Climate change REsilience framework for health SYStems and hospiTALs

DA1.2 - [Capacity Assessment Matrix]	
Contractual Delivery Date: 01/02/2022	**Actual Delivery Date**: 13/06/2022
Type: Report	**Version**: v1.0
Dissemination Level: Public Deliverable	

LIFE RESYSTAL is a project that has received funding from the LIFE programme, the EU's funding instrument for the environment and climate action, under grant agreement LIFE20 CCA/GR/001787.

Preparation Slip			
	Name	**Partner**	**Date**
From	Cyprien Butin	ACTERRA	18/05/2022
From	Mireia Figueras	HCWHE	18/05/2022
Reviewer	Stéphane Simonet, Chloé Stab	ACTERRA	13/06/2022
Reviewer	Celina Solari	RINA-C	20/06/2022
Reviewer	Kristen MacAskill	UCAM	21/06/2022
From	Cyprien Butin	ACTERRA	03/08/2022
Reviewer	Kristen MacAskill	UCAM	16/08/2022
For delivery	Cyprien Butin	ACTERRA	01/09/2022

Document Log			
Issue	**Date**	**Comment**	**Author / Organization**
V0.0	13/06/2022	Draft version submitted for review to all partners	ACTERRA with HCWHE support
V0.5	03/08/2022	Version with Polibari profile added and review of the first batch of comments	ACTERRA
V.1.0	01/09/2022	Final version	ACTERRA

Executive summary

This deliverable was produced as part of action A1.2 of the LIFE RESYSTAL project, which aims to assess the capacities and training needs of each pilot hospital. An adaptative capacity assessment matrix (or checklist) was designed. It covers the different dimensions of hospital's climate resilience: governance & leadership, crisis management, buildings and infrastructure. Interviews were then conducted with targeted members of the communities of practice of each hospital, and climate resilience capacity profiles were produced.

Table of content

Table of abbreviations	
Abbreviations	**Meaning**
ARS	Agence Régionale de Santé
CCA	Climate Change Adaptation
CH MILLAU	Hospital Center of Millau
CoP	Community of Practice
HCWHE	Health Care Without Harm Europe
NCSRD	National Center for Scientific Research Demokritos
NHOSP	General State Hospital of Nikaia “Agios Panteleimon”
NGO	Non-Governmental Organization
PCAET	Local Climate, Air and Energy Action Plan
POLIBARI	University hospital complex of the polyclinic of Bari and the Giovanni XXIII hospital
RINA-C	RINA Consulting
SERGAS	Galician Health Service
UCAM	University of Cambridge

General State Hospital of Nikaia "Agios Panteleimon"

Rapid Climate Resilience Capacity Profile

Background information

Founded in 1937, the General State Hospital of Nikaia "Agios Panteleimon" is the largest public healthcare facility in the Athens metropolitan area and in Greece. It is also second largest in the Balkans region. Below are some key figures:

- More than 31,000 patients are hospitalized each year, with more than 43,000 citizens examined at regular outpatient clinics and more than 131,000 citizens examined annually (up to 1,400 every day) at the emergency department;
- Approximately 600-700 beds with an average rate of occupied beds > 85% (prior to the Covid-19 sanitary crisis)
- More than 1700 employees;
- An annual budget of around €15 million
- A built area of 36,500 m^2 that is spread over 28 buildings in one single campus.

View of the hospital campus (Source: Eurokinissi, 2021)

Climate hazards

The most pressing climate hazards for the NHOSP's infrastructure and operations are:

- **Mainly heatwaves** which affect the cooling and heating units of the clinics. One important past disaster is the heatwave of 1987 that cost many lives. Heatwaves may also indirectly affect hospital operation when it is to cope with a significant influx of patients injured by **wildfires** – such as the ones that occurred in the summer 2021 in the islands of Evia and Rhodes as well as in the north of Athens – or suffering from **heat stroke.**
- **Floods** as the hospital is built on the tributary of a central river which may overflow during **heavy rains** or storms and damage the electricity power station. Although the hospital is located 3.5 km away from the coast, it is not subject to **coastal flooding** as its site is well above sea level.
- The hospital operation and access may also occasionally be impacted by extreme cold and snow cover.

