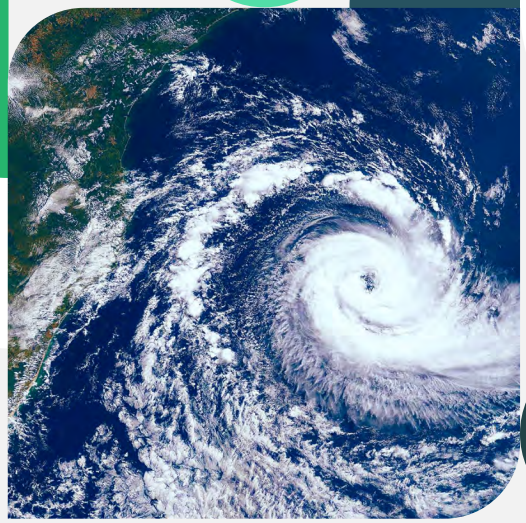
Health Care Without Harm

LIFE RESYSTAL

# PRACTICAL GUIDE FOR BUILDING CLIMATE-RESILIENT HEALTH SYSTEMS



# ACKNOWLEDGMENTS

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*More information about the project can be found on the project website.*

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# CONTENTS

# ABOUT THIS GUIDE

## PURPOSE

*The Practical Guide for Building Climate-Resilient Health Systems* (hereafter *The Guide*) has been developed as part of the LIFE RESYSTAL project. The project's goal is to develop resources that increase the climate resilience capacity of the European healthcare sector and related critical infrastructures. The Guide was created with insight from two pilot health systems but has been designed to be applicable to any European health system, irrespective of their structure and governance. The purpose of the Guide is to help organisations integrate climate resilience into healthcare planning, and is aimed at those responsible for developing a Climate Resilience Plan for their health system or organisation. A Climate Resilience Plan outlines the system's level of climate resilience capacity and the measures to be implemented to enhance that capacity.

## STRUCTURE

The Guide is divided into two sections. The first defines key concepts related to climate resilience and health systems and explains how climate change affects health systems, infrastructure, and services.

The second section offers a detailed step-by-step approach, outlining the essential actions required to strengthen resilience and including practical guidance for implementation. To illustrate these steps, case studies are presented throughout this section, showcasing real-world examples. Some of these case studies were developed in collaboration with two pilot health systems from the LIFE RESYSTAL project; the Galician Health Service (SERGAS) in Spain and the Regional Health Agency (ARS) Occitanie in France.

## TARGET AUDIENCE

The primary audience of the Guide is health system managers. However, the Guide can also serve as a valuable tool for policy-makers and stakeholders working closely with the healthcare sector (e.g. local authorities, insurance companies, medical product suppliers), as well as healthcare professionals interested in working on climate resilience within their own organisations.

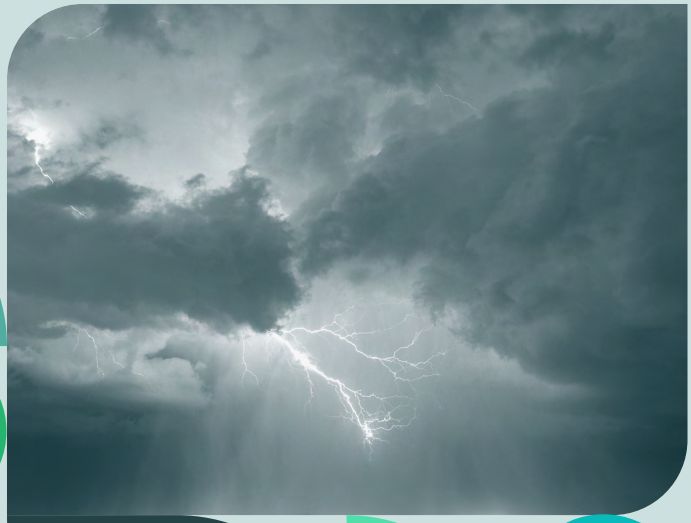
## NOVELTY OF THE GUIDE

The Guide presents a practical approach to developing a comprehensive climate resilience plan at the health system level. It outlines essential steps, supported by case studies and best practices, to help health systems navigate the complexities of climate preparedness.

While inspired by and based on the *WHO Operational Framework for Building Climate-Resilient and Low-Carbon Health Systems*[1] and the *WHO guidance for climate-resilient and environmentally sustainable healthcare facilities*,[2] which both discuss the climate resilience of healthcare infrastructure, this Guide offers a distinct approach. The Guide provides a clear, actionable path for health systems, guiding them from the initial stages of building climate resilience to the development of a comprehensive, implementable plan. It places particular emphasis on the broader European context, rather than focusing on a single country as other guides have done,[3,4] and addresses the entire health system rather than focusing on healthcare facilities,[2,3] offering a more holistic and system-wide perspective.

## PART ONE:

# INTRODUCTION TO CLIMATE IMPACTS AND CLIMATE RESILIENCE IN HEALTHCARE



## KEY DEFINITIONS

According to the Intergovernmental Panel on Climate Change (IPCC), **resilience** is "the ability and agility of a system to change and flex according to circumstances and continue to function under stress while undergoing change. Resilience describes whole system capacity, not just the absence of vulnerability."[5] The IPCC also defines it as a timely and efficient response to a hazardous event that will ensure, among others, an improvement in the system's essential structures and functions.[6] The word resilience can relate to all kinds of hazards, not only those driven by climate change.

The notion of "anticipation" also needs to be included in the concept of resilience: the ability of a system to be aware of and prepared for potential hazards. Due to the irregularity, and often unpredictability, of climate disasters and extreme weather events, climate resilience must be understood as the capability to succeed and function under varying expected and unexpected conditions, not merely as the capacity to absorb an adverse event.[7]

The Guide, as with the LIFE RESYSTAL project, adopts the World Health Organization's (WHO) working definitions for health systems and climate-resilient **health systems**. WHO defines health systems as "all the organisations, institutions, people, resources, and actions whose primary purpose is to improve, restore or maintain health." They define "six health system building blocks" which together "constitute a complete health system". These are health service delivery; health workforce; health information; medical technologies; health financing; leadership and governance, and some of which are underpinned by smaller building blocks (see Figure 1).[1]

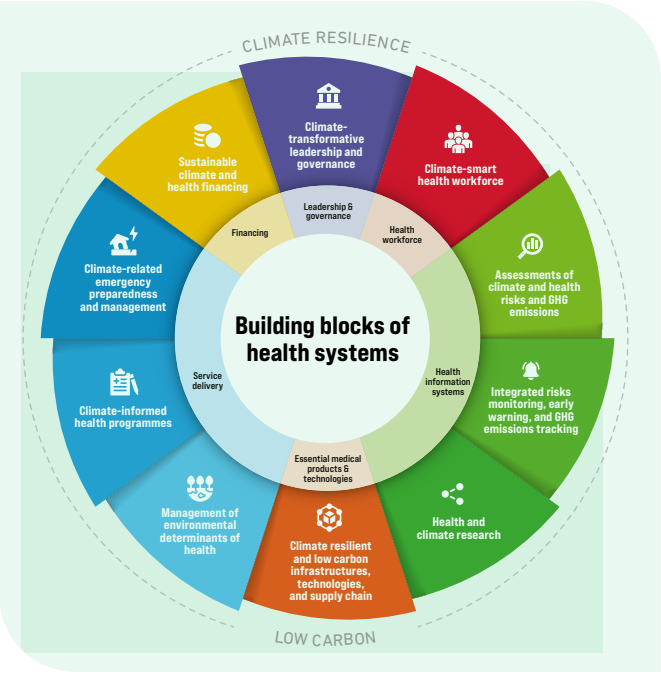



**FIGURE 1:**
*WHO's health system building blocks*[1]

In this Guide, a **health system** refers specifically to those organisations that not only provide healthcare services but have the responsibility and a certain degree of authority for policy-making, planning, and management, irrespective of the size or scope of their service area. A health system in this sense, can encompass regions, districts, or entire countries, depending on the degree of centralisation or decentralisation in the nation's governance structure. For example, Spain and Italy have decentralised systems, wherein regional and local health systems enjoy greater competencies and autonomy for the elaboration and implementation of plans and actions.[8] Comparatively, France operates with a centralised system, in which the central government retains substantial control over the system's policies and planning.[9]

Linking the notions of climate resilience and health system together, the *WHO Operational Framework for Climate Resilient and Low Carbon Health Systems* describes a **climate-resilient health system** as one "capable of anticipating, responding to, coping with, recovering from, and adapting to climate-related shocks and stress, to bring about sustained improvements in population health, despite an unstable climate."[1]

**Climate adaptation** refers to those processes of adjustment to the changing climate aiming at moderate harm and impact.[10] Adaptation is possible through changes to processes and infrastructures, to minimise the negative impact of climate events, as well as through improvements to disaster response arrangements and other behavioural changes. While adaptation is the process of adjusting to climate change effects, climate resilience refers to the capacity of a system to be prepared for those effects.

