

SESSION 2: Salutogenic Healthcare Design

**Design
& Health**
International Academy for Design and Health

Milano, Italy 11-14 April 2024

Design & Health

13TH WORLD CONGRESS & EXHIBITION

REVITALIZING HEALTH BY SALUTOGENIC DESIGN

Healthy environment / Healthy people

**SUSTAINABILITY
IN THE NEXT GENERATION HOSPITAL®**

Dr. Andrea Brambilla, March PhD

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Politecnico di Milano, Department ABC, Design & Health Lab



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If the Healthcare Industry was a country, it would be the 5th largest polluter on Earth

Source: Pichler PP et al: International comparison of health care carbon footprints. Environ. Res. Lett. 2019; 14 064004.

The healthcare sector is accountable for over 10% of all carbon emissions worldwide

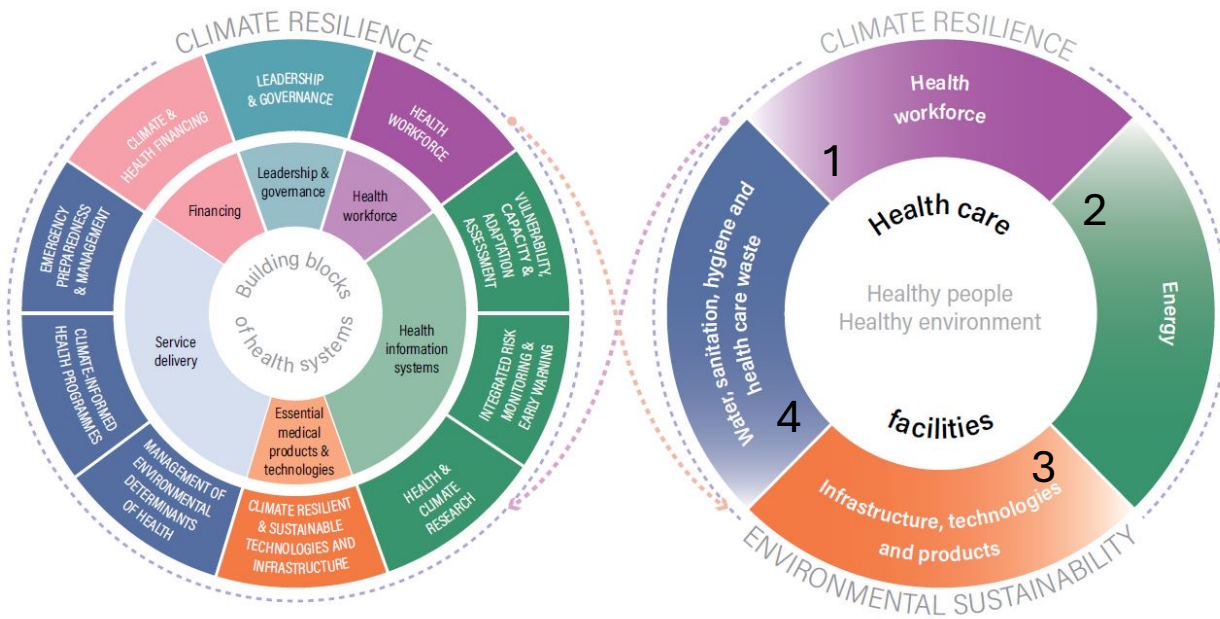
Source: Romanello et al., 2023

Background: Need for climate-resilient and sustainable healthcare facilities

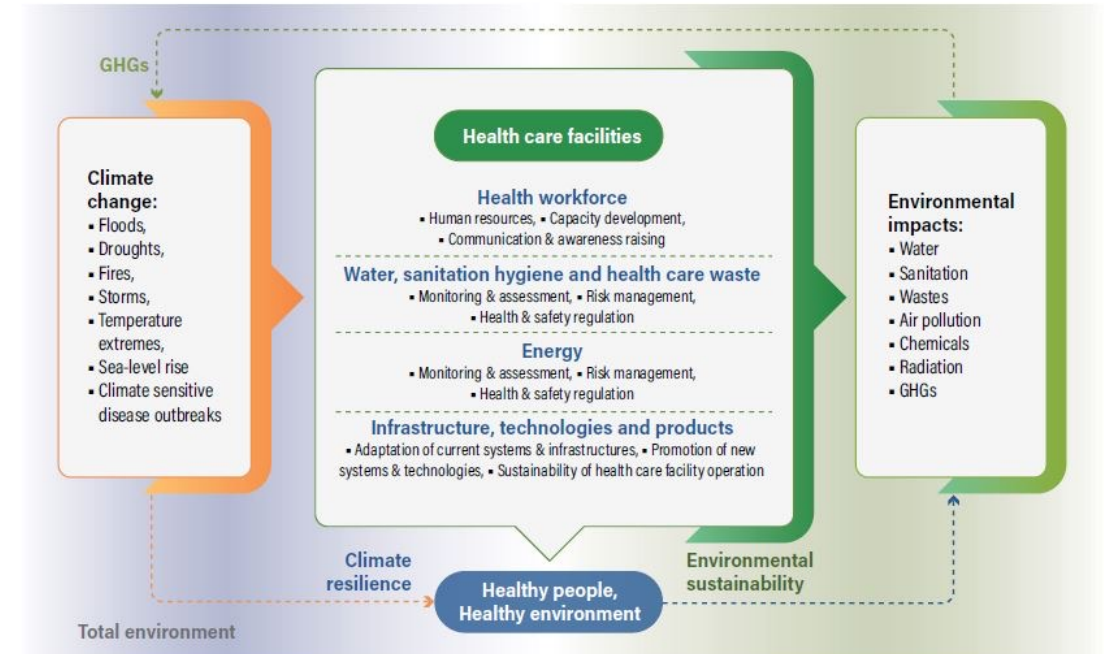
