    - We suggest focusing 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 preferrable 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 illicit the information sought.
    - When facilitating the Focus Group Discussion (FGD), 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: Recognize 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.
    - Adapt the method of data collection (recording with permission, note taking, etc.) from the generic template (Annex 4) to meet the needs.

  b. Select a transcription method that works for the setting, e.g.

    - Decide the best method for note taking, asking permission to record where appropriate.
    - Transcribe the FGDs based on notes taken by the facilitator. Sharing the thematic collaborative summaries of FGDs can be a good way to conclude the discussion, rechecking the summary and if anything vital is felt to be missing by any participant.

II. Work with facilitators to identify participants and allocate into groups:

  a. Pre-identify the FGD participants, allocate into three or four groups. Group constitution will vary by context.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

i. 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.

ii. Discuss with senior hospital staff and community members to identify locally relevant participants.

iii. Consider if any persons are at risk or 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.

iv. Consider language, hierarchical relationships, diversity of age and experience to ensure the collected information is as representative as possible.

v. For example, in some contexts, mixing categories of participant (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 homogenous.

b. Communicate FGD dates to invited participants in advance.

i. Decide what information participant will require in advance to feel comfortable participating and what is communicated as an introduction on the day.

ii. On the day, each group is briefed on the methodology and questions of clarification answered.

iii. Ensure on the day to re-ask about trauma and give the opportunity for any participants to excuse themselves from the exercise.

III. Carry out a debriefing and lessons learnt exercise with the facilitators after the FGDs have occurred

OUTPUTS:

- Collected FGD notes plus a 2-3 page summary of each FGD highlighting commonalities.

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 of all participants. The participants began with a warmup exercise to draw the local facility and community places of interest. This prop help 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 tree diagram (Figure 5), serving to depict a root cause analysis as FDG documentation.

STAGE 4: QUALITATIVE (SCENARIO-BASED) DATA COLLECTION

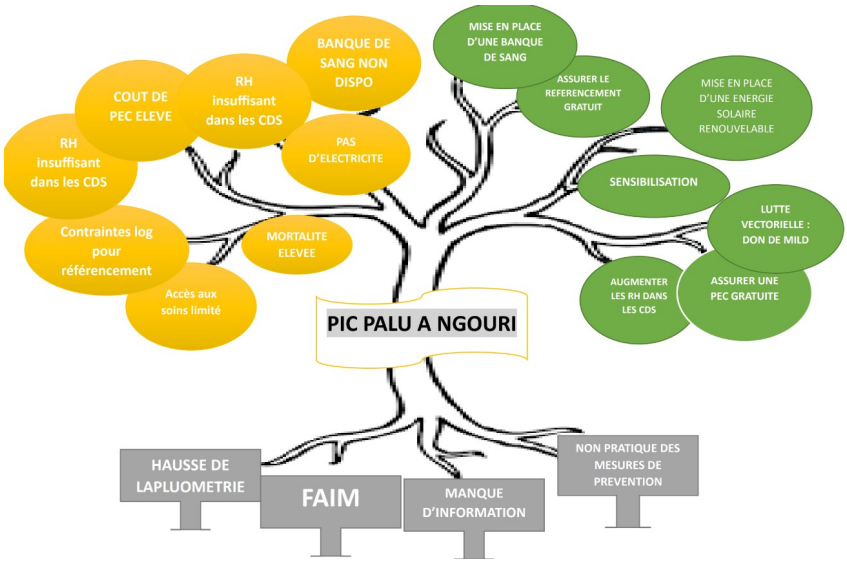


Figure 5: Tree diagram of the malaria peak in Ngouri

Western Cape case study – Stage 4 (Qualitative phase)

The methodology was co-designed and practiced 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 orientated the group to the climate scenario and encouraged them to elaborate on what happened, what were the strengths (capacities) and vulnerabilities (weaknesses) of the facility and services 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. 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, summarizing the key themes, based on the template and supported by the audio-recording.

STAGE 5: RISK AND SOLUTIONS MATRIX

AIM : Compile and analyse all the information obtained in Stages 1, 3 and 4 and complete the Risk and Solution Matrix.

TOOLS :

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

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

ACTIONS

I. Analyse, combine and condense the outputs from Stage 1, 3 and 4; normally there is overlapping information in each stage. Take note of this as aspects repeatedly identified are likely to be prioritized in Stage 6.
   a. For example, you can already place the risks most identified at the top rows of the matrix and less frequently mentioned risks lower in the matrix.