Importantly, the WHO definition requires that a climate-resilient health system provides healthcare services without additionally contributing to greenhouse gas emissions and climate change,[11] as this would exacerbate the likelihood and impact of extreme weather events that climate resilience is trying to prepare against. **Decarbonisation** and **mitigation** in healthcare include all those measures and interventions aiming to reduce the emissions of greenhouse gases (GHGs) generated by healthcare operations.

Therefore, the climate resilience of health systems depends on their ability to decarbonise operations through climate change mitigation measures and adapt to more frequent and severe extreme weather events.[12]

## THE IMPERATIVE OF CLIMATE RESILIENCE IN HEALTH SYSTEMS

Europe is currently the fastest-warming continent on the planet.[15] It is projected that by 2100, up to 1,400 hospitals in Europe will be at high risk of total or partial shutdown due to extreme weather events.[12] With climate change representing one of the biggest challenges to human health, health systems must be able to transform and reshape themselves to forecast, respond to, and recover from climate-related extreme weather events. Beyond the immediate impact on health systems, these events affect whole communities – local transport, energy networks, telecommunication and more. A climate-resilient health system thus represents a vital element for a climate-resilient community.[13]

Climate resilience should therefore be considered an essential part of effective healthcare planning in Europe. Furthermore, climate adaptation and climate mitigation are both components of climate resilience, and should not be considered unrelated actions in climate resilience planning. Decarbonisation represents an integral part of climate resilience. As Health Care Without Harm's (HCWH) work has shown, the healthcare sector is a major contributor to global climate emissions,[14] being responsible for 4.6% of global net emissions.[21]

The healthcare sector must seize the opportunity to address its contribution to climate change and the impact of climate change on public health, reducing its emissions. Without decarbonising the healthcare sector, the intensity and frequency of extreme weather events will further increase, undermining and working directly against the aim of climate resilience measures.[15] In addition, mitigation efforts can directly improve climate resilience and adaptation. For example, retrofitting a healthcare facility to improve its energy efficiency will not only cut down carbon emissions by reducing the need for air conditioning but can also make the building more resilient to heatwaves. The facility will stay cooler and protect medical equipment from overheating and malfunctioning.

## CLIMATE CHANGE IMPACTS ON HEALTH SYSTEMS

According to the Lancet Countdown, 67% of global cities surveyed expect climate change to "seriously compromise their public health assets or infrastructure."[21] The European Environment Agency, in their recent *European Climate Risk Assessment (2024)*, identifies health systems and infrastructure among the 5 major climate risk clusters for Europe.[15] These clusters are areas significantly impacted by climate change and in which action is the most needed.

Given the current scale of climate hazards and the current low level of climate resilience of Europe's health systems, healthcare services may not always be functional in times of climate-related severe weather events which are likely to cause injury and harm human health, exactly when a robust healthcare system is required, therefore exacerbating an already critical situation.[2]

The types of impact that climate hazards can cause can be divided into two categories: direct and indirect.[16,17]

**Examples of direct impacts include:**

- A sudden influx of patients during extreme weather events
- Patients presenting with particular kinds of illness and disease (e.g. increased respiratory and circulatory distress during a heatwave)
- Damage to hospital infrastructure (building and equipment failure) caused directly by the extreme weather event

**Examples of indirect impacts include:**

- Degradation of other critical infrastructure that the hospital needs to operate, and interruption of supply chains (e.g. transport, energy supply)
- Deterioration of human health following repeated episodes of drought, lack of water, more frequent heatwaves
- Loss of utilities or reduced supply due to over-demand from other users
- Loss or damage to the wider environment that the facility is located in
- Reduction in staffing due to disruption of transport, caring for dependents etc.
- Decrease of healthcare workforce's wellbeing

Importantly, a climate hazard also represents a burden on other health facilities inside and outside of the health system that are not directly affected by it.[15]

## COMMON CLIMATE HAZARDS IN EUROPE

Health systems and their infrastructures face a variety of climate hazards, from flooding, storms and cyclones to extreme temperatures, wildfires, and wind speeds.[18] The most frequent and significant climate-related hazards in Europe are listed and defined below.

### HEATWAVES

A heatwave is a period of abnormally hot weather, often defined with reference to a relative temperature threshold, lasting from two days to months.[19] This means that heatwave threshold temperatures are different depending on location, mostly because the people and infrastructures may be more or less used to or designed to withstand a higher or lower temperature based on historical trends.[20]

Globally, the number of heatwave days has increased by 94% in the period 2013-22 and projections show that this number will continue to increase.[21] All over Europe, the average temperatures are growing and heatwaves are more frequent, intense and long.[22]

In hospitals and healthcare facilities, heatwaves have a variety of impacts. Heatwaves cause the malfunctioning of medical equipment above a certain temperature (e.g. MRI scanners not able to cool sufficiently to be able to operate, or air conditioning systems not having sufficient capacity). Where there are low levels of building insulation, heatwaves can reduce the thermal comfort of patients and healthcare professionals and can compromise the storage of medicines, which might spoil.[23]

Heatwaves can also affect the energy systems, leading to the interruption of the energy transmission that will inevitably obstruct the healthcare service. Heatwaves also tend to instigate the additional use of air cooling and conditioning systems, which increase the demand for energy and decrease the reliability of electricity systems which can fail as a result of overheating or become overloaded due to increased demand for cooling.[24]

### FLOODS

A flood is the overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas that are not normally submerged. Floods can be caused by unusually heavy rain, for example, during storms and cyclones.[1] A flood can come in different forms, for example, a drainage system unable to cope with water volumes, a river overtopping, a water control mechanism failing (e.g. dam breach) or sea levels rising.

According to the XDI Global *Hospital Infrastructure Physical Climate Risk report*, hospitals located in proximity to coastlines and rivers are the most at risk for floods.[12] In the two past decades, 50 of the 53 countries of the WHO European Region have been affected by major flooding.[25] With 11% of European healthcare facilities located in flood-prone areas[26], many will likely face floods – as several examples of flooded healthcare facilities have been recorded.[27,28,29]

In hospitals and healthcare facilities, floods can damage the healthcare infrastructure especially the lower parts of the buildings, as well as near drainage infrastructure which may block and overflow. This can result in the malfunctioning of machinery and equipment, loss or damage to patients' records, and obstructing access to the healthcare facility itself, forcing the interruption of healthcare service for incoming patients and the healthcare workforce.[13] Floods can damage other types of infrastructures and services on which health systems rely for the provision of healthcare services, such as transport, electricity and water systems.[23]

## WILDFIRES

Wildfires are unplanned and uncontrolled fires that occur in parks, forests, rangelands or grasslands. The combination of high temperatures and droughts, made more severe and frequent by climate change, increases the frequency of wildfires.[12]

According to the 2020 report of the Lancet Countdown, in the period 2016-2019, an increase in the number of days of exposure to the risk of wildfires was registered in 114 out of the 196 countries investigated, compared to 2001-2004.[30]

Healthcare facilities can be affected by wildfires if situated adjacent or close to a park or green space, as the wind can fan flames and send smoke and toxic fumes towards facilities, leading to fire risks and poor air quality. Wildfires can damage the healthcare infrastructure and equipment and force evacuation, as well as causing additional pollution and respiratory issues for those in the area. Wildfires may also lead to water scarcity issues as responders use significant volumes of water to tackle the blaze, from local water sources.

Depending on its size and scope, each climate hazard will impact healthcare facilities differently. It is the role of the health system to develop coordinated plans and actions to ensure system-level preparedness and response, that extends beyond responding dynamically at the time of the severe weather event.

## PART TWO:

# A STEP-BY-STEP GUIDE TOWARDS HEALTHCARE CLIMATE RESILIENCE

## BELOW ARE THE RECOMMENDED STEPS TO FOLLOW TO BUILD A HEALTH-SYSTEM PLAN TO INCREASE HEALTHCARE CLIMATE RESILIENCE.

Note: It is recommended to follow **steps 1-5** in order to build a solid plan, while **steps 6 and 7** are crucial undertakings to be continually addressed through the process of building a climate-resilient health system. Some sub-steps in the Guide may be cross-cutting and can be anticipated, postponed, or revisited across multiple steps. The steps are designed to be general and flexible, allowing adaptation to the diverse governance structures of European health systems.

