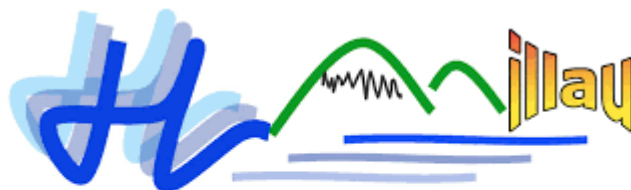




CLIMATE CHANGE RESILIENCE  
FRAMEWORK FOR HEALTH  
SYSTEMS AND HOSPITALS

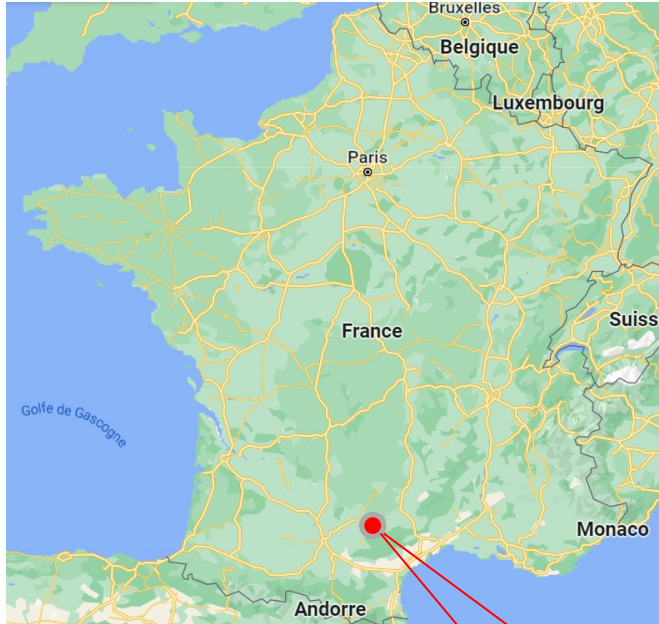
# Experiences on the ground at CH Millau and St Affrique : the impact of climate change on hospital functioning

February 7th, 2023



CENTRE HOSPITALIER DE MILLAU  
[www.ch-millau.fr](http://www.ch-millau.fr)

# Millau and St Affrique hospital



- Distance in between the two hospitals : 28 km  $\approx$  30 min.
- Mediterranean climate with sometimes mountainous areas (up to 1,000 m above sea level)
- Rural area with 70 000 inhabitants in living area (22 000 in Millau and 9200 in St Affrique, 2019)



Key figures in 2019	Millau	Saint Affrique
Foundation date	1910	1933
Beds	200	250 (including 130 for the retirement home - EHPAD )
Health professionals	600 including 60 doctors	320 including 20 doctors
Patients hospitalized (per year)	10 000	4 300
Patients examined at outpatients clinics (per year)	42 000	9 700
Budget (million €)	53	28
Built area (m <sup>2</sup> )	37,000	10,000
Buildings and campuses	21 spread over 6 campuses	3 in one campus