II. Populate the matrix template or complete it if you started populating the template in early stages. Ensure the following information is captured:
   a. Identified hazards, vulnerabilities and capabilities, and associated risks.
   b. Any solutions that participants felt were particularly appropriate / desirable, as well as solutions that they deemed not feasible or contextually inappropriate.

III. Identify potential solutions for each risk, referring to the CAA generic solution inventory for inspiration and the VCA notes (Stages 3 and 4).
   a. Make each solution SMART (Specific, Measurable, Achievable, Realistic, and Timely) be as specific 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.
   b. If possible, estimate the resources required per solution as this helps prioritization in Step 6. At this stage this might be a guesstimate (cost, time investment, procurement options, human resources needed etc.), only finalized 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.

IV. Refine and finalise the list of climate risks and solutions based on insights from experts / polyvalent climate and health advisors who were not directly involved in the Climate VCA process, through a 'collective brainstorming' approach.

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.

STAGE 5: RISK AND SOLUTIONS MATRIX

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

The Risk and Solution Matrix and list of interventions was 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 2 and steps 3 was entered into a matrix (Excel spreadsheet, example Annex 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 categorized 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, finalized and prioritized Health Risk and Solutions Matrix. The prioritization is a key step in making the outputs of the VCA concrete and actionable.

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

TEAM: This stage is normally led by a single member of the CRESH team

ACTIONS:

A series of meetings or workshops can be the best way to finalize the matrix as it permits discussion, clarification of any information and a decision on prioritization real-time.

The workshop is led by the person best placed to facilitate the conversation between different stakeholders. In our experience sometimes this is CAA or an individual from the partner organization. The workshop is attended by the commissioning organisation, facility leadership / the CRESH team and other key influential stakeholders.

I. Preparation of the weighted solution matrix:
   a. A list of values (factors) are agreed in advance by the CRESH team to guide the prioritization process. Examples include cost, potential impact on resilience and sustainability parameters, visibility, HR demands.
   b. The identified CRESH team member creates a second spreadsheet (tab) within the Risk and Solution Matrix template, listing the identified solutions in the first column, and then estimating their 'score' for each of the identified values (factors) in the subsequent columns.
   c. The completed matrix is shared with CRESH team members for validation (usually a specific meeting or small workshop is required.

II. Prioritisation workshop(s). Key stakeholders beyond the CRESH team – including the commissioner and any governance committees – are engaged through one or more workshops, according to expected practice in that setting / organisation to enable discussion, clarification and final prioritisation of solutions
   a. Start by ranking the solutions according to their scores on the various values/ factors, and the weighting that participants attribute to each value
   b. Each proposed solution is discussed to identify realistic impact and feasibility in terms of cost and other resource requirements.
   c. Cross-check the ranking of the solutions, amending the ranking if needed.
   d. Ensure key decision makers are aligned on the final ranking, seeking specialist input on specific solutions if required.

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.

STAGE 6: SOLUTION PRIORITISATION STAGE

- It can also form the basis of a multiyear facility improvement plan (See (Optional) Next Steps) if desirable.

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 clearly 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 (Annex 7) (with detailed activities, indicators and indicative budget), from which funding proposals for individual interventions were derived.

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, 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 FACILITY IMPROVEMENT PLAN

AIM : Create a phased, costed facility improvement plan to action the solutions prioritized in the matrix with matched M&E indicators.

TOOLS: Improvement plan template and M&E framework (Annex 6)

ACTIONS:

1. Investigate in detail the implementation requirements (cost, time investment, procurement options, human resources needed etc.) for each solution.
2. Determine if the costed, timed, implemented solution is feasible or not
    a. If a solution becomes infeasible (too costly, parts not available) then replace with a feasible solution
3. Review the chronology of synergistic interventions to make implementation most efficient (i.e. install roof ventilation prior to painting the roof)
4. Use the M&E framework (Annex 6) to identify the data that will be required to monitor the progress of the improvement plan on an ongoing basis.
    a. Relevant indicators are selected from the M&E generic indicator dictionary. Specific indicators can be created to meet needs if not found in the CAA generic dictionary
    b. The aim is not to increase facility reporting requirements unnecessarily. A triangulation of existing indicators, proposed CRESH indicators and organizational reporting requirements is essential.
    c. Ensure that data collection processes exist to enable the chosen indicators to be measured, prior to finalizing the indicator list.
5. Plan the interim and final evaluation approach:
    a. Where possible, this should be based on routinely collected data, and the periodic measurement of the indicators from the M&E framework.
    b. An alternative (or supplementary) measure that can be used where routine data collection is challenging, is the use of a resilience and sustainability scorecard that can be completed at project initiation and annually thereafter. See Annex 7 for an example scorecard.
    c. Monitoring the M&E indicators and annual completion of the scorecard can form a solid basis for project evaluation and for modelling impacts on resilience and carbon production.