- WHO's fundamental requirements for providing safe and quality care



- Minimizing negative impacts
- Protect the health and well-being



Climate resilience and environmental sustainability in health care facilities



Framework for building climate-resilient and environmentally sustainable health care facilities

Source: WHO guidance for climate-resilient and environmentally sustainable health care facilities, 2023

Background & Research Gap: measuring sustainability in healthcare facilities



70%

*EUROPEAN
HOSPITALS*

ARE MORE OBSOLETE THAN THE
OPTIMAL LIFECYCLE

D&H LAB, 2022



50

*HOSPITAL
GROUPS*

WILL BE ASKED TO DECLARE THEIR
SUSTAINABILITY LEVEL

CSRD DIRECTIVE (EU)



+90%

COSTS

INCREASE IN ELECTRICITY COSTS FOR HEALTHCARE
COMPANIES (2021-2022)

AGENAS, 2023



800

MILIONS

ALLOCATION 2023 FOR THE MODERNIZATION
OF HEALTHCARE INFRASTRUCTURES

LOMBARDIA REGION, 2023

LACK OF GUIDELINES AND STAKEHOLDERS INVOLVEMENT

Methodology: developing a Research Partnership



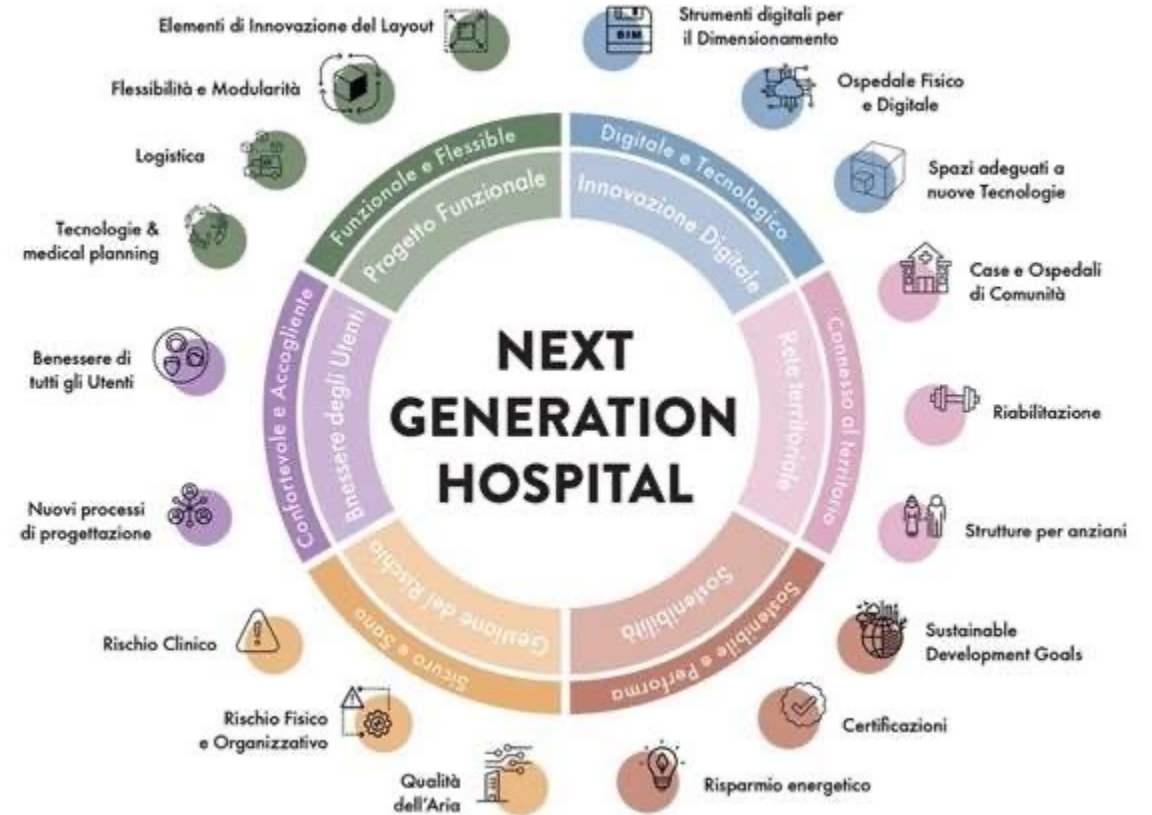
to learn more about the
Research Partnership