## External risk factors

1. An important ageing and rather low-income population with important healthcare needs.

2. A lack of accessibility to the hospitals as the community served can be quite secluded

# The two main climate hazards we are facing

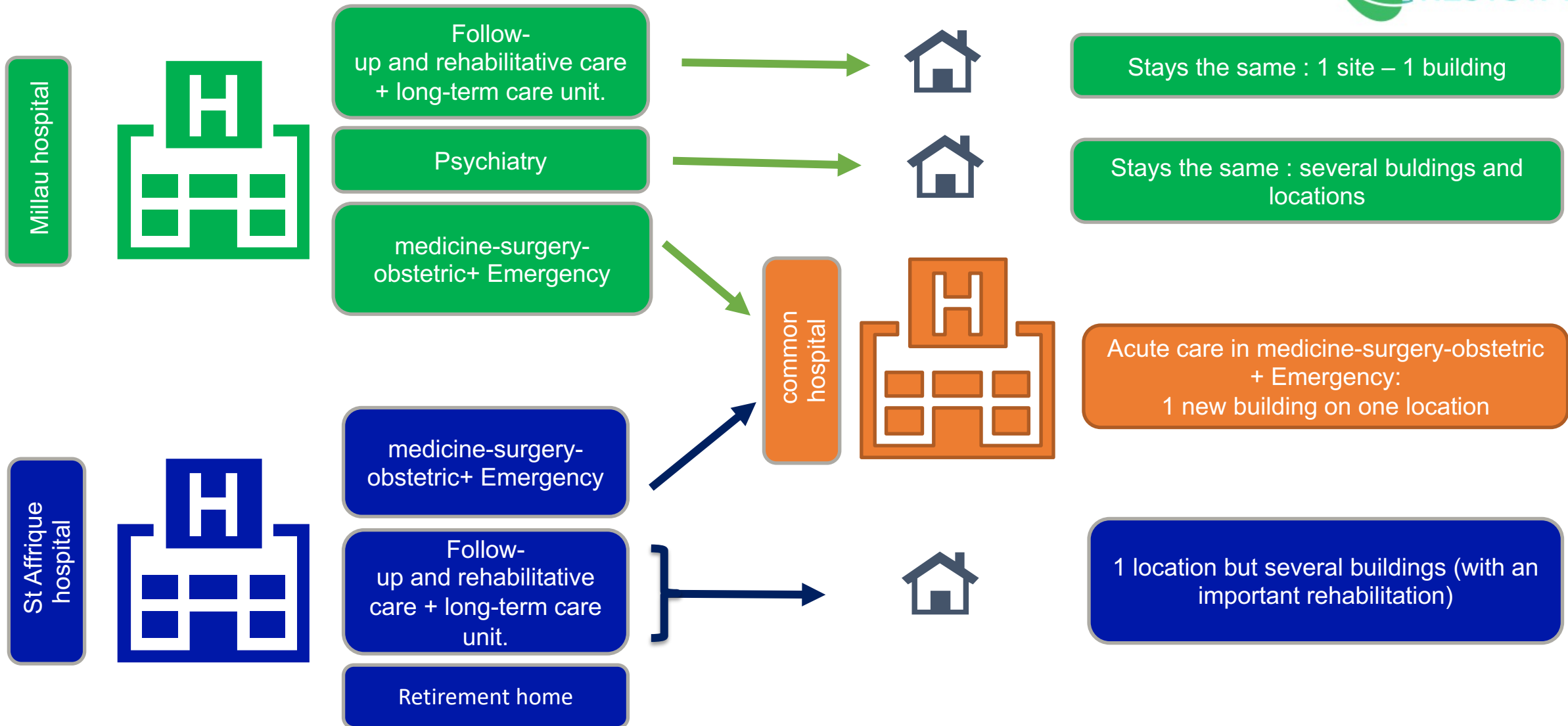
## Flooding in St Affrique

- Temperatures inside the buildings can reach 30°C in the rooms which are incompatible with proper patient care.
- Deterioration of the staff's working conditions.
- St Affrique buildings are less subject to the heat island effect (UHI).

## Heatwaves in Millau and St Affrique

- In 2014, after heavy rainfall, the hospital basement was fully flooded due to the overflow of the Sorgue river.
- 6 months closure and all patients had to be evacuated in 48 hours