OUTPUTS

- A multiyear facility improvement plan and M&E framework. The improvement plan may be integrated into an existing organizational or facility plan if relevant.

ANNEX 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.

ANNEX 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 prior to key seasonal timelines in order 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 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)

ANNEX 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

ANNEX 3: HEALTH FACILITY AUDIT TOOL TEMPLATES

- Health facility audit

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

ANNEX 4: STAGE 4 FGD NOTE TAKING TEMPLATE

This template is available as a basic model for note taking real time during the FDGs.

CLIMATE VCA TEMPLATE - FOCUS GROUP DISCUSSION NOTES

- Facility: Date:
- Scenario:
- Participants (names and roles):

	VULNERABILITY -	CAPACITY +	SOLUTIONS ++
GENERAL NOTES			
TAKE HOME MESSAGES			
KEY QUOTES			

ANNEX 5: LIST OF GENERIC SOLUTIONS

SOLUTION	RATIONALE
Energy	
Renewable energy source	Solar energy with adapted circuits and durable batteries with automated switch to backup energy source
Lighting efficiency	LED lighting and movement detector
Energy management	Energy 'diagnosis' and efficient energy management protocols
Health staff / Workforce	
HR planning for periods of climate (and other) stress	Adaptive and resilient workforce management processes: HR requirements (positions / skills / ratios) Health workloads and workflows to ensure staff wellbeing and adequate rest
Interventions to improve working conditions for staff	Rest areas with shade and water
Education for sustainable healthcare	Behaviour change training/ ways of working, implementing energy / water consumption / resilience strategies to cope with evolving changes
Infrastructure, technologies and products	
Supply and procurement	Reliable supply chains with focus on sustainable materials and sustainable supplier practices Review medication & product requirements to change from (1) single use → reusable products, (2) minimise packaging, (3) change to low GHG meds where possible Good inventory management to minimise stock outs Review existing food service for environmental sustainability
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
Biomed and technologies	Efficient O2 concentrators with reliable bridging / efficient O2 infrastucture to meet range of needs Change to non-toxic cleaning processes and materials to reduce indoor air pollution Oxygen management protocols to prevent wastage

ANNEX 5: LIST OF GENERIC SOLUTIONS

SOLUTION	RATIONALE
Health Service Provision	
Health service provision is oriented to current and evolving needs and epidemiology	Telemedicine and digital tools to ensure continuity of access Services are reviewed and adapted to local (evolving) needs - e.g. lab, bloodbank ambulance service for obstetrics
Community activities to promote population resilience and reduce demand for healthcare, oriented to local (and evolving) epidemiology and needs	Supplementary Feeding Programmes / Community management of malnutrition Preventative interventions of Malaria (Bednets, IRS, SMC) Reinforcement of EPI (campaigns or opportunistic) Community sensitisation on climate and health
Water, hygiene and medical waste	
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
Water security	Access to clean water Efficient water management including rainwater harvesting
Sanitation	Flood resileint toilets (e.g. elevated toilets)
Governance and financing	
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 Disaster management committee Annual current / future risk scenario planning is undertaken (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