General Objectives JRPHI *

Definition of Evidence and Practice Based guidelines for the Next Generation Hospital®

Specific Objective

Survey of the requirements framework, sustainability indicators, and constraints of the main stakeholders



- **Research Partnership between tra PoliMI, healthcare facilities and healthcare companies*
- *Advisory Board with different national and international healthcare institution (AGENAS, ISS, Ministry of Health, UNI, WHO,...)*

Methodology: developing a Research Partnership

33 PARTNERS 2023 +43% FROM 2022

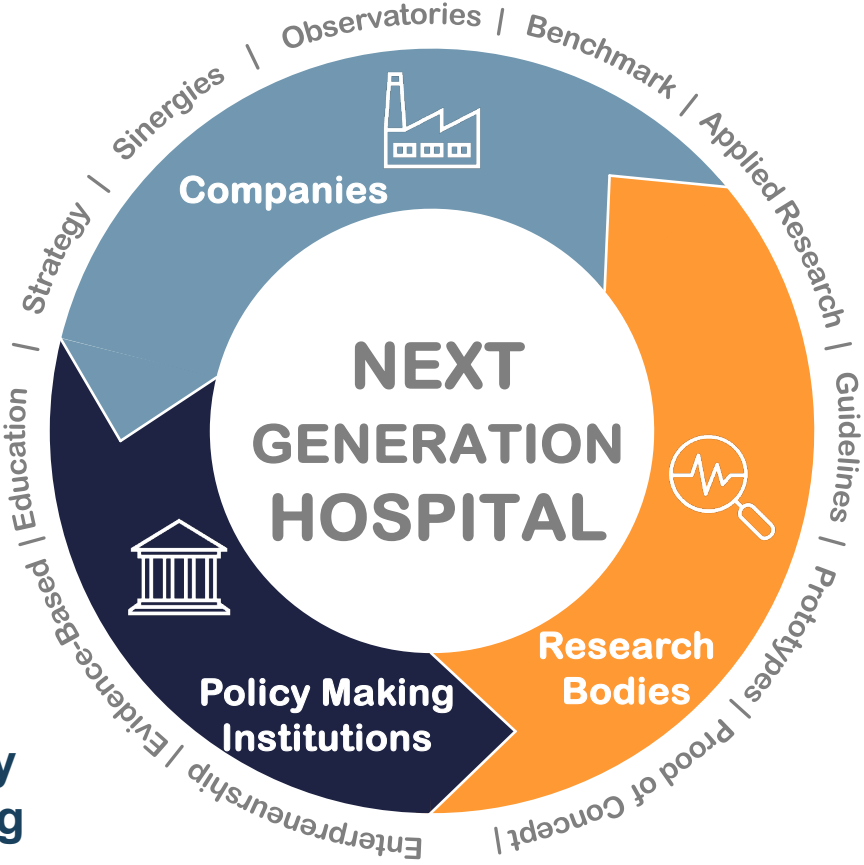
- 7 Architecture and Engineering Company
- 2 Construction Companies
- 9 Suppliers / Developers
- 3 Facility Management Companies
- 9 Hospital / Socio-sanitary
- 1 Insurance companies
- 2 Specialist Consultant