# Life resystal knowledge is an opportunity for the future hospital in 2028



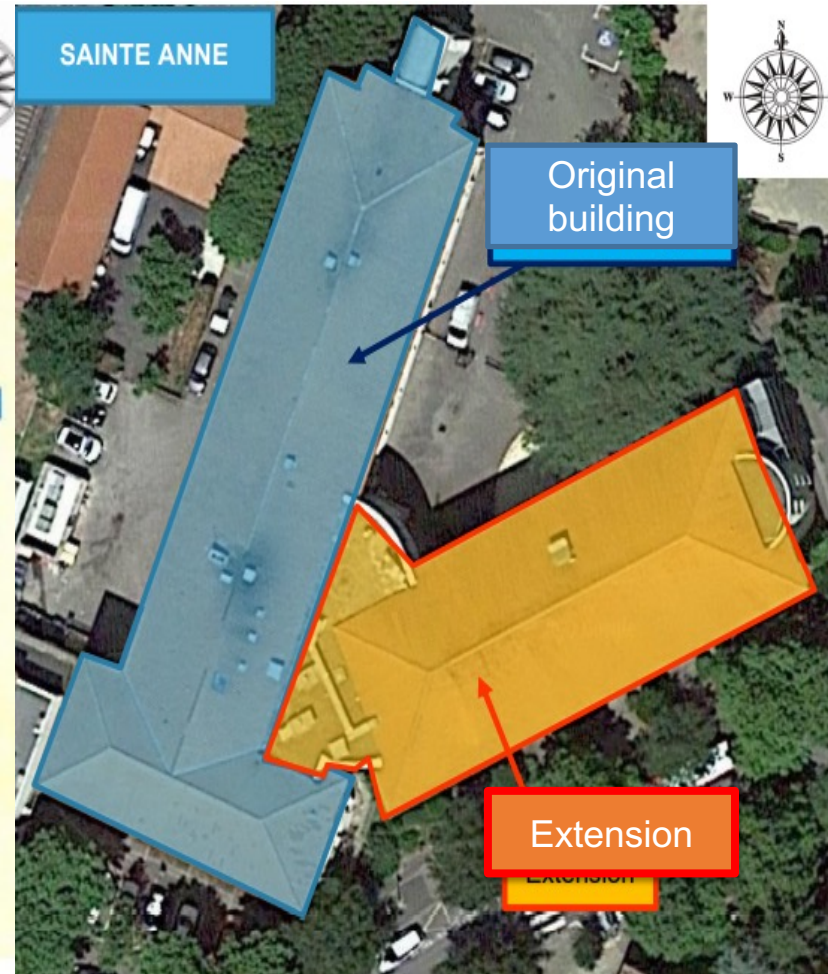
# Plans of the buildings concerned by the Life resystal project



## Plan of St Affrique Hospital



## Millau Hospital



## Adaptative measures

- waterproof mobile installation
- green façade
- Canadian well
- Protection against the sun

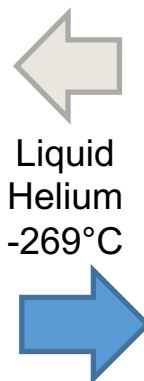
# Climate change risk on the MRI cooling system (1 of 2)