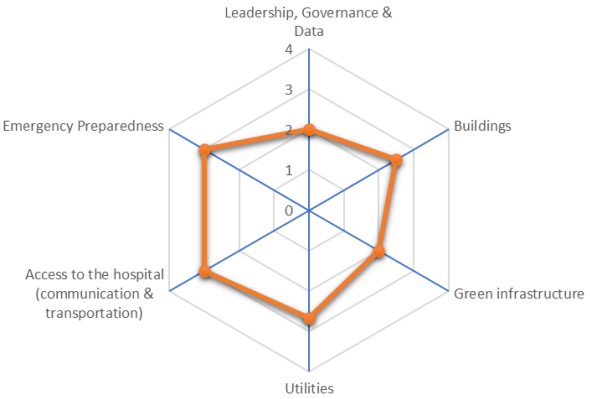
External risk factors

Being one of the main pillars of the Greek National Health System (NHS), NHOSP treats patients from all over the country, including the Greek islands given its proximity with the port of Piraeus. Located in Nikaia, a working-class town 7 km West of Athens, the hospital also treats a population coming from poorer and middle-class strata with tremendous healthcare needs.

Lessons learned: existing capacities and prospects

The Nikaia General State Hospital has today only marginally adapted its organization to climate change challenges. Outside the Engineering department which appears quite aware of the need to adapt buildings and infrastructure to climate change, its staff has a rather low awareness of climate change issues. No specific budget has been allocated to deal with such issues, except in the field of the buildings' energy efficiency. In addition, the hospital's crisis management plan only deals with fire and earthquake hazards.

Nevertheless, the hospital has a number of physical assets on which it could build to improve its adaptive capacity: the presence of one hectare of green spaces, the energy upgrade program of several buildings (still ongoing), a functional emergency electric power station, and several evacuation roads.



Assessment of the 6 dimensions of adaptive capacity for the Nikaia hospital

The way forward

Within this context, one main challenge for the hospital to increase its adaptive capacity will be to raise awareness of medical and management staff on climate change challenges while explaining that (i) investing on adaptation will be much less costly that repairing after the event has occurred; 2) climate change impacts should be included in the hospital's crisis doctrine. In addition, given the limited investment capacity of the hospital, cost efficient adaptation measures as well as external funding sources will need to be identified.

The hospital's resilience capacity is analyzed for each dimension identified i.e. (i) Governance, leadership and data, (ii) Buildings, (iii) Green infrastructure, (iv) Utilities, (v) Transport and telecommunication, and (iv) Emergency preparedness and management.

1- Governance, Leadership and Data

Score: 2 (Marginal)
This score indicates that the Nikaia hospital has only marginally adapted its organization to climate change challenges and that it is not supported neither technically nor financially to do so.

1-1 Organizational capacity

The hospital's organizational capacity to deal with climate change and sustainable development is rather low as there neither a dedicated position nor a specific plan or strategy to address such issues within the hospital. This is explained to a large extent by 1) budget cuts of up to €20 million for hospitals under the new austerity policy, which requires the hospital to prioritize urgent short-term investments to ensure the continuity of operation[1], 2) an overall lack of awareness of climate impacts, besides staff from the engineering department.

"Today, short-term solutions dealing with daily problems are preferred to strategical targets for climate resilience and long-term planification."
Technical Staff of NHOSP

Climate resilience solutions have only been indirectly taken into account through a project for the energy efficiency retrofit of the hospital from class F to class B[2]. This project, which started in September 2021, is being implemented by

[1] A short documentary released in 2012 already alerted on the risk of a "total collapse" of the Greek healthcare system due to budget cuts : https://www.theguardian.com/world/greek-election-blog-2012/video/2012/jun/15/greece-hospital-austerity-cuts-video?CMP=twt_gu
[2] See below, section 2-3-1

Ktiriakes Ypodomes S.A. (KTYP), the Greek national authority for delivering public building infrastructure (including hospitals), in coordination with the hospital's engineering department[3]. It mobilizes a €3.5 million funding from the Ministry of Development and Investments.

1-2 Enabling environment

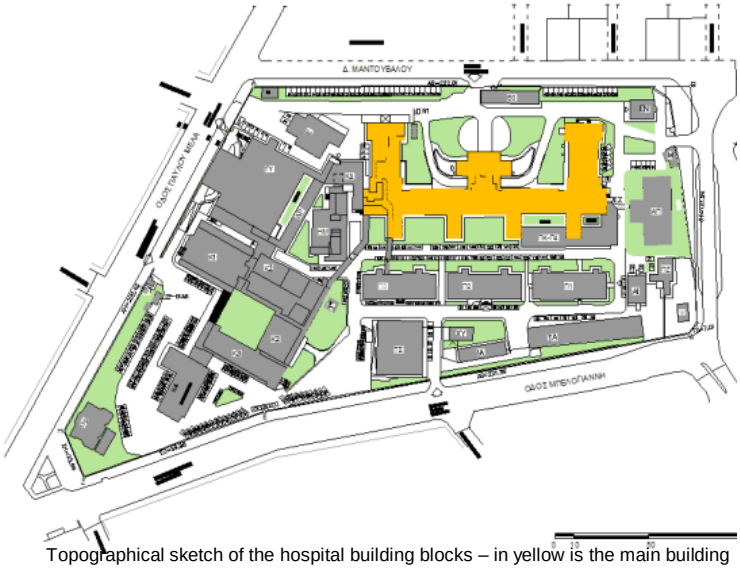
The NHOSP's supervisory bodies – i.e. the Regional Health Agency and Ministry of Health – do not provide guidelines, plans or directives to adapt the hospital to climate change. The only cooperation between the hospital and other national entities on this field – besides the RESYSTAL project with the National Center for Scientific Research "Demokritos" (NCSRD) – involves the School of Mechanical Engineering of the National University of Technology within the framework of the EU-funded Switch2Save project (see next subsection)[4].