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|---|---|
| STEP 1 | **MOBILISE SUPPORT** |
| STEP 2 | **UNDERSTAND THE POLICY LANDSCAPE** |
| STEP 3 | **ASSESS CLIMATE RISK** |
| STEP 4 | **IDENTIFY PRIORITIES** |
| STEP 5 | **DEVELOP HEALTH SYSTEM CLIMATE RESILIENCE PLAN** |
| STEP 6 | **MONITOR, MEASURE AND TRACK PROGRESS** |
| STEP 7 | **COMMUNICATE ABOUT CLIMATE RESILIENCE** |

# STEP 1:
# MOBILISE SUPPORT

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| **SUB-STEPS** | **1.1: BUILDING LEADERSHIP AND RAISING AWARENESS**<br>**1.2: STAKEHOLDER MAPPING AND COMPETENCIES ASSESSMENT**<br>**CASE STUDY: A COMMUNITY APPROACH TO CLIMATE RESILIENCE** |
| **LEVEL** | **HEALTH SYSTEM** |
| **WHO COMPONENT** | **LEADERSHIP AND GOVERNANCE** |
| **ROLE OF THE HEALTH SYSTEM** | • **BUILDING RELATIONSHIPS AT THE GOVERNMENTAL AND INTERNATIONAL LEVELS**<br>• **MAPPING STAKEHOLDERS AND COMPETENCIES ALLOCATION**<br>• **DEVELOPMENT OF STRATEGIES TO INCREASE CLIMATE-RELATED AWARENESS**<br>• **FOR COMMUNITY OF PRACTICE (COP)**<br>• **CREATE SYSTEM-LEVEL COP**<br>• **MANDATE AND SUPPORT FACILITY-LEVEL COPS** |
| **OUTCOME** | • **CREATION OF SYSTEM AND FACILITY-LEVEL NETWORKS COMMITTED TO CLIMATE RESILIENCE**<br>• **INCREASED CLIMATE CHANGE AWARENESS** |

## 1.1 BUILDING LEADERSHIP BUY-IN AND RAISING AWARENESS

The WHO considers leadership and governance the first of the six building blocks of a health system, as the involvement and commitment at the highest levels are necessary to develop strategies and plans and provoke policy changes.[2]

It is only when health system leadership understands the importance of and is fully committed to achieving climate resilience, that it becomes feasible to integrate this goal into the core processes and procedures of the organisation, enabling the development and implementation of a comprehensive, system-wide climate resilience plan.

Building leadership and governance means establishing strong partnerships and connections at the policy level.[31] A climate resilience-committed leadership, at the health system level, allows climate resilience concerns to be brought to the national Ministry of Health level, influencing national health priorities of the national health agenda[32] and pushing for and collaborating on the development of Health National Adaptation Plans (HNAP).[1]

The appropriate health ministry and its health systems should collaborate on policies aiming at increasing awareness of climate hazards, consolidating the connection between climate change and health.[33] They may also engage at the international level through international programmes, such as the Alliance for Transformative Action on Climate and Health (ATACH).

In addition to becoming leaders advocating for climate resilience actions and establishing governance structures that influence policies and contribute to national and international plans, health systems also need to raise public awareness about the impact of climate change on public health and the healthcare sector.

As healthcare professionals are among the most trusted and respected professions,[34] they can play a pivotal role in raising awareness about the impact of climate change and the need to adopt climate resilience actions to protect the healthcare system. To do so, healthcare professionals must receive training in educating patients, decision-makers and the public about climate change and health, climate resilience and mitigation, and be included in the decision-making and elaboration of climate resilience plans and procedures in health systems. As such, supporting the education and training of healthcare professionals in these matters is vital.

## 1.2 STAKEHOLDER MAPPING AND COMPETENCIES ASSESSMENT: CREATING A STRONG NETWORK TO SUPPORT CLIMATE RESILIENCE

Health systems cannot strengthen their resilience in isolation. To develop an effective and efficient climate resilience plan, it will be essential to involve external stakeholders, leveraging their expertise and experience throughout the process. It is recommended that systems establish an interdisciplinary and cross-sectoral stakeholders' network for climate resilience to ensure the system remains prepared, responsive, and functional to the challenges raised by a changing climate.[35]

Among the first stakeholder groups that need to be involved in this work are those managing other types of critical infrastructures, such as energy, water, and transport. This will avoid the risk of cascades,[15] where a malfunctioning of one of these critical infrastructures can compromise the resilience of other interconnected parts of the network they operate in. The EU Critical Entities Resilience Directive (CER) represent an important legal tool to ensure that essential infrastructure and services remain operational during a disaster.[36] Other stakeholders that must be involved at the beginning of the process are those with local decision-making authority – for example, local government. Local government often has the mandate of maintaining public infrastructures and is thus essential in developing and implementing local plans.[37]They may also have the technical expertise and knowledge for the development and implementation of climate resilience plans. Other types of stakeholders to engage in the process include private sector actors, voluntary associations,[27] academic institutions, local associations, as well as experts in the field.[37]

The LIFE RESYSTAL project has piloted its methodology to map stakeholders and establish Communities of Practice (CoP) at the hospital level, in collaboration with its seven pilot hospitals. This approach, designed for hospital-level implementation, can be scaled up to the broader health system. Based on this experience, the project developed a comprehensive Community Approach Replication Guide.[38]

The Replication Guide identifies three phases to establish a CoP:

1. Establishing a shared understanding of climate resilience challenges and agreeing on the process
2. Mapping stakeholders contributing to the healthcare facility's climate resilience
3. Understanding the health system's adaptive and resilience capacities

After the first three initial phases, it is important to define which activities the CoP will be involved in, and the timeline for all actions articulated in the CoP. The suggested timeline is 4 years, with recurrent meetings for the CoP every 6 months. The ultimate goal of implementing the CoP is to put in place measures aligned with the health system's climate resilience plan.

The health system may choose to establish an overarching, system-level CoP to strengthen the climate resilience of the entire network. This system-level CoP could also mandate and encourage the creation of hospital-level CoPs to provide more tailored, localised networks of support. The system-level CoP is crucial, as it leverages the health system's expertise to ensure a coordinated and actionable plan across all facilities.

## CASE STUDY:
## A COMMUNITY APPROACH TO CLIMATE RESILIENCE *SERGAS, SPAIN*

**THE GALICIAN HEALTH SERVICE (SERGAS) IS A PILOT ORGANISATION IN THE LIFE RESYSTAL PROJECT, COVERING THREE OF ITS HOSPITALS LOCATED IN THE OURENSE PROVINCE IN SPAIN. THROUGH THE PROJECT, SERGAS HAS MOBILISED ITS LOCAL COMMUNITY TO IMPROVE CLIMATE RESILIENCE. BY BUILDING A COP MADE UP OF STAKEHOLDERS FROM ACROSS THE COMMUNITY, THEY ARE FOSTERING A CRITICAL EXCHANGE OF KNOWLEDGE AND EXPERTISE NEEDED TO HELP THE HOSPITAL INCREASE ITS RESILIENCE TO CLIMATE CHANGE.**

To establish the CoP, SERGAS took an incremental approach with three steps:

1. **Awareness raising amongst hospital staff**
   - **Output:** *A Community of Practice Engagement Charter.* This document lays out the objectives of the CoP and defines the role of the stakeholders.
   - **Outcome:** A shared understanding of key concepts and principles about climate change impacts and a shared view of the CoP building process.
2. **Institutional mapping of relevant stakeholders**
   - **Output:** Stakeholder map of the relevant members for the CoP.
   - **Outcome:** Shared understanding of the health system's institutional context.
3. **Resilience capacity assessment (based on a needs assessment survey)**
   - **Output:** Resilience capacity and needs assessment survey.
   - **Outcome:** Shared understanding of the health system's adaptive capacity.
   - **Modality:** Targeted interviews with the hospitals and the project's technical partners, which helped produce the resilience capacity index.

Between steps two and three, SERGAS organised a kick-off meeting with stakeholders, which helped gather information for the capacity assessment survey. With support from the technical partners and using the stakeholders' matrices, they identified relevant stakeholders who they felt should participate in the community of practice.

*View the full Community Approach Replication Guide here.*

# STEP 2:
# UNDERSTAND THE POLICY LANDSCAPE

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| **SUB-STEPS** | **2.1:** MAPPING THE POLICY LANDSCAPE<br>**2.2:** POLICY RECOMMENDATIONS TO BUILD HEALTHCARE CLIMATE RESILIENCE<br>**CASE STUDY:** THE POLICY LANDSCAPE IN SPAIN AND FRANCE |
| **LEVEL** | HEALTH SYSTEM |
| **WHO COMPONENT** | LEADERSHIP AND GOVERNANCE |
| **ROLE OF THE HEALTH SYSTEM** | • MAP THE POLICY AND LEGAL LANDSCAPE<br>• UNDERSTAND HOW OTHER HEALTH SYSTEMS HAVE NAVIGATED THE POLICY LANDSCAPE |
| **OUTCOME** | • CLEAR UNDERSTANDING OF POLICIES AND LEGAL FRAMEWORK RELATED TO CLIMATE RESILIENCE |

## 2.1 MAPPING THE POLICY LANDSCAPE

Mapping the policy landscape involves analysing and understanding relevant policies at the international, European Union (EU), national and regional levels. This process helps the health system identify key priorities, align its strategies accordingly and, develop effective plans. By doing so, it can also help uncover potential funding opportunities. A good understanding of the EU policy framework can represent a valuable tool and guide to increase climate resilience, especially with regard to infrastructure.