Air



Water  
10°C



Liquid Helium  
-269°C



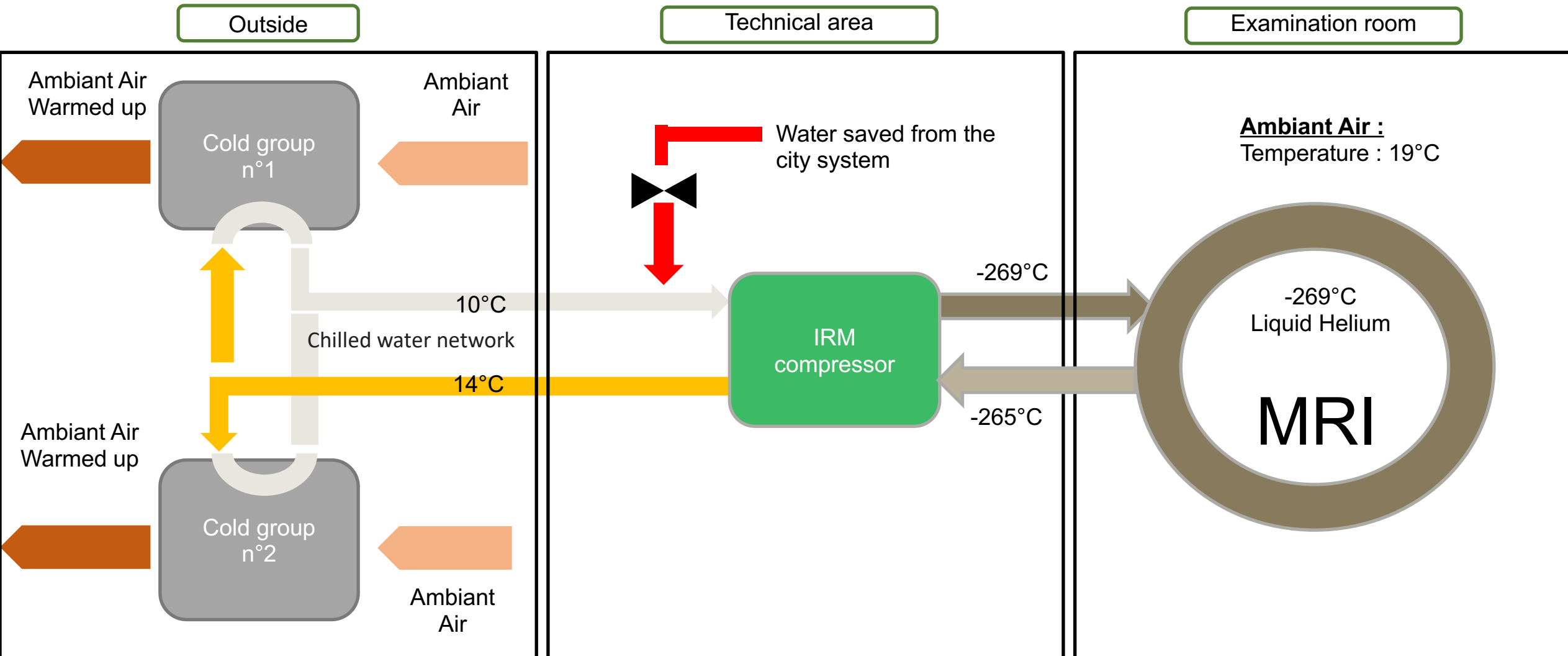
Compressor MRI



Water  
10°C



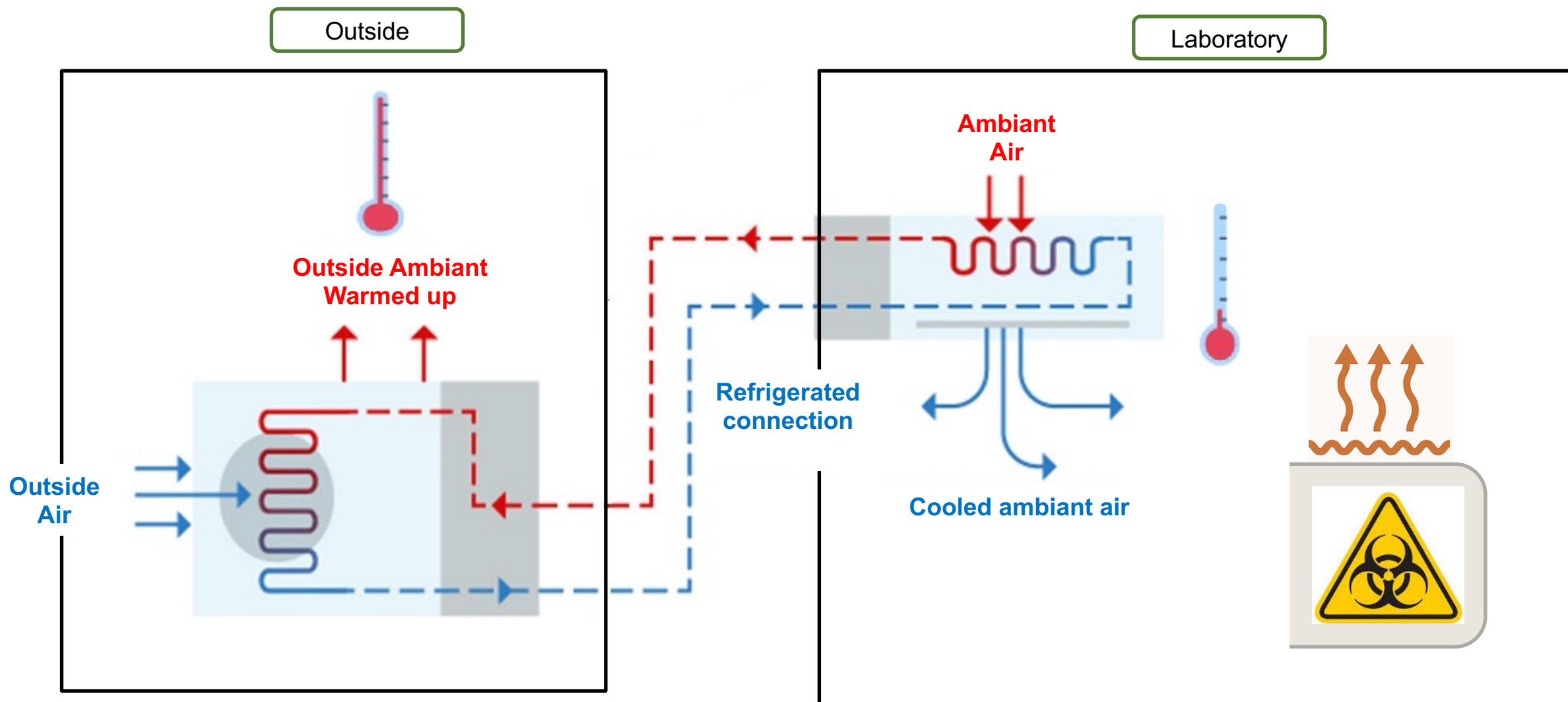
# Climate change risk on the MRI cooling system (2 of 2)