13 focus group

4 Board Meeting

2 Legislative Groups

2 Plenary Meeting JRP HI



Methodology: developing a Research Partnership



to learn more about the
Research Partnership



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Associati Platinum



Associati Gold e Istituzionali



Advisory Board



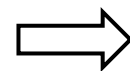
Methodology: developing a Research Partnership



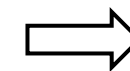
to learn more about the
Research Partnership



• Thematic Tables



• Workshop



• Scientific dissemination events

Methodology: Needs Recognition

- Web-based Survey
- Interviews
- 30 stakeholders
- 6 working groups

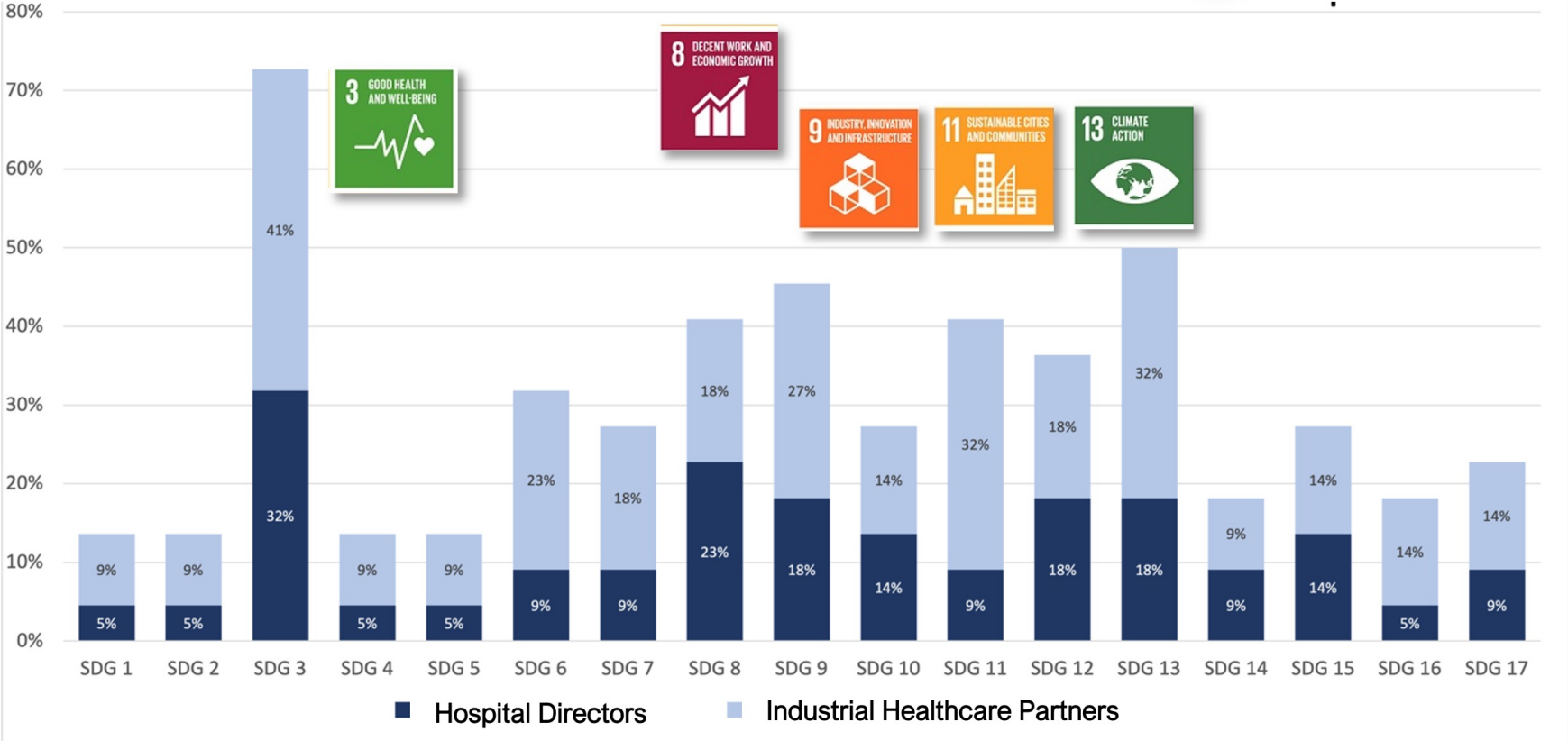
- Needs
- SDGs
- Constraints and drivers