In the *Treaty on the Functioning of the European Union*,[39] public health is a shared competence between the EU and the Member States. The latter are primarily responsible for public health in their countries, but the EU can support them and provide guidelines to assess system preparedness and build system capacity for climate resilience.[38] The EU can therefore influence the healthcare sector through policies that, while not directly targeting healthcare, still have significant impacts on the sector. Below are the most relevant EU policies that can impact the European healthcare sector.

The *EU Adaptation Strategy*,[40] adopted on 24 February 2021, has the goal of making adaptation smarter and more systemic with the final objective of creating a climate-resilient European Union by 2050. One of the key outcomes of this Strategy is a series of *Guidelines* to support Member States in improving their adaptation strategies and plans. These *Guidelines* will also endure a more systematic approach to adaptation.

The *Directive on the Resilience of Critical Entities*[36] entered into force on 16 January 2023. It aims to strengthen the resilience of those critical infrastructures and entities vital for modern society against natural hazards, terrorist attacks, sabotage, etc. Health is one of 11 sectors covered by the Directive, alongside other types of critical infrastructure that support the functioning of the health sector, such as energy, transport, and water.[36]

The revised *Energy Performance of Buildings Directive*[41] requires all Member States to develop long-term building renovation strategies. It promotes the increase in the climate resilience of buildings and in resilience against natural disasters.

The *Revision of the TEN-E Regulation*,[42] adopted on 15 December 2020 to revise the EU rules on Trans-European Networks for Energy, aims to better support the modernisation of Europe's cross-border energy infrastructure, facilitate energy transition and reinforce the climate resilience of energy infrastructure.

Despite the fact that the COP26 Health Programme included the development of a Health National Adaptation Plan (HNAP) among the main goals for its signatories,[1] not all European countries have produced one.[15] HNAPs are developed by a country's Ministry of Health and must define the priorities and actions to address the impact of climate change on people's health and the healthcare sector.

The two HNAPs most aligned with the purpose of this Guide are those developed by Finland and Ireland.

The Finnish HNAP consists of guidelines emphasising the necessity of increasing the climate resilience of the healthcare sector when planning adaptation measures and collaborating between various levels of governance. The measures outlined in the plan include implementing requirements to enhance the climate resilience of healthcare infrastructure and buildings, ensuring the reliability of digital information and electricity systems, and establishing a resilient supply chain for medicines and other medical products.[43]

The Irish HNAP highlights the need for the system infrastructure and supply chain to become more resilient to the impact of more frequent and severe extreme weather events. It also outlines a series of actions that will be implemented by the Irish Government and the Irish Department of Health (HSE) to that end, such as the creation of a Climate Change Oversight Group and the assessment of healthcare infrastructure resilience to extreme weather events via a survey.[44] The HSE has also produced a Climate Action Strategy (2023-2050)[45] within which adaptation and resilience are identified among the 6 priority areas and the strategic goal is defined as implementing the measures outlined in the Irish HNAP.

Although not many European countries have a HNAP specific to the healthcare sector, national legislation and policies are often applicable. The box below presents an overview of the Spanish and French policy landscape that has been produced as part of the LIFE RESYSTAL project.

## 2.2 POLICY RECOMMENDATION TO BUILD HEALTHCARE CLIMATE RESILIENCE

The EU and its member states should implement multiple policies to strengthen the climate resilience of the health system. These include:

- **EN-Eurocodes to include climate resilience:**[15] Eurocodes are standards provided by the EU to define a common approach for the structural design of public buildings.[48] It has been announced that the Eurocodes standards will take into account the impact of climate change on infrastructure to enhance climate resilience.[49] These new standards should also apply to health infrastructures.
- **Resilient procurement criteria:** Incorporating specific climate resilience criteria into procurement processes. To minimise the risk of disasters and ensure that they are cost-effective over their lifetime, infrastructure investments should be climate resilient. According to the World Bank, adding climate resilience to procurement criteria might increase the cost of the initial investment but will reduce the cost of maintenance, restoration, renovation and avoiding future risks.[50]
- **Strengthening the EU Civil Protection Mechanism:**[15] The mechanism supports cross-border cooperation among member states to improve prevention, preparedness, and response to disaster.[51] Through the training that the Mechanism provides, the EU can build the capacity to respond better to climate-related disasters across the Union.

## CASE STUDY:
## THE POLICY LANDSCAPE IN SPAIN AND FRANCE

### GALICIA, SPAIN

The Galician Health Service (SERGAS) is one of the seventeen regional health authorities that operate under the Spanish national health system - Sistema Nacional de Salud (SNS), attached to the Department of Health of the *Xunta de Galicia* (Regional Government of Galicia). SERGAS and the Xunta de Galicia are planning to work on plans that will improve the climate resilience of the health system. Some plans already exist, such as the *Plano de Calor* (Heat Plan) and *Plan territorial de emergencias de Galicia* (Territorial Emergency Plan of Galicia) (PLATERGA).[46]

At the national level, the healthcare sector is included in the *National Climate Change Adaptation Plan 2021-2030* - PNACC (NAS, 2020) and the *Climate Change Adaptation: Work Programme 2021-2025* (NAP, 2021). Health represents one of the 18 areas covered by the PNACC that has the goal to facilitate adaptation actions.

### OCCITANIE, FRANCE

The ARS (Agence Régionale de Santé) Occitanie is one of the eighteen regional health administrations that operate under the French Ministry of Health. Following the national policies outlined by the Ministry of Health and coordinated by the agencies mentioned above, the ARS defines and implements regional health policy as close as possible to the needs of the population.

Through the 2020 Ségur de la santé, the Minister of Health and the 18 ARS gathered and decided on a social and green transition strategy which includes resilience to climate hazards among its pillars. The ARS has developed the Regional Health Project (PRS) and the Regional Environment Health Plan (PRSE). The operational objectives of the PRSE 2023-2028 include the launch of adaptation measures to strengthen the climate resilience of territories and populations. In the associated Regional Health Scheme (SRS), the challenge of "preventing and adapting to the health impacts of global warming" is targeted with the goal of "support[ing] the adaptation of healthcare facilities and medical and social care services establishments in an eco-responsibility approach".[47]

# STEP 3:
# ASSESS CLIMATE RISK

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|---|---|
| **SUB-STEPS** | **3.1: UNDERSTAND RISK**<br>**3.2: RECOMMENDATIONS ON HOW TO CONDUCT A VULNERABILITY & RISK ASSESSMENT**<br>**3.3: CONDUCT A VULNERABILITY & RISK ASSESSMENT**<br>**EXAMPLE OF PREPAREDNESS MEASURE: EARLY WARNING SYSTEM** |
| **LEVEL** | **FACILITY LEVEL** |
| **WHO COMPONENT** | **HEALTH INFORMATION SYSTEMS** |
| **ROLE OF THE HEALTH SYSTEM** | • **MANDATE THE ELABORATION OF VULNERABILITY AND RISK ASSESSMENT**<br>• **COORDINATE THE VULNERABILITY AND RISK ASSESSMENT THROUGHOUT THE SYSTEM**<br>• **SUPPORT FACILITIES** |
| **OUTCOME** | • **ASSESSED VULNERABILITY AND RISK AT THE FACILITY LEVEL**<br>• **UNDERSTANDING OF THE RISK ACROSS THE HEALTH SYSTEM** |


**FIGURE 2:** *Impacts of climate-related risks on health care facilities. Adapted from the original by the World Health Organization (2021).*[52]

## 3.1 UNDERSTANDING RISK

It is important to understand the climate risks that facilities within a health system face to make well-informed decisions and design appropriate actions to reduce these risks. The risk and levels of risk are composed and determined by the intersection of three components: hazard, exposure, and vulnerability. This is visually represented in Figure 2, adapted from the World Health Organization.

A **hazard** is an event that can potentially occur and that can cause damage.[10] Examples of climate hazards are floods, storms, extreme temperatures, wildfires, and droughts. While the health system cannot decrease the intensity and frequency of a climate hazard, it can minimise its impact on its facilities and services, by acting on the other two components of risk: exposure and vulnerability.

**Exposure** refers to those areas that are sensitive to the hazard and will be potentially impacted by it.[10] For a health system and its healthcare facilities, exposure is represented by built infrastructures, health workforce, transport network, water and energy supply.

**Vulnerability** represents the propensity or predisposition to be affected, the degree of sensitivity and susceptibility of a system and its capacity to cope with adverse events.[10] Vulnerability is related to the location of the healthcare facility and the population it serves.[52]

Through these components, it is possible to determine the impacts of climate-related risks on a health system's individual facilities.

Identifying climate-related hazards is the first step to assessing a facility's risk. However, the presence of a hazard does not mean that the healthcare facility will be impacted.[52] Indeed, exposure may be reduced entirely if appropriate measures and interventions have been implemented. Nevertheless, if exposure is present, even a moderate climate event can have a negative impact on a facility. Further, vulnerability can be present without the hazard, but it can be exacerbated by a hazard.