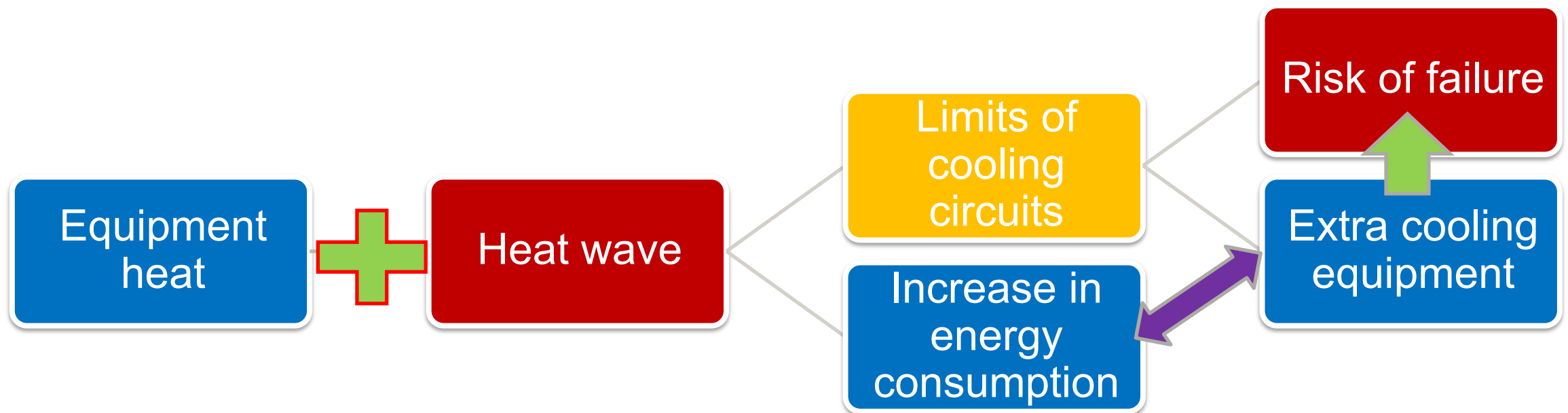
# Climate change risk on the laboratory cooling system (1 of 3)



## Climate change risk on the laboratory cooling system (2 of 3)



## Climate change risk on the laboratory cooling system (3 of 3)



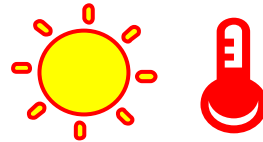
# Climate change impacts on the hospital activity



Break down	Problems	Impact on the team and activity	Medical-technical platforms	Hospitalization	Consultation	Health care Users	Health professionals
<b>MRI</b>	<ul style="list-style-type: none"> <li>• Malfunction of chilled water units (ice forms on the magnet).</li> <li>• Air treatment malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Stopping MRI activity (repair + helium)</li> <li>• Reduced quality of medical images</li> </ul>	Reorientation of patients in serious condition according to the level of emergency	Transfer to another hospital	Postponement of appointment	Extension of deadlines	Deterioration of care (motivation and sense of work)
<b>Laboratory machines</b>	<ul style="list-style-type: none"> <li>• Air conditioning unit malfunction</li> <li>• Destruction of certain reagents when they reach the maximum temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Stopping the machine activity (repair)</li> </ul>	Closing the emergency, maternity, operation rooms, intensive care unit,...	Outsourcing of the activity	Postponement of appointment		