Methodology: Web-based Survey

QUESTION	EVALUATION METHOD
Q1: Assessment of the priority of sustainability for healthcare organizations;	Likert scale 1-5
Q2: Assessment of the resources allocated for the implementation of sustainability strategies	Likert scale 1-5
Q3: existence or non-existence of a tool to measure sustainability performances. The possibility to briefly describe existing tools adopted by the organization to measure the performances (<i>open answer</i>)	Yes/no Open answer
Q4: Indication of the main constraints that hinder the implementation of sustainability strategies.	Multiple selection (from a list of items proposed by the questionnaire)
Q5: Indication of the main drivers that favor the implementation of sustainability strategies	Multiple selection (from a list of items proposed by the questionnaire)
Q6: The existence or non-existence of case studies or innovative procedures, concrete experiences related to sustainability and its description	Open answer

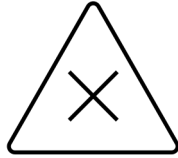
Results: SDGs priorities for strategic hospitals managers and healthcare sector companies



Correspondence | Published: 24 February 2022
One Health as a catalyst for sustainable development
 Christopher Dye
 Nature Microbiology 7, 467–468 (2022) | [Cite this article](#)

NATURE MICROBIOLOGY | VOL 7 | APRIL 2022 | 467–468

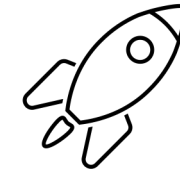
Results: Constraints and Drivers for Sustainability Performance Improvement in Healthcare Facilities



CONSTRAINTS

LIMITING SUSTAINABILITY IMPROVEMENTS

- **Budgetary concerns**
- Lack of Innovative strategies in day-to-day operations for sustainability improvement
- **Inadqeuat and outdates healthcare infrastructure of the healthcare facility**
- Shortage of adequately trained personnel



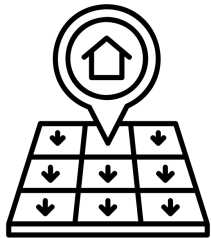
DRIVERS

ENCOURAGING SUSTAINABILITY IMPROVEMENTS

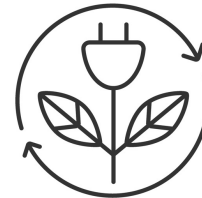
- Innovative construction systems and energy intensive plants;
- Environmental protocols and sustainability certifications;
- Specific training for healthcare staff;
- **Next Generation EU (PNRR) Funds;**

Results: Sustainability Challenges for Next Generation Healthcare Infrastructures

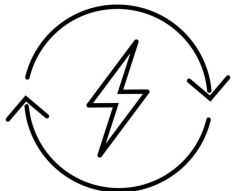
Reinforcing **sustainability performances** in health facilities encompasses aspects of the architecture, building components and impact on surroundings and other management considerations.



reduce **land consumption** and enhance existing infrastructures, where possible



Perform **life cycle assessment** in the procurement phase



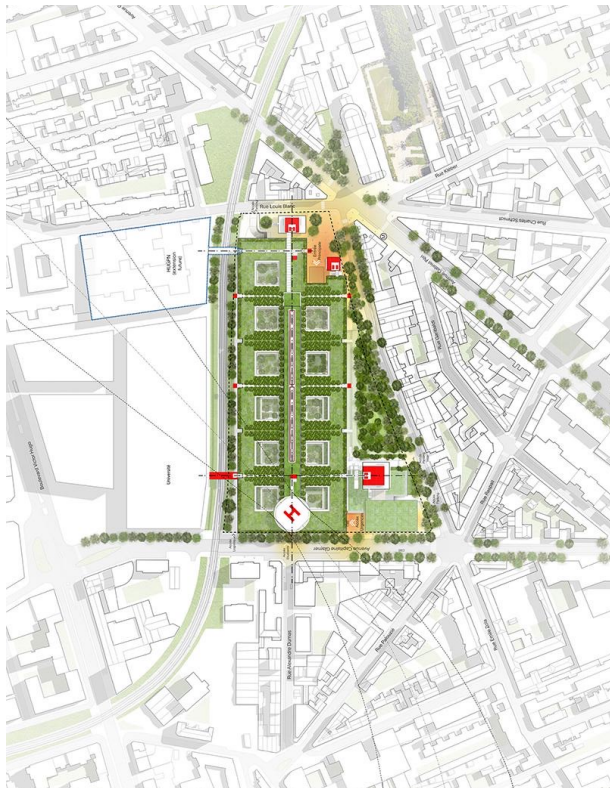
prioritize **low energy consumption** and environmental control.