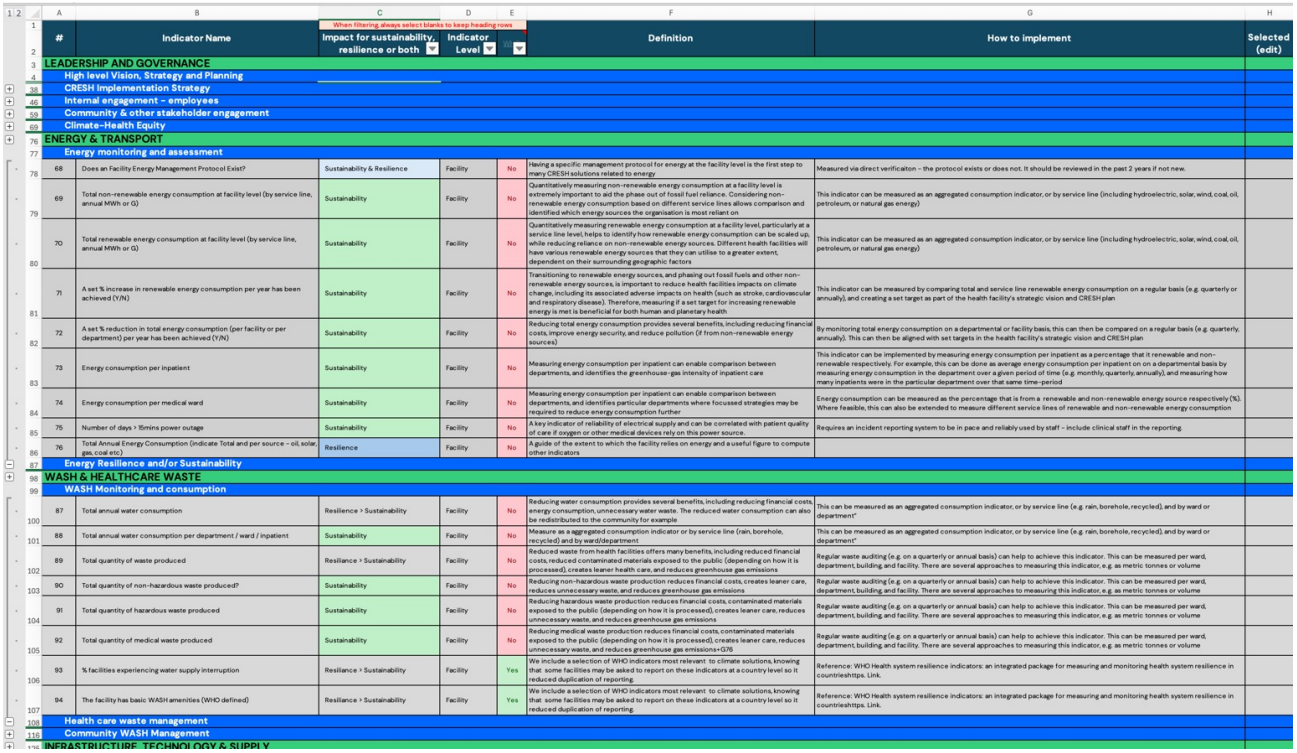
ANNEX 6: M&E FRAMEWORK

The CAA M&E framework contains over 200 indicators that monitor both process and outcome (impact) of each solution. 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.

These indicators are aligned with CAA's generic solutions. Users can select indicators from this list according to the specific solutions included in their matrix; we recommend not to exceed (on average) one process indicator and one outcome indicator per solution. Choice of indicators will be determined by feasibility of measurement in that context, as well as the means or measurement identified (e.g. data extraction from monthly routine reports, or ad hoc assessments based on the VCA data tools).

A sample from the M&E framework is given below.

Please contact contact@climateactionaccelerator.org for more information.