Measuring only one of the components will be not enough to determine the level of risk – only by considering all the components in combination will health systems be able to develop a complete picture, allowing it to proceed with the identification of interventions and elaboration of a plan.[52]

## 3.2 RECOMMENDATIONS ON HOW TO CONDUCT A VULNERABILITY & RISK ASSESSMENT AT THE HEALTH SYSTEM LEVEL

The vulnerability and risk assessment is a process that aims at identifying weaknesses in the system so as to better respond to the consequences of climate change.[2] Completing a vulnerability and risk assessment is essential to making well-informed decisions, setting priorities, allocating resources and finally moving from higher-risk to lower-risk situations.[2]

While it would be ideal to assess the vulnerability & risk of entire health systems, due to their complexity, assessments on that scale are not common practice.18 In this case, the role of a health system should be to mandate all individual facilities to conduct such assessments of their own operations, favouring a bottom-up approach to ensure their quality and accuracy. The health system should coordinate the health facilities and support them in conducting their assessments, such as by providing guidelines and standards on how to conduct them. This is important to guarantee its consistency across the system.

Importantly, the complexity of conducting such assessments is increased by the fact that hospitals are not the only type of infrastructure inside a health system. Health systems include different types of facilities such as emergency and primary care, long-term care, and rehabilitation facilities.[53] Health systems might need to develop a different approach for each type of facility and may need to prioritise them in the context of climate resilience. Prioritisation can be based on the type of healthcare service provided by the facility (e.g. primary care), its vulnerability (e.g. facility located in an area sensitive to the impact of climate hazards), the level of the potential hazard, or the level of exposure (e.g. poor condition of the healthcare infrastructure).

The results of facility vulnerability and risk assessments should be aggregated to provide an overall picture of the health system's current risk level. This analysis helps the health system identify major risks, their frequency, and the areas most impacted, as well as where redundancy should be integrated.

Redundancy refers to the intentional duplication of functions, processes and components within the system to allow the system to operate even if one of its parts encounters failures from disruptions, such as from extreme weather events.[54] Redundancy is thus a crucial way for health systems to ensure an increased overall resilience, as it ensures the provision of essential health services during climate-related extreme events and increases the flexibility and adaptability of a health system by facilitating the relocation of resources and the use of alternative pathways and procedures.[55] An example of redundancy is represented by backup technology ensuring that patients' data is available and accessible if the primary server fails.[56]

## 3.3 CONDUCT A VULNERABILITY & RISK ASSESSMENT

The LIFE RESYSTAL project provides guidelines on how to complete a vulnerability and risk assessment at the health facility level. As well as providing essential information about what a vulnerability and risk assessment is, these guidelines present **10 steps** to follow to develop a Vulnerability & Risk Management (VRM) framework:

1. **IDENTIFY THE VRM TEAM SUPPORT WITHIN THE MEMBERS OF THE COP**
2. **PLAN THE VRM AND DEFINE RISK TOLERANCE (ACCEPTED LEVELS OF RISK)**
3. **DEFINE THE CLIMATE HAZARDS**
4. **IDENTIFY POLICIES THAT CAN IMPACT CLIMATE RESILIENCE**
5. **DESCRIBE THE HEALTHCARE FACILITY VIA THE IDENTIFICATION OF ASSETS, SYSTEMS, NETWORKS, AND FUNCTIONS**
6. **CONDUCT RISK ASSESSMENT AGAINST THE CLIMATE-DRIVEN RISKS**
7. **SCENARIO BUILDING: DETERMINE THE MOST VULNERABLE ASSETS AND DEVELOP WORSE-CASE SCENARIOS**
8. **IDENTIFY AND QUANTIFY VULNERABILITIES, DETERMINE AREAS FOR IMPROVEMENT**
9. **RE-EVALUATE THE HEALTH CARE FACILITY WITH PROPOSED IMPROVEMENTS (CONSIDER SECURITY AND SOCIAL ASPECTS AS WELL AS URBAN PLANNING)**
10. **REPORT RESULTS AND ISSUE RECOMMENDATIONS FOR ACTION**

*Find the full Guidelines to develop vulnerability and risk assessment here.*

Different tools are available to support the completion of a risk and vulnerability assessment:

- Hospital Safety Index – A rapid and low-cost tool that helps evaluate whether a hospital remains operational in case of extreme weather events, natural disasters or emergency[57]
- Checklists to assess vulnerabilities in healthcare facilities in the context of climate change – Created as a complementary document to the WHO *Guidance for climate-resilient and environmentally sustainable health care facilities*, the checklists allow healthcare providers to identify climate hazards, assess vulnerability, understand potential impacts and inform the design of interventions to enhance climate resilience of healthcare facilities[52]
- Vulnerability and risk assessment (LIFE RESYSTAL) – Based on WHO guidelines, allows the assessment of the level of risks in a healthcare facility offering three major outcomes: vulnerable sectors, potential impact list and risk analysis. The assessment can be performed on 3 hazards, 2 climate scenarios and 2 future timespans (available from August 2025)

## EXAMPLE OF A PREPAREDNESS MEASURE: **EARLY WARNING SYSTEM**

**EARLY WARNING SYSTEMS ARE A WAY THAT COMMUNITIES OR FACILITIES CAN ACT TO ENSURE IMMEDIATE ACTIONS AND RESPONSE TO IDENTIFIED POTENTIAL CLIMATE HAZARDS.[58] AN EFFECTIVE EARLY WARNING SYSTEM INCLUDES FOUR ELEMENTS: RISK KNOWLEDGE, MONITORING AND WARNING SERVICES, DISSEMINATION AND COMMUNICATION, AND RESPONSE CAPACITY.[59]**

All four elements are crucial for minimising the impacts of extreme events, and all require the consideration of the entire area or organisation affected. Early warning systems will allow the health system to provide a prompt and adequate response during an extreme weather event and minimise its impact on healthcare infrastructures and services.

### METEOALARM

MeteoAlarm, developed by the Network of European Meteorological Services (EUMETNET), offers a way for health systems to track weather-related warnings for various weather events like heavy rain, heat waves, and extreme cold if the health system does not have its own in place.

# STEP 4:
# IDENTIFY PRIORITIES

| | |
|---|---|
| **SUB-STEPS** | **4.1:** IDENTIFY FOCUS AREAS AND INTERVENTIONS<br>**4.2:** ASSESS THE FEASIBILITY OF INTERVENTIONS<br>**4.3:** MOBILISE RESOURCES<br>**CASE STUDIES:**<br>THE NEW CLIMATE-RESILIENT NORTH ZEALAND HOSPITAL<br>INVESTING IN THE HEALTH SECTOR: SÉGUR DE LA SANTÉ |
| **LEVEL** | HEALTH SYSTEM |
| **WHO COMPONENT** | ESSENTIAL MEDICAL PRODUCTS AND TECHNOLOGIES, HEALTH WORKFORCE, SERVICE DELIVERY, FINANCING |
| **ROLE OF THE HEALTH SYSTEM** | • IDENTIFY AREAS OF INTERVENTION<br>• DEFINE INDICATORS<br>• COLLABORATE WITH THE HEALTH FACILITY TO DEFINE PRIORITIES<br>• ASSESS THE FEASIBILITY OF THE INTERVENTIONS<br>• MAP AND MOBILISE RESOURCES |
| **OUTCOME** | • DEFINITION OF PRIORITIES AND INTERVENTIONS<br>• ASSESSED INTERVENTION FEASIBILITY<br>• IDENTIFICATION OF NECESSARY RESOURCES |

## 4.1 IDENTIFY FOCUS AREAS AND INTERVENTIONS

Once the vulnerability & risk assessment has been conducted at the facility level, the health system, together with the facilities and the CoP, can set priorities and focus areas for improving its collective climate resilience. It is recommended that the health system identifies priorities based on the urgency of required actions, and the extent to which climate hazards are affecting the health system. Other factors can shape priorities, including technical capacity, available resources, political commitment and the feasibility of implementation.

The vulnerability & risk assessment should have helped identify areas of exposure, allowing for the determination of specific focus areas where intervention is needed. These focus areas may include infrastructure, supply chains, workforce and water, sanitation, hygiene (WASH). All four are considered in depth below.

### INFRASTRUCTURE

Having carried out the vulnerability & risk assessment at the facility level, and gathered the relevant information from each healthcare facility, health systems will have a clear overview of the condition and preparedness of their physical infrastructure.

Future buildings should be designed with climate-resilient capacity. For instance, by incorporating sustainable building codes (e.g. building orientation) to favour thermal comfort to patients and healthcare professionals during heatwaves, or factoring in an increased flood risk when considering layout, entrance protection and drainage capacity.[12]

For existing buildings, types of interventions are numerous and the cost and impact of implementing these vary in magnitude. More invasive interventions, such as building renovations and retrofitting, might require the reduction or interruption of healthcare services or the relocation of patients. It is recommended to prioritise interventions that offer both mitigation and adaptation benefits, in view of both elements being essential to building resilience.