Implement the use of **evidence-based assessment** models

Challenge 1: Urban Regeneration

Case study: Hospital Paris Nord



The Grand Paris-Nord University Hospital, is a cutting-edge medical establishment, focusing on people and performance, and quite simply ideally designed to face the growing needs of the greater Paris region for the decades ahead.



- Ability to follow the sun throughout the seasons
- Performance, adaptability and efficiency



- Reduced physical footprint
- Compact hospital
- Green roof

Location: Saint Ouen sur Seine, France

Client: Assistance Publique Hôpitaux de Paris

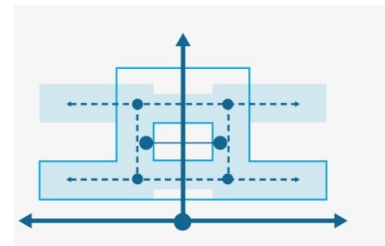
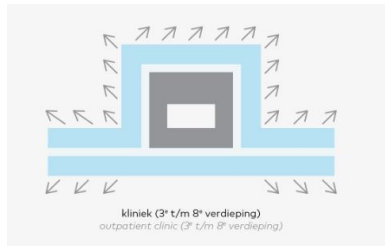
Date: 2019 - Ongoing

Architect: RPBW Architects (Renzo Piano Building Workshop)

Source: <https://www.rpbw.com/>

Challenge 2: Optimise energy consumption

Case study: Radboudumc Main Building



The new main building at Radboudumc offers a friendly and warm welcome. This is where the mission of Radboudumc comes to life: sustainable collaboration for personalized care that benefits public health.



- Solar panels
- Thermal-storage installation and water-saving measures
- Material-saving main structure
- Slender floor slabs



- Compact hospital
- Prefabricated components

Location: Nijmegen, The Netherlands
Client: Radboudumc

Date: 2022
Architect: EGM architects

Source: <https://egm.nl/>

Challenge 3: Study the Life Cycle

Case study: Polo chirurgico San Raffaele – Iceberg



The New Surgical and Emergency Center is a state-of-the-art facility entirely focused on the principles of hospital humanization. The project translates into the design choices the most recent sustainability solutions available.



- Natural light
- Reduction of thermal loads caused by solar radiation
- High energy efficiency of systems and building envelope