# Heat wave impacts on the elderly in Caylus retirement home

## Caylus retirement home in St Affrique hospital location



- **Average age : 89 years old**  
vs national average age in retirement homes : 87 years old
- **Dependency score : 907**  
vs national average score : 720
- **45 nursing home residents**

- The average temperature during the heat wave : **29°C**
- The highest temperature in a resident room : **32°**
- The lowest temperature in a resident shared area : **26°**

- **Increased risk of hyperthermia of the elderly because of :**
  - sweating disorders
  - disruption of the thirst mechanism
- **Risk associated with Caylus residents' frailties :**
  - polypathologies
  - 84% suffer from neurodegenerative diseases
  - palliative care

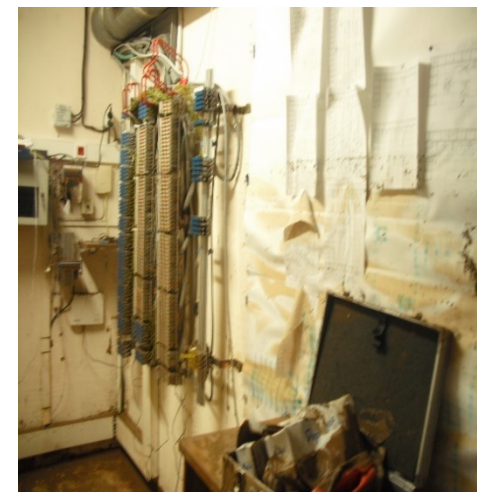
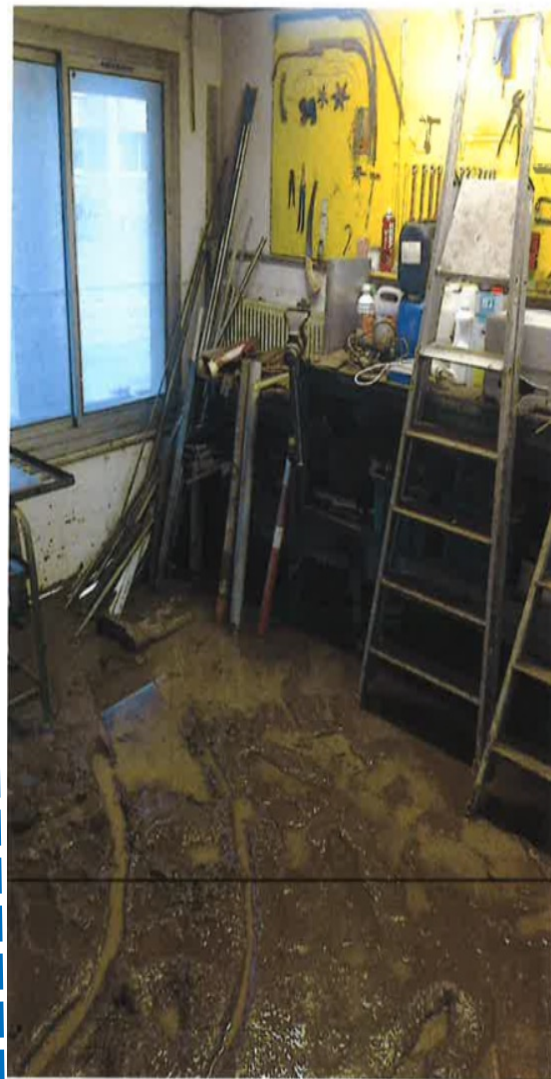
# Flood impacts on the several buildings at St Affrique Hospital (1 of 3)



## Building B : Long-term care unit + Retirement home Caylus



## Building A : Technical installation



# Flood impacts on the several buildings at St Affrique Hospital (2 of 3)

## Building A : Linen room – Kitchen



- **Building A : Laboratory**





Number of days between the closing (28/11/2014) and the opening (07/12/2015) with the flood impact