1-3 Mechanisms to Collect and Monitor Data

A system to monitor humidity, temperature, air velocity, CO2 concentration parameters has been set up in the pediatric clinic and in the neonatal intensive care unit, as part of the Switch2Save project. Data is collected automatically (every 5 sec.) by the Engineering Department.

2- Buildings

Score: 3 (Functional)
This score indicates that the status of building construction is rather sound; climate mitigation measures have or are being implemented, contrary to climate-adaptation measures.



Topographical sketch of the hospital building blocks – in yellow is the main building (Source: Study 2nd Piraeus & Aegean region General hospital of Nikaia-Agios "Panteleimon", 2017)

The hospital's buildings were all built between 1950 and 2004. As a result, there is a heterogeneity between old buildings that are in lower conditions and the ones that are more recent and in a better state. Some have highly efficient glazing systems that insulate the buildings whereas others don't. The "Gennimatas" buildings[5] were built in the 1980s and are in a medium condition. Their rehabilitation is identified by the Nikaia hospital as a priority investment to be funded by the LIFE RESYSTAL project. A feasibility study is currently being conducted on this matter.

Inspection and maintenance are operated on a daily basis by the Engineering department. Regarding the stormwater management system, it is often clogged by leaves and no frequent cleaning is performed.

Most measures taken on buildings aimed to reduce GHG emissions and not adapt to climate impacts: few to no measures have been taken to enhance the climate resilience of the buildings (install reflective roofs, high-albedo paving, etc.).

3- Green infrastructure

[3] The engineering department comprises: (i) the biomedical division which deals with the maintenance and upgrading of medical devices, (ii) the technical division which deals with buildings, (iii) the Mechanical-Electrical-Plumbing (MEP) division, which considers the mechanical, electrical, plumbing and medical gas supply systems

[4] "Lightweight switchable smart solutions for energy saving large windows and glass facades" is a project funded by the EU Horizon 2020 program that aims to test new energy saving solutions for large glass façade areas (https://switch2save.eu/).

[5] They are named after Georgios Gennimatas, a Greek politician and founding member of the Panhellenic Socialist Movement (PASOK).

Score: 2 (Marginal)
This score indicates that hospital has only marginally committed to enhance its resilience through green infrastructure. Though it benefits from a significant surface of green spaces (1 ha), no adaptation measure has been implemented lately.

Source: ΑΝΤΩΝΗΣ ΚΑΡΑΝΙΚΟΣ Google Earth, 09/2021

The hospital benefit from 9,890 m^2 of green spaces – including many trees, that are rather equally distributed in the campus. The fire risk posed by vegetation is not significant because trees are at a safety distance from the buildings. Their impact to improve shading during the summer and diminish the urban heat island effect **would need to be assessed**. Plants are watered through rainwater runoff wells, rainwater pumps and a drip irrigation system. However, no adaptation measures have been implemented lately (such as permeable paving, green roofs, bioswales, etc.).

4- Utilities

Score: 2.7 (between marginal and functional)
This score indicates that the operating parameters without essential utilities (islanding operation) are relatively effective during extreme weather events. Nonetheless, the hospital's energy system remain highly vulnerable during the summer period as the A/C system is put under stress. On the contrary, during the winter, oil tanks can be used for thermal comfort.