#	Indicator Name	When filtering, always select blanks to keep heading rows Impact for sustainability, resilience or both	Indicator Level		Definition	How to implement	Selected (edit)
	LEADERSHIP AND GOVERNANCE						
	High level Vision, Strategy and Planning						
	CRESH Implementation Strategy						
	Internal engagement - employees						
	Community & other stakeholder engagement						
	Climate-Health Equity						
	ENERGY & TRANSPORT						
	Energy monitoring and assessment						
68	Does an Facility Energy Management Protocol Exist?	Sustainability & Resilience	Facility	No	Having a specific management protocol for energy at the facility level is the first step to many CRESH solutions related to energy	Measured via direct verificaiton - the protocol exists or does not. It should be reviewed in the past 2 years if not new.	
69	Total non-renewable energy consumption at facility level (by service line, annual MWh or G)	Sustainability	Facility	No	Quantitatively measuring non-renewable energy consumption at a facility level is extremely important to aid the phase out of fossil fuel reliance. Considering non-renewable energy consumption based on different service lines allows comparison and identified which energy sources the organisation is most reliant on	This indicator can be measured as an aggregated consumption indicator, or by service line (including hydroelectric, solar, wind, coal, oil, petroleum, or natural gas energy)	
70	Total renewable energy consumption at facility level (by service line, annual MWh or G)	Sustainability	Facility	No	Quantitatively measuring renewable energy consumption at a facility level, particularly at a service line level, helps to identify how renewable energy consumption can be scaled up, while reducing reliance on non-renewable energy sources. Different health facilities will have various renewable energy sources that they can utilise to a greater extent, dependent on their surrounding geographic factors	This indicator can be measured as an aggregated consumption indicator, or by service line (including hydroelectric, solar, wind, coal, oil, petroleum, or natural gas energy)	
71	A set % increase in renewable energy consumption per year has been achieved (Y/N)	Sustainability	Facility	No	Transitioning to renewable energy sources, and phasing out fossil fuels and other non-renewable energy sources, is important to reduce health facilities impacts on climate change, including its associated adverse impacts on health (such as stroke, cardiovascular and respiratory disease). Therefore, measuring if a set target for increasing renewable energy is met is beneficial for both human and planetary health	This indicator can be measured by comparing total and service line renewable energy consumption on a regular basis (e.g. quarterly or annually), and creating a set target as part of the health facility's strategic vision and CRESH plan	
72	A set % reduction in total energy consumption (per facility or per department) per year has been achieved (Y/N)	Sustainability	Facility	No	Reducing total energy consumption provides several benefits, including reducing financial costs, improve energy security, and reduce pollution (if from non-renewable energy sources)	By monitoring total energy consumption on a departmental or facility basis, this can then be compared on a regular basis (e.g. quarterly, annually). This can then be aligned with set targets in the health facility's strategic vision and CRESH plan	
73	Energy consumption per inpatient	Sustainability	Facility	No	Measuring energy consumption per inpatient can enable comparison between departments, and identifies the greenhouse-gas intensity of inpatient care	This indicator can be implemented by measuring energy consumption per inpatient as a percentage that it renewable and non-renewable respectively. For example, this can be done as average energy consumption per inpatient on on a departmental basis by measuring energy consumption in the department over a given period of time (e.g. monthly, quarterly, annually), and measuring how many inpatients were in the particular department over that same time-period	
74	Energy consumption per medical ward	Sustainability	Facility	No	Measuring energy consumption per inpatient can enable comparison between departments, and identifies particular departments where focussed strategies may be required to reduce energy consumption further	Energy consumption can be measured as the percentage that is from a renewable and non-renewable energy source respectively (%). Where feasible, this can also be extended to measure different service lines of renewable and non-renewable energy consumption	
75	Number of days > 15mins power outage	Sustainability	Facility	No	A key indicator of reliability of electrical supply and can be correlated with patient quality of care if oxygen or other medical devices rely on this power source.	Requires an incident reporting system to be in pace and reliably used by staff - include clinical staff in the reporting.	
76	Total Annual Energy Consumption (indicate Total and per source - oil, solar, gas, coal etc)	Resilience	Facility	No	A guide of the extent to which the facility relies on energy and a useful figure to compute other indicators		
	Energy Resilience and/or Sustainability						
	WASH & HEALTHCARE WASTE						
	WASH Monitoring and consumption						
87	Total annual water consumption	Resilience > Sustainability	Facility	No	Reducing water consumption provides several benefits, including reducing financial costs, energy consumption, unnecessary water waste. The reduced water consumption can also be redistributed to the community for example	This can be measured as an aggregated consumption indicator, or by service line (e.g. rain, borehole, recycled), and by ward or department"	
88	Total annual water consumption per department / ward / inpatient	Sustainability	Facility	No	Measure as a aggregated consumption indicator or by service line (rain, borehole, recycled) and by ward/department	This can be measured as an aggregated consumption indicator, or by service line (e.g. rain, borehole, recycled), and by ward or department"	
89	Total quantity of waste produced	Resilance > Sustainability	Facility	No	Reduced waste from health facilities offers many benefits, including reduced financial costs, reduced contaminated materials exposed to the public (depending on how it is processed), creates leaner health care, and reduces greenhouse gas emissions	Regular waste auditing (e.g. on a quarterly or annual basis) can help to achieve this indicator. This can be measured per ward, department, building, and facility. There are several approaches to measuring this indicator, e.g. as metric tonnes or volume	
90	Total quantity of non-hazardous waste produced?	Sustainability	Facility	No	Reducing non-hazardous waste production reduces financial costs, creates leaner care, reduces unnecessary waste, and reduces greenhouse gas emissions	Regular waste auditing (e.g. on a quarterly or annual basis) can help to achieve this indicator. This can be measured per ward, department, building, and facility. There are several approaches to measuring this indicator, e.g. as metric tonnes or volume	
91	Total quantity of hazardous waste produced	Sustainability	Facility	No	Reducing hazardous waste production reduces financial costs, contaminated materials exposed to the public (depending on how it is processed), creates leaner care, reduces unnecessary waste, and reduces greenhouse gas emissions	Regular waste auditing (e.g. on a quarterly or annual basis) can help to achieve this indicator. This can be measured per ward, department, building, and facility. There are several approaches to measuring this indicator, e.g. as metric tonnes or volume	
92	Total quantity of medical waste produced	Sustainability	Facility	No	Reducing medical waste production reduces financial costs, contaminated materials exposed to the public (depending on how it is processed), creates leaner care, reduces unnecessary waste, and reduces greenhouse gas emissions=G76	Regular waste auditing (e.g. on a quarterly or annual basis) can help to achieve this indicator. This can be measured per ward, department, building, and facility. There are several approaches to measuring this indicator, e.g. as metric tonnes or volume	
93	% facilities experiencing water supply interruption	Resilance > Sustainability	Facility	Yes	We include a selection of WHO indicators most relevant to climate solutions, knowing that some facilities may be asked to report on these indicators at a country level so it reduced duplication of reporting.	Reference: WHO Health system resilience indicators: an integrated package for measuring and monitoring health system resilience in countrieshttps. Link.	
94	The facility has basic WASH amenities (WHO defined)	Resilance > Sustainability	Facility	Yes	We include a selection of WHO indicators most relevant to climate solutions, knowing that some facilities may be asked to report on these indicators at a country level so it reduced duplication of reporting.	Reference: WHO Health system resilience indicators: an integrated package for measuring and monitoring health system resilience in countrieshttps. Link.	
	Health care waste management						
	Community WASH Management						
	INFRASTRUCTURE, TECHNOLOGY & SUPPLY						