- Green areas

Location: Milano

Client: *Ircs Ospedale San Raffaele*

Date: 2021

Architect: *Mario Cucinella Architects*

Source: <https://www.mcarchitects.it/>

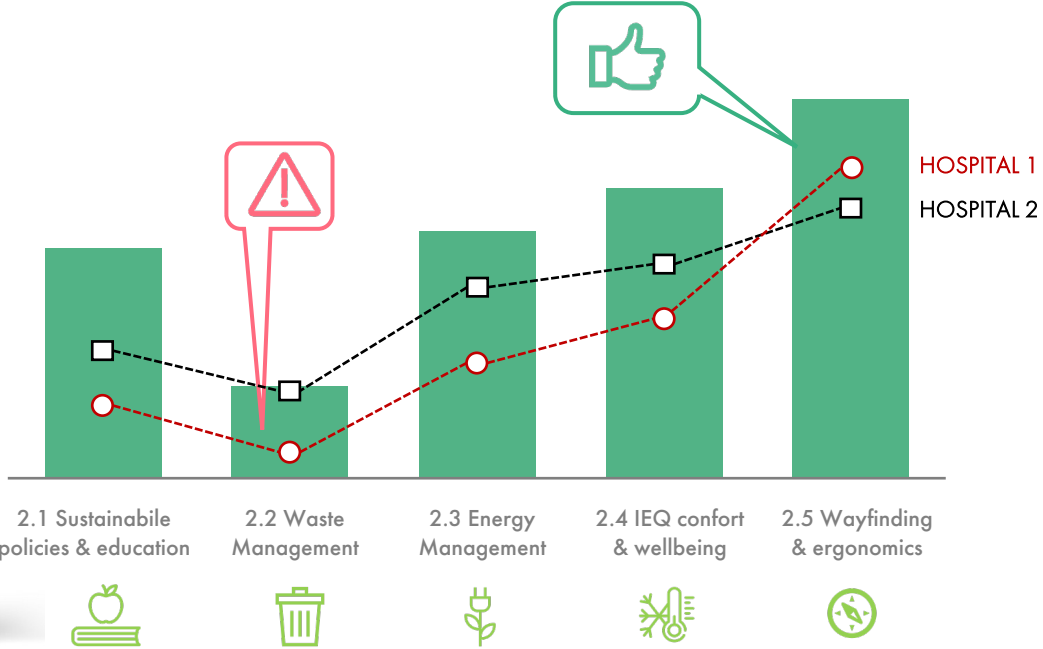
Challenge 4: Evidence-based assessment

Case study: SustHealth ESG



Measuring Environmental, Social and Governance Sustainability of Hospital organizations

HOSPITAL	
MACRO AREA	ms
1. ENVIRONMENTAL QUALITY (E)	0,68
Criterion	cs
1.1 Policies and Sensitization (PS)	0,89
1.2 Waste Management (WM)	0,88
1.3 Energy Management (EM)	0,41
1.4 Comfort Perception (CP)	0,43
1.5 Wayfinding and Ergonomics (WE)	0,86
2. SOCIAL QUALITY (S)	0,80
3. GOVERNANCE QUALITY (G)	0,77
TOTAL (T)	75,03



RELIABLE **FAST** **SCALABLE**

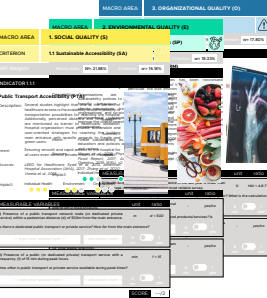
Challenge 4: Evidence-based assessment

Case study: SustHealth ESG

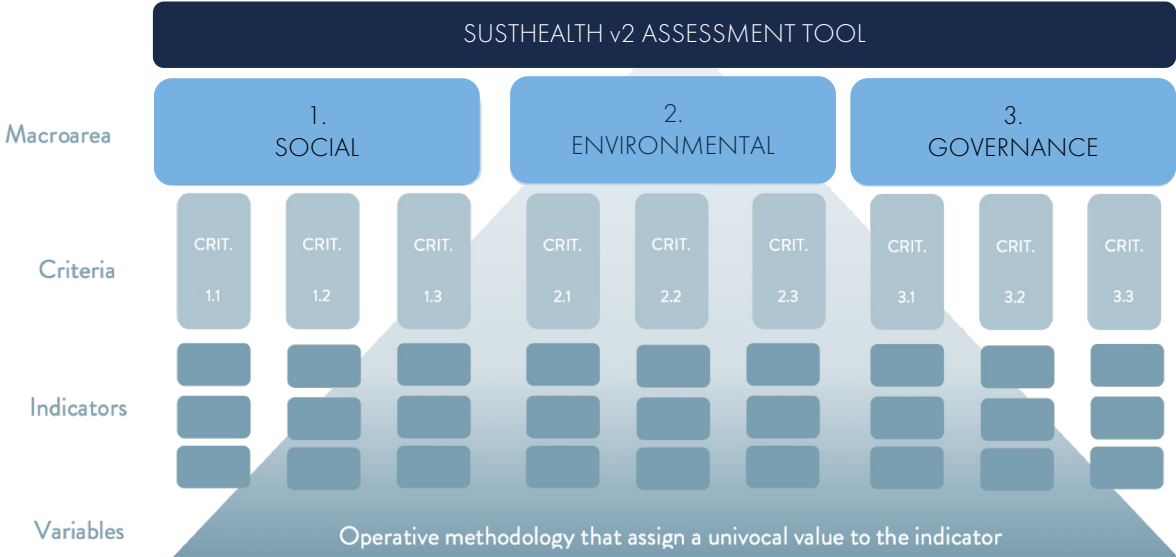
DATA COLLECTION

OUTPUT

SustHealth ESG Assessment



TESTED IN 15 EU HOSPITALS



SustHealth ESG Report



200 KPIs BENCHMARK

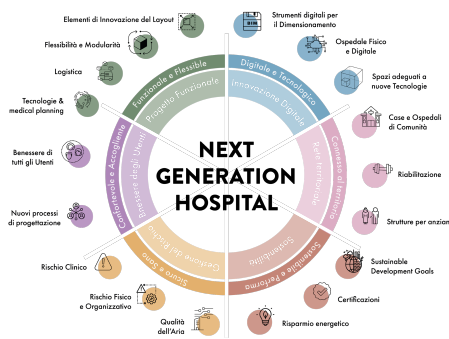
SustHealth ESG Advice



IMPROVEMENT STRATEGIES

Future Developments: Application of Evaluation framework Next Generation Hospital®