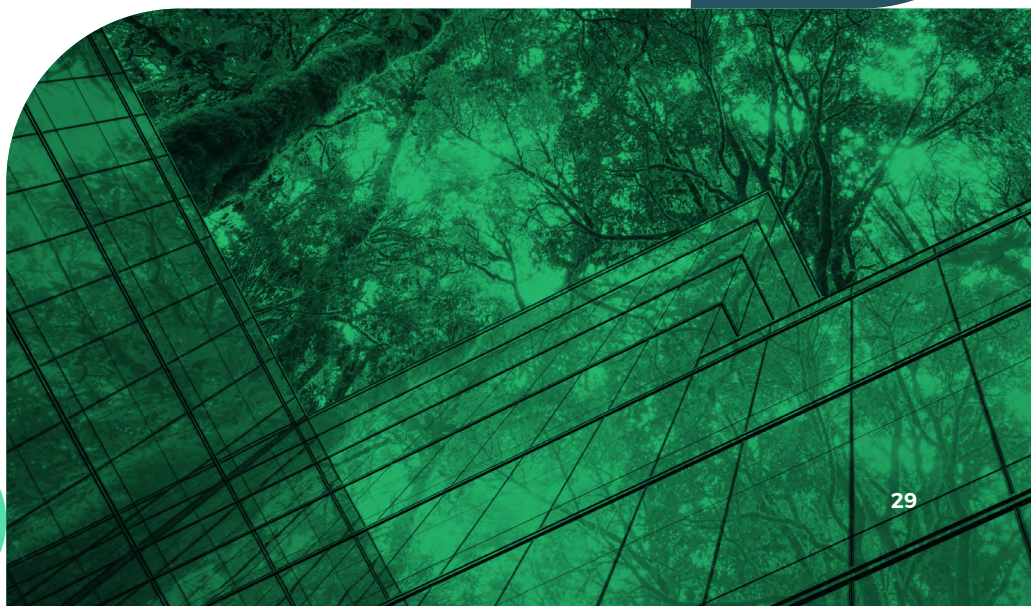
For small interventions, individual hospitals can typically make decisions autonomously depending on the cost. However, the health system is often responsible for managing major infrastructural interventions because of the scale of cost and the scale of the disruption to hospital operations.

The health system may include target areas concerning external infrastructures (e.g. transport, energy and water networks, sewerage) over which it does not have direct control, but whose operations influence its resilience capacity.[12] In light of this consideration, and particularly to avoid cascading effects, the health system must collaborate with other stakeholders to strengthen the climate resilience of critical infrastructure. Collaboration should be possible through the Critical Entities Resilience Directive which requires all critical entities providing critical services, to have effective plans in place to manage risks. If collaboration is not possible or if the organisation is not able to reduce the risk to a level that the health system is satisfied with, the health system must develop contingency solutions to maintain operations.

For instance, climate change has a significant impact on energy infrastructure; between 2018 and 2021, climate hazards accounted for 18-22% of disruptions in Europe, making them the leading cause of interruptions.[15]

If energy supply cannot be guaranteed, a common practice at the facility level is the installation of an autonomous current source at the facility level. Another solution would be the diversification of energy sources.

Concerning buildings, the European Commission issued the *EU-level technical guidance on adapting buildings*[60] and the *EU-level technical guidance on adapting buildings – Best practice guidance.*[61] Despite not being specific to healthcare buildings, the documents provide a necessary overview of the EU policies and standards concerning climate adaptation at the building scale. In particular, the *Best practice guidance* provides lists of solutions to reduce the impacts of identified climate risks.



## CASE STUDY:
## INFRASTRUCTURE MEASURES: NORTH ZEALAND HOSPITAL

**LOCATED IN HILLERØD, DENMARK, THE NEW NORTH ZEALAND HOSPITAL WAS DESIGNED TO BE A LOW-CARBON AND RESILIENT HEALTHCARE INFRASTRUCTURE. THE PROJECT IS PART OF A LARGER VISION OF THE CAPITAL REGION OF DENMARK, ONE OF THE HEALTH SYSTEMS IN DENMARK, TO PROVIDE A MORE SUSTAINABLE HEALTHCARE SERVICE.**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The sustainability and decarbonisation aspects have been taken into account throughout the various phases of the construction project, from planning to design until implementation. This included the selection of the demolition site, the inclusion of reuse or recycling of the demolition material in the work tender, the decision to implement methods to reduce the hospital's carbon emissions, such as energy-efficient solutions for ventilation, cooling, and heating, and the use of climate low-impact material.

With the rise in frequency and intensity of extreme weather events, the Region knew it was crucial to consider the aspect of climate resilience in the hospital design. Heavy rain and floods represent the major hazards for the hospital, with the risk of causing the interruption of healthcare service. The planning of the new North Zealand Hospital followed the national guidelines established in Denmark in 2014, which consider different types of climate scenarios and models. Thanks to this method, an optimal location and different solutions were identified for the hospital infrastructure, such as constructing external ponds and streams that can serve as overflow water storage and thus prevent the water from flowing into the access road and the hospital. Additional measures to reduce flood risk include installing trenches in the car park and adding vegetation to help absorb and manage rainwater.

The hospital will be completed in 2025.

*Read more on Climate-ADAPT.*

## SUPPLY CHAIN

A resilient supply chain is one that can withstand and adapt to disruptions, ensuring the timely availability of essential medical resources.[13] Even the most common and necessary medicines and medical supplies may have an international and complex supply chain, increasing the chances of disruption in the production and distribution process.13 In some cases, some medical products are produced in regional clusters (e.g. India), meaning that a single extreme weather event might cause the unavailability of multiple medical products.[62] Among the solutions that can be adopted to strengthen the climate resilience of the supply chain are the diversification of the number and locations of suppliers, and onshoring and near-shoring,[18] so sourcing the products locally or at close proximity from a neighbouring region or country. A more local supply might decrease the risk of disruption in the supply chain but increase the cost and decrease the number of possible suppliers.[18] Options therefore need to be carefully evaluated.

## CONSIDERING CLIMATE RESILIENCE IN PROCUREMENT

Health systems should procure with climate resilience in mind and integrate climate resilience criteria into their projects and contracts. Health systems should opt for products, designs and interventions that will minimise the impact of extreme weather events. Procurement processes, like the Green Public Procurement (GPP),[63] are lacking in considering climate adaptation and resilience and tend to focus on the climate mitigation aspect of sustainability.

The University of Cambridge, in the framework of the LIFE RESYSTAL project, has produced the guide *Procuring for Adaptation: Incorporating climate adaptation into healthcare investment decisions**. This procurement guide highlights the lack of procurement principles related to climate adaptation in healthcare and aims to provide procurement adaptation principles to support healthcare organisations navigate the process of securing funding and procuring climate change interventions for structural adaptation measures.[64]

**To be published in December 2024.*

## WORKFORCE

Despite their experience and competencies, healthcare professionals might not feel prepared to face the challenges of climate change.[11]

Healthcare workers should be trained to respond to the impacts of climate change on health and healthcare,[21] increasing their skills and knowledge concerning climate-related health conditions, and if their role relates to the management of facilities, then also the intervention options that they might consider when making installation and maintenance decisions. Health systems should integrate specific climate hazard preparedness in existing disaster preparedness training.[65] Healthcare workers should be given the necessary support in attending these courses, allowing them to participate during their working hours. Having unified courses and preparation among healthcare workers in the health system will help develop consistent procedures and protocols that favour a coordinated response. A trained and prepared workforce is far more likely to provide an efficient and responsive healthcare service during an extreme weather event.[31]

Furthermore, affected healthcare professionals should be involved in the development of climate resilience plans and contribute to the creation of protocols on climate hazards. Climate resilience plans are enriched by the involvement of healthcare professionals by drawing on their competence and lived experiences in the day-to-day provision of healthcare services. Involving them in this process, rather than imposing decisions from above, also increases the likelihood of their commitment to and engagement with the changes necessary to increase resilience, and thus ensure the plan is carried out more effectively.