ANNEX 7: HEALTH FACILITY RESILIENCE AND SUSTAINABILITY SCORECARD

Category	Aggregate outcomes (extracted from facility audit checklist)	Baseline[4]	Annual review
Resilient & sustainable Infrastructure (M1)[5]	• Buildings are structurally robust with minimal ongoing maintenance (either through design or retrofitting) • Local sustainable materials are used for construction and renovation • Buildings are heat stable and flood protected • Buildings have natural ventilation		
Resilient and sustainable technologies and supplies (M1)	• Non-toxic cleaning materials are used to reduce indoor pollution • Oxygen supply is reliable (no outages > 15 mins) • Supply chains (including transport) and inventory management are reliable, with minimal stock outs (>4d for essential meds) • Materials/food/ drugs procured are as sustainable / low impact as possible		
Resilient and sustainable energy supply (M2)	• Energy infrastructure and management is efficient and based on analysis of energy needs • Energy supply is reliable (effective back-up system à no outage >15 mins) • Energy supply is based on high proportion of cost-effective renewables		
Resilient and sustainable WASH services (M3)	• There is constant access to (and monitoring of) clean water • There is efficient water management (e.g. rainwater harvesting) • Waste management includes waste segregation and recycling		
Resilient and sustainable health service provision (M5)	• Health services provided at the facility respond to current & evolving needs and epidemiology in that locality (e.g. blood bank, IPC, malnutrition unit). • Community sensitisation and prevention activities occur and are oriented towards local needs and epidemiology (e.g. malnutrition / malaria / EPI).		

[4] Scoring: 3 = fully implemented and functional; 2 = implemented but could be improved / not fully functional; 1 = partially implemented or significant gaps / dysfunctions; 0 = not implementer / non-functional

[5] CRESH Module number is given in parenthesis

ANNEX 7: HEALTH FACILITY RESILIENCE AND SUSTAINABILITY SCORECARD

Category	Aggregate outcomes (extracted from facility audit checklist)	Baseline	Annual review
Resilient health workforce (M4)	• Staff are trained on ESH and emergency response; • Staff numbers / rotas / working conditions meet peak needs (based on staff feedback) • Staff have capacity to provide IPC measures during pic (IPC committee)		
Disaster and contingency planning (M6)	• Annual risk assessment / future risk scenario planning is undertaken (e.g. as part of annual planning exercise) • Disaster preparedness plans exist and are tested and used, (partnerships with local DRM systems and actors and pre-positioned stocks where appropriate) • An early-warning system (or context adapted alternative) is in place.		
Governance and financing (M6)	• There are practical methods (e.g. HIS) for tracking and reporting indicators • There is a long-term financial plan for the facility • Business continuity and contingency plans (including prioritisation of essential services) exist • Facility (or local) managers have authority to reorganise services to respond to unexpected events.		

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