7 areas, 20 criteria, 95 performance requirements



Future Developments: Evidence Based Decision Making

	Ownership	Private	Non_Profit	Public
1. Social Quality	1.1 Sustainable Accessibility (SA)	Yellow	Yellow	Yellow
	1.2 Security Enhancement (SE)	Yellow	Yellow	Yellow
	1.3 Involvement and Empowerment (IE)	Yellow	Yellow	Yellow
	1.4 Social Inclusion (SI)	Yellow	Yellow	Yellow
	1.5 Health Promotion (HP)	Yellow	Yellow	Yellow
	1.6 Visual Environment (VE)	Yellow	Yellow	Yellow
2. Environmental Quality	2.1 Policies and Sensitization (PS)	Yellow	Yellow	Yellow
	2.2 Waste Management (WM)	Yellow	Yellow	Yellow
	2.3 Energy Management (EM)	Orange	Orange	Orange
	2.4 Comfort Perception (CP)	Yellow	Yellow	Yellow
	2.5 Wayfinding and Ergonomics (WE)	Yellow	Yellow	Yellow
3. Organisational Quality	3.1 Patient Safety (PS)	Yellow	Yellow	Yellow
	3.2 Survey and Monitoring (SM)	Yellow	Yellow	Yellow
	3.3 Future Proofing (FP)	Yellow	Yellow	Yellow
	3.4 Logistics and Efficiency (LE)	Yellow	Yellow	Yellow
	3.5 Technological Innovation (TI)	Orange	Yellow	Yellow
	3.6 Facility Management (FM)	Yellow	Yellow	Yellow

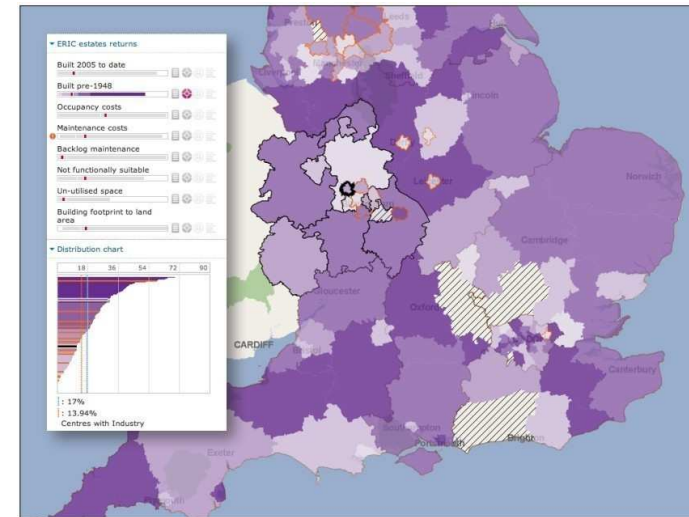
	Patient Beds	1-150	151-300	151-300	301-450	451-600	601-750	750+
1. Social Quality	1.1 Sustainable Accessibility (SA)	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow
	1.2 Security Enhancement (SE)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	1.3 Involvement and Empowerment (IE)	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow
	1.4 Social Inclusion (SI)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	1.5 Health Promotion (HP)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	1.6 Visual Environment (VE)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
2. Environmental Quality	2.1 Policies and Sensitization (PS)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	2.2 Waste Management (WM)	Yellow	Yellow	Yellow	Yellow	Orange	Yellow	Yellow
	2.3 Energy Management (EM)	Orange	Orange	Orange	Orange	Yellow	Yellow	Yellow
	2.4 Comfort Perception (CP)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	2.5 Wayfinding and Ergonomics (WE)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
3. Organisational Quality	3.1 Patient Safety (PS)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	3.2 Survey and Monitoring (SM)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	3.3 Future Proofing (FP)	Yellow	Yellow	Yellow	Orange	Orange	Yellow	Yellow
	3.4 Logistics and Efficiency (LE)	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	3.5 Technological Innovation (TI)	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	3.6 Facility Management (FM)	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow



Article
Testing of a Multiple Criteria Assessment Tool for Healthcare Facilities Quality and Sustainability: The Case of German Hospitals

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