Finally, healthcare professionals must also be supported during the recovery period after an extreme weather event to ensure their well-being. Ignoring the effects of extreme weather events on the healthcare workforce can increase dissatisfaction and burnout, as well as *climate anxiety*,[65] a feeling of distress in response to climate change and its effects.[66] Potential measures to tackle this include the provision of counselling and the offer of adequate rest periods.[65] Notably, providing psychological support to the health workforce after a climate disaster should not be something exceptional and occasional but rather part of standard health system procedures in the context of climate resilience. Regular training, reward packages, and hazard allowance favour healthcare professionals' participation in disaster management.[31]

## WATER, SANITATION, AND HYGIENE (WASH)

Ensuring and maintaining WASH services in healthcare facilities during a climate-related extreme event is vital. The healthcare workforce needs constant access to safe and well-functioning water, sanitation, and hygiene to provide assistance to patients.[67] Climate change can cause a shortage of water, compromise the quality of water and impact sanitation systems.[2] Furthermore, improving WASH services reduces the burden on healthcare services by preventing the spread of waterborne diseases.[67] WHO and UNICEF developed WASH FIT, a risk-based tool to support the healthcare sector in prioritising risks and implementing processes to ensure and improve WASH services by providing fact sheets, checklists and examples of the use of WASH FIT.[67]

## PRIORITIES AND INTERVENTIONS BY FOCUS AREA

Targets must be set for each priority identified in a resilience plan, in order to support monitoring and evaluation. The chart below is an example of how climate resilience planning targets can be developed and framed:

| PRIORITY | FOCUS AREAS | CLIMATE HAZARD | INTERVENTION | TARGET |
|---|---|---|---|---|
| Increase thermal comfort | Infrastructure | Heatwave | Shading/ Natural Ventilation | Maintain internal temperature below 26˚C (in summertime) |
| Guarantee essential medicine supply | Supply chain | Flooding | Implement a coordinated backup system | Involve 10 healthcare facilities in the coordinated backup system |
| Establish climate-resilient procurement criteria | Procurement | Heatwave, Flooding | Integrate climate-resilient procurement criteria into tenders | Include three climate-resilient procurement criteria |
| Increase skills and knowledge of the healthcare workforce in disaster preparedness | Workforce | Heatwave, Flooding, Wildfire | Provide courses to the healthcare workforce | 75% of healthcare professionals trained |
| Ensure access to healthcare facilities | Infrastructure | Flooding | Elaborate a transport plan with local authorities | Guaranteed facility access until a certain flood magnitude |

*Find in Appendix 1a list of recommended interventions.*

## 4.2 ASSESS THE FEASIBILITY OF INTERVENTIONS

The feasibility aspect includes various factors: political commitment, legal and bureaucratic barriers, capacity, staff preparedness, funding, and technical aspects.[37] Even though ideally, the health system would have created a CoP that involves policymakers and local government, it is necessary to ensure political will to implement the health system's climate resilience plan.[37]

While the cost of becoming climate resilient may appear to be high, inaction will almost certainly be even more costly.[37] Extreme weather events caused an economic loss of over half a trillion euros between 1980 and 2021 in Europe.[68] The rainfall-induced floods that occurred in Europe in the summer of 2021 resulted in 38 billion euros in damages.[69] Evidence shows the cost-benefit calculation supports the need for resilience measures: the U.S. Chamber of Commerce has estimated that 1 dollar invested in climate resilience reduces the recovery cost by 6 dollars and by an additional 7 dollars in reducing the community's economic costs after an extreme weather event.[70]

Performing a cost-benefit analysis is crucial for informed decision-making. It helps evaluate the financial feasibility of implementing a specific action and determines whether another intervention may offer greater benefits in terms of resilience or cost-effectiveness.[71] Once a cost-benefit analysis has been performed, the health system will have an in-depth understanding of various aspects of the selected actions, such as their installation and maintenance costs and cost-saving or types of organisational benefits (e.g. emission reductions).[64]

## 4.3 MOBILISE RESOURCES

Funding and resource mobilisation often represent a major barrier to implementing plans.[21] It is therefore fundamental to map and identify the sources of available funding at the local, national, and EU level to enable health systems to develop climate resilience plans.

At the EU, financial support for climate resilience is provided by several funds including the European Structural and Investment Funds, the LIFE Programme, the Recovery and Resilience Facility and Horizon Europe. Through *the Adaptation to Climate Change, including Societal Transformation*, Horizon Europe aims to develop and test integrated solutions to achieve climate resilience by 2050. The Mission plans to support communities in developing transformative adaptation strategies and to scale up 100 deep demonstrations of climate resilience. The European Environment Agency provides a list of the relevant EU funding streams for Adaptation. However, these funding streams are not specific to the healthcare sector.

At the national level, each EU country has national funding streams to make the health system more sustainable. Health systems should assign staff to identify available streams in their country. In the box below, we consider the example of the French funding stream *Ségur de la santé*, created by the central French health system, and how it is used by the ARS Occitanie.

## CASE STUDY:
## INVESTING IN THE HEALTH SECTOR: SÉGUR DE LA SANTÉ

Through the national investment scheme of *Ségur de la santé*, ARS Occitanie has a budget of 678 million euros to finance 67 projects. *Ségur de la santé* supports implementing projects in the healthcare sector to favour the green transition. Any project must fall under one of the seven pillars of Ségur de la santé, of which resilience to climate hazards is one. The projects related to this pillar must implement measures to anticipate and manage extreme weather events to protect the health and safety of patients and healthcare staff while maintaining continuity of care.

# STEP 5:
# DEVELOP HEALTH SYSTEM CLIMATE RESILIENCE PLAN

| | |
|---|---|
| **LEVEL** | **HEALTH SYSTEM** |
| **WHO COMPONENT** | **ALL** |
| **ROLE OF THE HEALTH SYSTEM** | • **CREATE A HEALTH SYSTEM-WIDE CLIMATE RESILIENCE PLAN**<br>• **COLLABORATE WITH RELEVANT STAKEHOLDERS FOR THE DEVELOPMENT OF THE PLAN**<br>• **COLLABORATE WITH HEALTH FACILITIES WITHIN THE HEALTH SYSTEM**<br>• **PERIODICALLY REVIEW THE PLAN AND MONITOR PROGRESS** |
| **OUTCOME** | • **HEALTH SYSTEM CLIMATE RESILIENCE PLAN** |

By this point, the health system should have gathered all the necessary information to write a Health System Climate Resilience Plan to foster climate resilience at the system level. The purpose of this kind of plan is to provide a strategic overview of the organisation's approach to climate mitigation (e.g., reducing greenhouse gas emissions) and adaptation to the unavoidable impacts of climate change within its scope. This strategy is typically supported at the facility level by local Climate Mitigation and Climate Adaptation Plans, or by combined Climate Resilience Plans that address both aspects.

The health system should already have identified and engaged the relevant stakeholders, assessed the climate risks faced by facilities within the system, and identified priorities, interventions, and available funding streams for implementation. This information should constitute the backbone of the Climate Resilience Plan.

A health system-level plan for climate resilience should also contain general information, such as background information about the health system (size of the public served, total number of staff, etc.). The plan should also contain a governance section that delineates the decision-making process and the structure of the CoP. The plan is a living document that must be periodically reviewed, updated and adjusted. New data, acts and results will be available to adjust the plan to the current situation and make it more effective.[43]

Finally, as discussed in the introduction, resilience encompasses both adaptation and mitigation. Therefore, integrating mitigation efforts is not just important but essential to any robust resilience plan. By actively reducing emissions alongside adapting to climate impacts, it is possible to create a stronger, more sustainable system capable of withstanding future climate hazards, that also avoids contributing to the increased frequency of such hazards.

An actionable first step in incorporating mitigation in a resilience plan is through the calculation of the system's carbon footprint baseline. Whether directly included in the plan, or done alongside, this calculation allows for identifying key sources of emissions and opportunities for reduction at the facility level, and achieving where possible the dual outcome of increased climate resilience and reduced carbon emissions. This process is crucial for tracking progress, setting realistic goals, and making informed decisions about energy efficiency, resource use, and sustainable practices that can mitigate the facility's impact on climate change. To support this, health systems and providers can join Health Care Without Harm's Global Green and Healthy Hospitals (GGHH) network, the largest sustainable healthcare network in the world focused on the interests and needs of healthcare sustainability practitioners.

# STEP 6:
# MONITOR, MEASURE AND TRACK PROGRESS

| | |
|---|---|
| **LEVEL** | **HEALTH SYSTEM** |
| **WHO COMPONENT** | **ALL** |
| **ROLE OF THE HEALTH SYSTEM** | • **CREATE A HEALTH SYSTEM-WIDE CLIMATE RESILIENCE PLAN**<br>• **COLLABORATE WITH RELEVANT STAKEHOLDERS FOR THE DEVELOPMENT OF THE PLAN**<br>• **COLLABORATE WITH HEALTH FACILITIES WITHIN THE HEALTH SYSTEM**<br>• **PERIODICALLY REVIEW THE PLAN AND MONITOR PROGRESS** |
| **OUTCOME** | • **HEALTH SYSTEM CLIMATE RESILIENCE PLAN** |

Measuring and tracking progress in health system climate resilience can be challenging. When implementing general climate mitigation actions, measuring their effectiveness is relatively simple, as it can be measured through readily quantifiable reductions in emission levels. Even when climate mitigation actions are included in a climate resilience plan, measuring their effectiveness in terms of climate resilience is complex. Emission reductions on their own do not demonstrate that the health system is resilient, and in the absence of extreme weather events, it might not be possible to monitor the effectiveness of certain actions. For instance, a hospital can install a water harvesting system to collect rainwater and protect its infrastructure from potential flood damage.