4-1 Energy

The hospital's energy infrastructure is particularly vulnerable to climate hazards and physical impacts including floods – as the electricity power station is located in a flood-prone area – as well as heatwaves – which can affect the cooling and heating units of the clinics, including Intensive Care Units (ICUs). Indeed, when the operation parameters of units are exceeded, air conditioning (A/C) system may stop working; in such case about 1500 patients are at risk.
In case of an electricity cut, there are electrical (oil-based) emergency generators that can produce electricity for the crucial clinics, mainly the ICUs, as well as the food refrigeration equipment. **Regarding the thermal, heating and water systems whose burners all use gas, they may also operate with oil as back up**. Overall, the hospital may operate **without grid power or refueling for a period of 24h.**
The hospital do not have a strategic plan to addressing extreme weather events. As mentioned above, climate resilience issues are only taken into account indirectly through the reduction of energy consumption, which is quite a pressing issue as the NHOSP is a major energy consumer, with overall annual natural gas and electricity consumption for heating and cooling needs exceeding 10MWh and 7MWh, respectively. Within this context, the hospital has secured a €3,500,000 funding from National Programs for the energy upgrade of the Hospital from class F to class B. The energy upgrade deals with external insulation, new energy efficient glazing, new energy efficient boilers, a building management system etc. It also includes the replacement of the current conventional fluorescent lights to low-energy lighting LED lights (appr. 10000 lights will be replaced), a lighting control system to control tunable lights. In addition, s**olar thermal plants will be installed as part of the energy upgrade program.**

4-2 Water and sewage

There are two independent water sources from the national water supplier which are, in theory, able to supply the whole hospital. But if there is increased water demand probably there will be “some problems” (sic). The water is potable without any treatment. In addition, the hospital can rely on bottled drinking water for emergencies.
The consumption of water tracked is approximatively 22m3/day (it refers to the hot water consumption not the overall water consumption). Some showers/toilets are low flow.

4-3 Waste management
There is a garbage can of contaminants which is collected by the municipal garbage trucks every two days. There is a cleaning service which empties all the garbage in the bins of the municipality which are collected by the garbage trucks of the municipality. Also, there are special bins for collecting infectious medical waste, a special press that pulverizes the infectious medical waste which is then collected by special garbage trucks of the municipality.

5- Communication, information and access to the hospital

Score: 3 (Functional)
This score indicates that the hospital is relatively well equipped in terms of communication, that it remains well served and accessible.

There are specific evacuation routes inside the hospital that are above flood elevation, with alternative route in case the first one is blocked. Most of the trees are far from the evacuation roads, and most cables are in ditches in the ground or hidden in shafts or suspended ceilings. Subway is 15-min away by foot from the hospital and the bus station is just in front of the hospital ; yet, most employees use their own vehicles to come. Moreover, there are taxi stands, especially reserved for direct access to the hospital. In case of an extreme weather event, traffic can be banned for a certain period of time.
In terms of communication, there is a central landline telephone system but no mobile phone system provided by the hospital. Indeed, every employee has a personal cellphone that he or she uses for emergencies. The hospital security service has its own radio communication system. The hospital is not part of a regional network with coordinated communication systems.
Finally, most of the paper record storage and medical records are located in an area above flood elevation.

6- Emergency Preparedness & Management

Score: 3 (Functional)
This score indicates that a majority of critical medical care departments/support services and diagnostic equipment are accessible and functional in case of an extreme weather events.

The Nikaia hospital has a crisis management plan for fire and earthquakes only. Indeed, the crisis management steering entity called “PSEA” (Emergency design planning officer) is responsible for fire and earthquake and it does not explicitly consider climate hazards. Yet, the early warning system put in place includes climate-related emergencies: all managers/directors receive a text from the PSEA on their mobile phone (there is no specific software) in case of a natural disasters. In addition, there is protocol for the patient transfer and self-sustaining care can be provided without re-supply of equipment and supplies for a duration of approximately 4 days.
Finally, the Emergency Department indicates that no disaster planning activities involving the community or emergency management were undertaken and that no systematic feedback sessions were organized after a climate disaster (it is the case for Covid-19 pandemic). This situation may impede the crisis management system to perform, as illustrated below.

“When a disaster happens, people often feel abandoned because they have not been trained: there are not preventive program or simulation exercise.“
Technical Staff of NHOSP

Entrance of the Emergency Department, NHOSP (Source: Valdimirios Poliakov, Google Earth, October 2020)

Main sources and limitations

Data was collected from (i) contributions from the participants to the kick-off meeting of the community of practice held on December 17, 2021, (ii) written responses to the questionnaire filled by Dimos Kontogeorgos, Engineer in the technical division of the Engineering Department for Section 1 to 5 and by Dr. Intas Georgios, Senior Director of Nursing, Nursery Department and Dr. Dimitrios Tsiftsis, Head of Emergency Department for Section 6 on Emergency Preparedness and Management; (iii) one additional interview with Dimos Kontogeorgos to elaborate some of the responses.

One limitation of this assessment may be the lack of data on section 6 on Emergency Preparedness and Management as it was not possible to directly talk with the two respondents who filled this part of the questionnaire.