However, the effectiveness of this measure can only be fully assessed during actual flooding events.

Therefore, the type of monitoring should be determined based on the type of actions. Once an action is defined, indicators should be established to evaluate their effectiveness and make corrections if needed. Establishing indicators will also help define better the action, by providing a clear target.

Depending on the targets set, there are different ways to measure and monitor the effectiveness of an action. Examples of the first elements of a system-level resilience plan include qualitative surveys to assess the well-being of patients and healthcare professionals, the number of healthcare professionals trained, the number or scope of CoPs created, and the number of risk and vulnerability assessments conducted. If an extreme weather event occurs, quantitative data can be collected to measure the effectiveness of an action by calculating internal temperature, ater collected, equipment performance, and hospital accessibility.

The level of climate resilience can be measured by combining different types of indicators. In the case of heatwaves, if retrofitting interventions are implemented in buildings, pre and post-intervention surveys can be used to assess the thermal comfort of patients and the healthcare workforce combined with internal temperature measurement and variation in the use of air conditioning.

In this phase, the involvement of stakeholders through the CoP is fundamental. They will support the health system to identify the indicators to measure climate resilience and gather relevant data.

# STEP 7:
# COMMUNICATE ABOUT CLIMATE RESILIENCE

| | |
|---|---|
| **LEVEL** | **HEALTH SYSTEM** |
| **WHO COMPONENT** | **ALL** |
| **ROLE OF THE HEALTH SYSTEM** | • **CREATE A HEALTH SYSTEM-WIDE CLIMATE RESILIENCE PLAN**<br>• **COLLABORATE WITH RELEVANT STAKEHOLDERS FOR THE DEVELOPMENT OF THE PLAN**<br>• **COLLABORATE WITH HEALTH FACILITIES WITHIN THE HEALTH SYSTEM**<br>• **PERIODICALLY REVIEW THE PLAN AND MONITOR PROGRESS** |
| **OUTCOME** | • **HEALTH SYSTEM CLIMATE RESILIENCE PLAN** |

**COMMUNICATION IS AN OVERARCHING ACTIVITY THAT SHOULD COVER THE DURATION OF THIS PROCESS, STARTING FROM THE INVOLVEMENT OF THE STAKEHOLDERS THROUGH THE IMPLEMENTATION OF THE MEASURES AND THE MONITORING AND REPORTING ON PERFORMANCE AND EFFECTIVENESS. COMMUNICATING AND DISSEMINATING AN ORGANISATION'S WORK ON CLIMATE RESILIENCE WILL ENCOURAGE CHANGE ACROSS THE ENTIRE HEALTHCARE SECTOR AND THE REPLICATION OF BEST PRACTICES BETWEEN AND ACROSS ORGANISATIONS AND IN DIFFERENT LOCATIONS.**

## COMMUNICATION STRATEGY TO INCREASE PUBLIC ENGAGEMENT WITH HEALTHCARE CLIMATE RESILIENCE

Effective communication is crucial for building support and momentum for climate resilience in healthcare systems. The role of health system management in shaping the narrative and engaging stakeholders cannot be overstated. It is recommended that health systems develop a comprehensive communications plan about climate resilience activities—a strategic roadmap outlining the organisation's messaging, target audiences, channels, and timelines—as an integral part of its overall resilience efforts. Below are key strategies to incorporate into the wider health system communication plan.

1. **FRAME THE NARRATIVE:**
   In all communications about the health system's climate resilience efforts, begin by positioning climate resilience as an essential component of healthcare quality and safety. It is important to emphasise how climate resilience measures protect patient care, staff well-being, and community health, and use clear, compelling language that resonates with both healthcare professionals and the public.
2. **HIGHLIGHT LOCAL IMPACTS:**
   Contextualise climate risks for the specific region. The use of local data and projections to illustrate how climate change affects a community's health makes the issue more tangible and urgent.

3 **SHOWCASE SUCCESS STORIES:**
Sharing examples of healthcare facilities that have successfully implemented resilience measures. Highlighting both the process and outcomes, including cost savings, improved patient care, and enhanced community trust and staff wellbeing.

4 **ENGAGE DIVERSE STAKEHOLDERS:**
Tailoring messaging for different audiences - from healthcare staff and patients to local policymakers and community leaders.

5 **LEVERAGE HEALTHCARE'S TRUSTED VOICE:**
Healthcare professionals are viewed as credible messengers on health-related issues. Health systems should empower healthcare staff to become climate resilience advocates within their professional networks and communities.

6 **DEVELOP A CLEAR CALL TO ACTION:**
Clearly communicating what support is needed from various stakeholders to implement the resilience plan is of particular relevance during step 1 of this Guide, MOBILISE SUPPORT. This could range from policy changes and funding allocations to community partnerships and behavioural shifts.

7 **MONITOR AND ADAPT:**
Communication strategies should be regularly monitored to assess their effectiveness. This can be done through surveys, social media analytics, and stakeholder feedback to refine the communication approach and address emerging concerns or misconceptions.

Integrating these communication strategies into a Climate Resilience Plan can help to build the necessary public and political will to support and sustain efforts in creating a more resilient health system. It also increases community engagement with healthcare service provision, ultimately improving general awareness of climate change impacts, the need for mitigation and adaptation measures, and the overall resilience of the community to climate-related health impacts.

# APPENDIX 1:
# INTERVENTIONS

| TARGET AREAS | INTERVENTION | CLIMATE HAZARD | BENEFIT | ADDITIONAL BENEFITS |
|---|---|---|---|---|
| Infrastructure | High-performance infrastructure envelope to prevent high/low temperature[18] | Heatwave/ cold spell | Thermal comfort | Emissions reduction |
| Infrastructure | Thermal regulation[23] | Heatwave/ cold spell | Thermal comfort | Emissions reduction |
| Infrastructure | Placing all critical care functions above the first floor[18] | Flooding | Ensure operational continuity of healthcare services | |
| Infrastructure | Appropriate location of critical equipment | Flooding, Heatwave | Avoid equipment malfunctioning | |
| Infrastructure/ supply chain | Diversification of energy sources | Various | Ensure energy supply | Emission reduction |
| Infrastructure/ supply chain | Backing up the power system | Various | Ensure energy supply | |
| Infrastructure | Installation of ventilation system[72] | Heatwave | Increase well-being and thermal comfort | Reduce energy consumption, reduce load on the energy supply network |
| Infrastructure | Installation of shading systems[72] | Heatwave | Increase well-being and thermal comfort, decrease internal temperature | Reduce energy consumption, reduce load on the energy supply network |

| TARGET AREAS | INTERVENTION | CLIMATE HAZARD | BENEFIT | ADDITIONAL BENEFITS |
|---|---|---|---|---|
| Infrastructure | Creation and maintenance of fire breaks | Wildfire | Protect facility buildings | |
| Infrastructure | Installation of sensors[73] | Wildfire | Measure and ensure air quality | |
| Infrastructure | Update drainage system[26] | Flooding | Avoid system stoppage, ensure water supply and quality | |
| Infrastructure | Water harvesting system[72] | Flooding, storm | Ensure access to the facility, and avoid damage | |
| Infrastructure | Flood protection system/ floodgates[74] | Flooding | Protect facility buildings and infrastructure | |
| Infrastructure | Use water-resistant construction methods and materials[75] | Flooding | Protect facility buildings and infrastructure | |
| Infrastructure | Green rooftops[62] | Heatwave, storm | Improve insulation, energy efficiency, thermal comfort, absorb water | Emissions reduction |
| Infrastructure | Green spaces[62] | Heatwave, flooding | Increase thermal comfort, absorb water | Increase patients' well-being, contribute to the local biodiversity |
| Supply chain | Onshoring and near-shoring[18] | Various | Decrease the risk of disruption | Decrease the number of possible suppliers, increase the cost |

| TARGET AREAS | INTERVENTION | CLIMATE HAZARD | BENEFIT | ADDITIONAL BENEFITS |
|---|---|---|---|---|
| Supply chain | Diversification of supply sources[62] | Various | Increase the availability of medicines and critical medical products | |
| Supply chain | Stocking[61] and coordination among the hospitals in the health system | Various | Increase the availability of medicines and critical medical products | |
| Supply chain | Backup system for essential medical products[13] | Various | Continued availability of medicines and critical medical products in times of crisis | |
| Workforce | Communications campaign on the need for climate resilience | Various | Raise awareness and increase mobilisation for resilience | |
| Workforce | Training | Various | Increase climate impact knowledge and preparedness | |
| Workforce | Recruiting of health personnel with specific competencies: biostatistics and epidemiology[18] | Various | Increase knowledge and preparedness | |
| Workforce | Collaborate with the HC workforce to elaborate protocols and procedures | Various | Increase preparedness and awareness | |

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